City of Garden Grove Specifications

General Conditions and Special Provisions

SECTION 6 - GENERAL CONDITIONS

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SECTION 6 - GENERAL CONDITIONS

1. GENERAL DESCRIPTION

The work shall consist of furnishing all material and equipment and performing all labor required to carry out the general intention in accordance with the Plans and Specifications.

2. DEFINITIONS

State:	Shall mean the State of California or the City of Garden Grove as applicable
City Council:	Shall mean the governing body of the City of Garden Grove.
Public Works:	Shall mean the Public Works Department of the City of Garden Grove.
City:	Shall mean the City of Garden Grove.
Engineer:	Shall mean the City Engineer or his authorized agent.

3. LOCATION

The work shall be constructed on land owned or controlled by the City of Garden Grove, at the sites shown on the plans.

4. CONTRACT

Within ten (10) calendar days after CITY award, the Contract shall be executed on the form enclosed herein by the successful CONTRACTOR. It shall be the responsibility of the CONTRACTOR to make an appointment within the above time limit to sign the Contract in the Engineer's office and to discuss the construction operations with the Engineer or his representative.

5. PERFORMANCE BOND

Refer to Construction Agreement.

6. RETENTION

Refer to Construction Agreement.

7. BEGINNING OF WORK

Refer to Construction Agreement.

8. TIME FOR COMPLETION

Refer to Construction Agreement.

SECTION 6 – GENERAL CONDITIONS (Continued)

9. LIQUIDATED DAMAGES

Refer to Construction Agreement.

10. STANDARD SPECIFICATIONS AND STANDARD PLANS

"Standard Specifications" referred to herein shall be those published by the State of California, Department of Transportation, Standard Specifications, dated May, 2015 and the "Greenbook" referred to herein shall be Standard Specifications for Public Works Construction, latest edition. The "Standard Plans" referred to herein shall be those of the City of Garden Grove, Public Works Department, latest revision unless noted otherwise.

11. MATERIALS

Materials shall be new and in accordance with these specifications. Certified reports of material's inspections of materials required under this contract as specified herein shall be submitted and may be accepted by the Engineer in lieu of actual chemical or physical tests in the field. Where a reasonable doubt exists in the mind of the Engineer, however, he shall conduct all necessary tests to determine that the material in question meets the requirements of the specifications. The cost of making such tests shall be borne by the City of Garden Grove when the results indicate compliance with the specifications, otherwise, the expense of such tests shall be borne by the Contractor.

12. LICENSES, PERMITS, REGULATIONS AND ORDINANCES

At its sole cost and expense, Contractor and all sub-contractors shall obtain such licenses, permits, and approvals as may be required by law for the performance of the services required by this agreement. Contractor and all subcontractors shall have the sole obligation to pay for any fees, assessments, and taxes, plus applicable penalties and interest, which may be imposed by law and arise from or are necessary for the performance of the services required by this contract. The Contractor and any subcontractor shall have the proper state licenses for the work to be performed along with obtaining a City business license prior to commencement of their work.

The Contractor shall pull encroachment and/or construction permits from the controlling agency for all work outside the jurisdiction of the City of Garden Grove. Contractor and all subcontractors shall have the sole obligation to pay for any fees associated with obtaining the required permit.

The Contractor and all subcontractors shall comply with all laws, ordinances, rules and regulations bearing on the conduct of the work. Any work performed, or materials or equipment furnished, which does not conform to said laws, ordinances, rules and regulations, shall be changed to conform thereto by the Contractor at his sole expense.

13. WORK OUTSIDE REGULAR HOURS

No work will be allowed outside regular working hours without the express permission of the Engineer of City of Garden Grove**,** except work items as mentioned above and relating to maintenance and cleanup of the work area for the purpose of public safety and convenience. In the event, work outside regular hours is allowed, any extra expense incurred by the CONTRACTOR shall be considered as being included in his bid prices and no extra compensation will be due for such work. The night work shall be lighted in a manner approved by the Engineer.

The legal workday shall consist of eight (8) hours. Work may be completed between the hours of 7:30 AM to 4:30 PM unless otherwise specified. Should CONTRACTOR receive permission from the Engineer to work overtime, the CONTRACTOR shall pay $500.00/hr for all inspection costs because of the CONTRACTOR's overtime work.

Workdays shall be restricted to Monday through Friday unless written request outlining substantial reasons for working on Saturdays, Sundays or contractual holidays is submitted to the Engineer a minimum of forty-eight (48) hours in advance of the proposed non-contractual working day(s). If the work proposed is determined by the Engineer as being in the best interest of the CITY, the necessary inspection will be provided.

If the reasons for such request are not deemed sufficient, the Engineer may authorize inspection and survey services, if available, and such services shall be billed against the CONTRACTOR at the time and one-half salary rate plus fringe benefits for the personnel assigned to the project. Such services shall be paid to the nearest half-hour worked, subject to a minimum working period of two (2) hours.

Emergency repairs and pre-storm protective installations may be performed in project areas without written notice.

14. ORDER OF WORK

The method of conducting the work shall be subject to the approval of the Engineer, or his authorized representative. (Refer to ARTICLE 4 of Special Provisions.)

15. PRECONSTRUCTION CONFERENCE

The CONTRACTOR, along with his field representative(s) and all subcontractors', shall meet with representatives of the City of Garden Grove before the start of construction. The CONTRACTOR will be notified regarding the exact time and place of the conference.

The CONTRACTOR shall submit a list of material suppliers to the Engineer at the Preconstruction Conference. He shall also designate an employee to be responsible for traffic control on this project other than the Project Superintendent. This employee shall have expertise in urban traffic control, and shall be at the site during all operations requiring traffic control. As part of his responsibilities, he shall personally inspect the traffic control devices in use at least twice per day during operations, and twice per day on days when traffic control remains in effect when no work is in progress.

A schedule of construction shall be submitted to the Engineer at the Preconstruction Conference.

16. QUANTITIES OF WORK

The quantities of work shown in the Proposal are approximate only and constitute the Engineer's Estimate for this project. The CITY does not expressly or by implication agrees that the actual amounts of work will correspond exactly with the Engineer's Estimate.

The CITY reserves the right to increase or decrease the amount of any class or portion of the work as may be deemed necessary or expedient by the Engineer.

SECTION 6 – GENERAL CONDITIONS (Continued)

17. LEGAL RELATIONS AND RESPONSIBILITY

General - In connection with laws to be observed and responsibility of CONTRACTOR, attention is directed to Section 7 of the Standard Specifications and to the laws therein applicable to this contract.

Labor - Attention is directed to the provisions and penalties applicable to workmen permitted to labor more than eight hours in a calendar day, to labor discrimination, and to employment of alien labor.

18. PROSECUTION OF WORK

The CONTRACTOR shall conduct the work in such a manner and with sufficient materials, equipment, and in the time limits set forth in the Specifications. Should the CONTRACTOR with the consent of the Engineer discontinue the prosecution of the work for any reason, he shall notify the Engineer at least twenty-four hours in advance of resuming operation.

19. EXAMINATION OF PREMISES

Contractors are required to visit the site before submitting proposals so as to satisfy themselves as to existing conditions in and around the project work area. No extra payment will be allowed by the CITY for failure to properly assess site work area and conditions.

20. TERMS OF CONSTRUCTION AS USED IN THESE SPECIFICATIONS

The present tense includes the past and future tenses; and the future the present.

The masculine gender includes the feminine and the neuter.

The singular number includes the plural; and the plural the singular.

"Shall or will" is mandatory and *"may"* is permissive.

21. RECORD DRAWINGS

The CONTRACTOR shall keep a complete set of Record Drawings at the job site. Contract Drawings shall be legibly marked showing each actual item of record construction including:

A. Measured depths of elements in relation to fixed datum points.

B. Measured horizontal and vertical locations of underground utilities with reference to permanent surface improvements.

C. Field changes of dimensions, locations and/or materials with details as required to clearly delineating the modifications.

D. Any details not in the original Contract Drawings developed by the CITY or the CONTRACTOR through the course of construction necessary to clarify or modify the Contract Drawings.

E. Each month, the contractor will submit updated as-built plan to the Engineer for review as a condition of payment for monthly progress payment. Progress pay will be withheld until as-built plans are brought up to date.

At the end of the project, CONTRACTOR shall submit to the Engineer of Garden Grove "As-Built" prints prior to the CITY acceptance of the work. The prints shall indicate in red all deviations from Project Plans. Failure by CONTRACTOR to submit "As-Built Plans" may cause delay in final payments.

22. SUBMITTALS

The CONTRACTOR shall submit for approval by the Engineer such material, samples, product specifications/brochures, certified mix designs, warranties material certifications, operations and maintenance manuals and equipment as may be required, whether mentioned specifically herein or not.

23. SUPERINTENDENCE OF LABOR AND COMPETENCY

The CONTRACTOR, or an experienced superintendent authorized to act for him, shall be continually in charge of the work. Information given by the Engineer to the CONTRACTOR's superintendent or his authorized representative shall be as binding as though given to the CONTRACTOR in person. In addition, there shall be a qualified and experienced foreman in charge of each branch of work. No workman, foreman, or superintendent shall be continued on the work that, in the judgment of the Engineer, is negligent or incompetent.

24. PROTECTIONS AND INSURANCE

Refer to Construction Agreement.

25. SUBCONTRACTORS

No subcontractors will be recognized as such. All persons engaged in the work of construction will be considered as employees of CONTRACTOR, and CONTRACTOR will be held directly responsible for their work. No contract or any portion thereof may be assigned without the written consent of the Engineer.

26. CLAIMS/LEGAL ACTIONS AGAINST THE CITY

It is the intent of this contract, that the Contractor shall and will indemnify and hold harmless the City of Garden Grove, its officers and employees from all claims, suits or actions regardless of the existence or degree of fault or negligence on the part of the City. The Contractor shall be responsible for any liability imposed by law and for injuries to or death of any person including but not limited to workmen and the public, or damage to property resulting from defects or obstruction or from any cause whatsoever during the progress of the work or at any time before its completion and final acceptance.

In the event claim/legal actions are brought against the City, immediately it will be referred to the Contractor. Failure by the Contractor, for any reason to indemnify, defend and save harmless the City, the City shall deduct from any money due to Contractor reasonable expenses that the City staff or consultant working for the City have incurred in processing, investigation, defending any claims/legal actions brought against the City.

27. SATISFACTION OF LIENS

Prior to judicial determination of any claim or claims in accord therewith, the CITY may apply an amount withheld to the payment and satisfaction of subcontractors for labor and services rendered and materials furnished. In so doing the CITY shall be deemed the agent of the

CONTRACTOR and any payment so made by the CITY shall be considered as a payment made under the Contract by the CITY to the CONTRACTOR, the CITY shall not be liable to the CONTRACTOR for any such payment made in good faith provided that such payment shall not be made except by court order if the CONTRACTOR furnished a bond satisfactory to the CITY to indemnify the CITY against any lien or claim.

If any lien or claim should remain unsatisfied after final payment to the CONTRACTOR, the CONTRACTOR, upon demand, shall refund to the CITY any money that the latter may be compelled to pay to discharge such lien or claim, including all costs and reasonable attorney's fees.

Before the CITY will make the final payment to the CONTRACTOR, the CONTRACTOR shall furnish the CITY with lien releases from all subcontractors and suppliers of material, together with a certified statement that the releases represent all the materials furnished and all the subcontractors engaged for the work.

28. DISPUTED WORK

If the CONTRACTOR and the CITY are unable to reach agreement on disputed work, the CITY may direct the CONTRACTOR to proceed with the work. Payment shall be as later determined by arbitration, if the CITY and the CONTRACTOR agree thereto, or as fixed in a court of law.

Although not to be construed as proceeding under extra work provisions, the CONTRACTOR shall keep and furnish records of disputed work in accordance with Section 9-1.03C of the Standard Specifications.

29. CLEAN UP

The CONTRACTOR shall protect and care for all work until final completion and acceptance.

During construction, the CONTRACTOR shall keep the site free and clean from all rubbish and debris, and the site must be cleaned up within one day after the Engineer gives him notice.

At the time of the completion of the work, the CONTRACTOR shall remove from the site and the vicinity of the work all plant equipment, buildings and other temporary facilities, all used or unused materials belonging to him or used under his direction during construction. He shall remove all debris and rubbish from the site of the work before he makes application for acceptance of the work.

30. LEGAL HOLIDAYS

Legal holidays shall be regarded as New Year's Day and the day before or after as approved by the CITY, Martin Luther King, President's Birthday, Memorial Day, Fourth of July, Labor Day, Veterans Day, Thanksgiving and the Friday following, and from **December 24, 2018 to January 1, 2019**. No work shall be scheduled on a legal holiday.

31. PAYMENTS

Refer to Construction Agreement.

32. PAYMENT OF TAXES

The contract prices paid for the work shall include full compensation for all taxes which the CONTRACTOR is required to pay, whether imposed by Federal, State, or local government, including, without being limited to, Federal Excise Tax and Federal Transportation Tax.

33. SCHEDULE OF CONSTRUCTION

The CONTRACTOR shall submit to the Engineer a schedule of construction for approval. The schedule of construction shall be submitted in accordance with Section 8.1.04 of the Standard Specifications with the following exceptions:

A. The CONTRACTOR shall submit a written proposed progress schedule to the engineer before starting construction.

B. The CONTRACTOR shall be responsible for furnishing a schedule on a form, which meets the Engineer's approval.

C. The CONTRACTOR shall be responsible for updating the schedule and, if requested, will provide an updated copy of the schedule at the end of each billing period.

D. No payments of work completed shall be made until the subject schedule is submitted and approved.

The schedule of construction shall list in detail and proper sequence the various construction items for the job. The Engineer shall be notified before any change is made in the sequence of construction.

34. SAFETY PROVISIONS

The CONTRACTOR shall conform to the rules and regulations pertaining to safety established by the California Division of Industrial Safety.

The CONTRACTOR shall maintain the work site in a clean, safe and workmanlike manner. All material to be cleared from the site shall be removed from the site at the end of each day. All open trenches shall be backfilled at the end of each working day. The work area shall be secured with a six-foot (6') high chain link construction fence at the end of the day or adequately covered with steel plates or as directed by the CITY Engineer.

The CONTRACTOR shall upon direction of the Engineer, immediately remove or protect any item, which in the opinion of the Engineer presents a safety hazard. All costs involved in maintaining the work site in a clean and safe manner shall be included in the various items of work and no additional compensation will be allowed. With the approval of the City Engineer, The Contractor may establish temporary "No Parking Tow Away" zones adjacent to the work zone. Establishment of such zones shall be coordinated with the Garden Grove Police Department, (714) 741-5707, and the City's Traffic Engineer, (714) 741-5192.

35. GUARANTEE

Refer to Construction Agreement.

SECTION 6 – GENERAL CONDITIONS (Continued)

36. ENGINEERING AND SURVEY CONTROL

Control of the work shall be in accordance with Section 5 of the Standard Specifications and herein contained under Section 6 - General Conditions, with the following modifications:

A. The CONTRACTOR shall provide the services of a land Surveyor licensed in the state of California, for laying out survey control for the work.

37. COORDINATION OF DOCUMENTS

In case of conflict between the various contract documents, the order of precedence shall be as follows:

1. Special Provisions
2. General Conditions
3. Construction Plans
4. City of Garden Grove Standard Plans
5. The City of Garden Grove Public Works Department Specifications
6. Caltrans Standard Specifications, 2015 Edition
7. Standard Specifications for Public Works Construction, 2015 Edition

The standard specifications shall apply to all phases of work not controlled by documents 1 through 5 above.

In case of conflict between the specifications and the instructions and conditions of the invitation to bid, the specifications shall have precedence.

In case of conflict, it is the contractor's responsibility to use best materials as approved by the Engineer.

38. RIGHT-OF-WAY

It shall be the responsibility of the Contractor to conduct all of his activities and operations within the rights-of-way provided by the City and within the confines of the work site.

If, for any reason, the Contractor elects to encroach upon other lands adjoining rights-of-way or adjoining the work site, he shall first obtain written permission from the owner thereof and provide evidence of such permission in writing to the Engineer prior to entering upon such lands.

The Contractor shall indemnify and hold the City harmless from all claims for damages occasioned by such work or activity, whether done in compliance with this section and with permission or in violation of this section and without permission.

39. CONSTRUCTION SITE

Construction equipment shall not be stored at the work site before its actual use on the work nor for more than three (3) working days after it is no longer needed on the work. All repairs or assembly of equipment that will take two (2) or more working days to repair shall be done at the construction yard adjacent to the work area. The CITY shall approve the location and size of construction yard. Any damaged, destroyed or disturbed area at the site shall be restored to their original condition or replaced by the CONTRACTOR as directed by the

Engineer at no additional expense to the CITY. All equipment and materials shall be stored at the yard during weekends, unless otherwise authorized by the Engineer.

Excavated materials shall not be stored on the site. Excavated materials that may be suitable for backfill may be stored at the site as approved by the CITY Engineer. The Engineer shall, at all times, have a safe access to the site for purposes of inspection and testing. The CONTRACTOR shall remove all trash, debris, and construction materials, spoil and contaminates (gas, oil diesel fuel, lubricants, etc.) and leave the site in a clean and level condition.

Full compensation for conforming to the requirements of this section shall be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed.

40. TESTS

Tests, including compaction tests, shall be performed in accordance with the Standard Specification and this Specification. The Contractor, at its own expense, shall deliver the materials for testing to the place and at the time designated by the Engineer. The Contractor shall notify the Engineer no less than two (2) working days in advance of any required materials testing. The cost of making such tests shall be borne by the City when results indicate compliance with the specifications, otherwise, the expense of such tests shall be borne by the Contractor.

41. COMPLIANCE WITH LAW

CONTRACTOR shall comply with all applicable laws, ordinances, codes, and regulations of the federal, state, and local governments.

42. NO WAIVER OF CONDITIONS

CONTRACTOR agrees that waiver by CITY of any one or more of the conditions of performance under this contract shall not be construed as waiver of any other condition of performance under this contract.

43. CORPORATE AUTHORITY

The persons executing this contract on behalf of the parties hereto warrant that they are duly authorized to execute this contract on behalf of said parties and that by so executing this contract; the parties hereto are formally bound to the provisions of this contract.

44. MODIFICATION

This Agreement constitutes the entire agreement between the parties. This Agreement may be modified only by subsequent mutual written agreement executed by the CITY and the CONTRACTOR.

45. WAIVER

All waivers of the provisions of this Agreement must be in writing by the appropriate authorities of the CITY and the CONTRACTOR.

SECTION 6 – GENERAL CONDITIONS (Continued)

46. CALIFORNIA LAW

This Agreement shall be construed in accordance with the laws of the State of California.

47. INTERPRETATION

This Agreement shall be interpreted as though prepared by both parties.

48. PRESERVATION OF AGREEMENT

Should any paragraph, clause or provision of this agreement be found invalid or unenforceable, such decision shall affect only the paragraph, clause, or provision construed and interpreted, and all remaining provisions shall remain valid and enforceable.

49. MUTUAL AGREEMENT

The parties hereto do mutually covenant and agree to the full and faithful performance of their respective obligations under this contract.

50. NOTICE OF COMPLETION

Contractor shall certify in writing to City, prior to final payment, that the entire project is complete and request that City issue a Notice of Completion. Within a reasonable time thereafter, City and Contractor shall make an inspection. If the City does not consider the project complete, it will notify the Contractor in writing giving its reasons the list of work to be completed or corrected and shall be accepted by the City prior to recordation of the Notice of Completion and final payment.

51. HAUL ROUTE PLAN

Prior to the start of construction, the Contractor shall submit three copies of a haul route plan to the Engineer for review and approval. Plan shall delineate route and type of contractor and subcontractor vehicles from point of inception to work site, and return to point of inception.
The Contractor shall demonstrate that he has given full consideration to the possible impacts to the surrounding and adjacent properties and that the proposed plan provides the least possible impact. Safety appropriate to haul trucks will be required at all items. Haul truck route to be free of debris, material at the end of the working day, and cleaned continuously during the hauling operation.

52. NOTICE

Prior to the start of construction operations, the Contractor shall notify the Police and Fire Departments of the AGENCY, giving the approximate starting date, completion date, and the name and telephone of responsible persons who may be contacted at any hour in the event of a critical condition requiring immediate correction.

At least two weeks prior to starting work, the Contractor shall notify the Orange County Transportation Authority (OCTA) bus service of the approximate starting date and completion date.

At least two weeks prior to starting work, the Contractor shall deliver notices supplied by the AGENCY to the residents and businesses in the area affected by the construction. At least 48 hours before working on a street, the contractor shall contact the residents and businesses of that street by written notice to provide information as to the type of work, closure, type of inconvenience and the expected duration. The written notice shall be a tag shape and be hanging on doorknobs and all parked vehicles on the street. In the event of a

SECTION 6 – GENERAL CONDITIONS (Continued)

delay after the notice has been delivered, the contractor shall provide an updated notice to the residents and businesses. After construction completion on the street, the contractor shall collect any notices that are not pickup by the residents or businesses.

SECTION 7 - SPECIAL PROVISIONS

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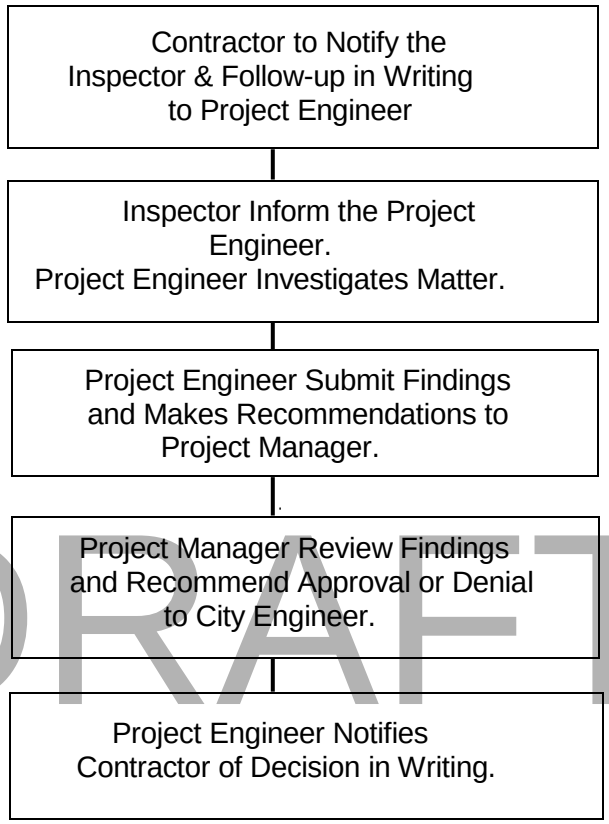
ARTICLE 1 - CONTRACT ADMINISTRATION PROCEDURES

For any type of problems, changed conditions, plan interpretations, progress billings and etc.,



If Contractor disagrees with the decision, the City will direct the Contractor to proceed with the work, subject to the provisions of Subsection 5-1.43. If a notice of potential claim is filed under the provisions of Subsection 5-1.43, Contractor shall provide daily extra work reports per Subsection 9-1.04.

All daily extra work reports shall be delivered to the Engineer within 24 hours of performance of such extra work.

The Contractor shall notify the City Engineer through the inspector in writing within three (3) working days following the discovery of any conflicts and/or difficulties, and before they are disturbed of existing conditions. The Contractor's failure to give written notice of changed conditions within the time required (Ten calendar days) shall constitute a waiver of any potential claim.

It shall be the responsibility of the Contractor to initiate, to meet and confer, and try to resolve in good faith pending claims against labor, materials and equipment, potential and disputed claims, extra work, corrections and repairs, and any other claims associated with the project.

At the final inspection, Contractor shall provide a list of all claims, proceeding from notices of potential claims previously submitted under the requirements of the Contract, for which he intends to file claims.

Contractor shall also arrange to meet and confer on the listed claims within 15 days of the final inspection. Time of the meeting shall be within this 15-day period.

If on the day of final inspection Contractor fails to set such meeting or provide the list of claims, the project will not be accepted and working days will continue to accrue. If these requirements are met on the day of the final inspection, preliminary acceptance will be established pending final acceptance following attendance of Contractor at the scheduled meeting.

If Contractor attends the scheduled meeting within 15 working days of the final inspection, the date of acceptance will be the date of final inspection. Failure of the Contractor to attend such meeting within 15 days of the date of preliminary acceptance shall cause the working days used in performance of the contract to be calculated based on the date of the actual meeting being date of final acceptance, minus 15 days.

If for any reason claims cannot be settled through good faith negotiations, claims will be resolved in conformance with Section 9-1.22 "Arbitration" of the Standard Specifications with the following additions:

The City and the Contractor shall share all fees required by arbitration equally. When the claim is to be settled in court, both parties must pay their own attorneys' fees.

Full compensation for conforming to the requirements of this article shall be considered as included in the contract lump sum price and no separate payment will be allowed therefore.

ARTICLE 2 - SCOPE OF WORK

The scope of work shall conform to the provisions of Section 4 of the Standard Specifications and the following additions:

The intent of this project is to construct all items of work complete in place in accordance with the project plans, specifications and as directed by the Engineer. The unit prices, which include the cost of equipment, tool, materials and labor that are delivered to the work site are necessary for this purpose, to complete the project within the contract time required.

When unforeseen difficulties or a conflict is encountered, including toxic and hazardous materials, Contractor shall notify the engineer in writing immediately upon discovery and before the existing conditions are disturbed. Contractor shall also allow the engineer minimum of three (3) hours to investigate the conditions and make determinations concerning these conditions. Contractor and his work force shall assist the Engineer in such investigations. If the Engineer determines that additional time is needed for evaluation after investigation; the Contractor shall reschedule, reassign, transfer or move any labor, materials, tools, and equipment and alter the sequence of construction activities as necessary to carry out the intent of this project at no cost to the City.

The Contractor cannot withdraw from the project site any labor, materials, tools and equipment without prior written approval by the engineer or his authorized representative. The Contractor, therefore, shall have no claim against the City for delay, standby time of tolls, equipment and labor, damages, liability and loss of profit, when it is necessary for the engineer to exercise this requirement.

Full compensation for conforming to the requirements of this article shall be considered as included in the contract lump sum price and no separate payment will be allowed therefore.

ARTICLE 3 - COOPERATION

Although there can be no guarantee that difficulties will not be encountered, the cooperation of the Contractor is expected. The City has endeavored to provide a complete project plan and specifications. In the event of any conflict during the course of construction, Contractor shall allow reasonable time and to provide equipment and manpower for the engineer to field-check and make determination to resolve the conflict.

Contractor shall provide equipment and manpower to dig all holes necessary for testing and other test requirements.

Contractor shall have, at all times during working hours, a representative on the job site. The representative shall have the authority to make decisions regarding work that can commit Contractor time, materials, equipment's, labors, and resources.

Full compensation for conforming to the requirements of this article shall be considered as included in the contract lump sum price and no separate payment will be allowed therefore.

ARTICLE 4 - SCHEDULE OF CONSTRUCTION AND ORDER OF WORK

A. Schedule of Construction

Before starting construction, the Contractor shall submit to the Engineer a practicable progress schedule to be approved by the Engineer. The schedule shall show the order in which the Contractor proposes to carry out the work, and the contemplated dates for completing the salient features.

The progress schedule shall be consistent with the order of the work, and time requirements of the Contract. Construction shall also be scheduled in such a manner as to allow the Engineer to inspect the readiness of every phase of the work.

B. Construction Meeting

Contractor shall anticipate a weekly construction meeting held between representatives of the City of Garden Grove, and the Contractor, at an agreed place, day of the week and time in order to discuss progress, submittals, current challenges, potential problems and other miscellaneous topics necessary to the proposed project.

C. Order of Work

The first order of work, after being notified that he has awarded the Contract, shall be to place the order for all the materials required by this project within three (3) working days from date of notification. The Contractor shall furnish the Engineer with a statement from the vendor that the order for said materials has been received and accepted by said vendor.

The Contractor shall furnish and install the video detection system which must be operational and approved by the City Traffic Engineer before any work that takes the traffic detection loops out of service may begin.

In addition, in order to provide lead time to resolve any unforeseen utility conflicts, the Contractor shall pothole and ascertain the true location and depth of all underground utilities and services as shown on the plans or located within the lines of excavation and/or marked by their respective owners in the field. This phase of work shall be performed a minimum of two (2) weeks, if allowable, prior to excavation work and shall be incorporated into the construction schedule.

Full compensation for conforming to the requirements of this article shall be considered as included in the contract lump sum price and no separate payment will be allowed therefore.

ARTICLE 5 - CONSTRUCTION WATER

Application of water shall conform to the provisions of Section 17-1.02 of the Standard Specifications. Construction water may be taken only at locations approved by the Water Services Division. The City, at the Contractor's expense, will install a construction meter and eddy valve at these locations. This valve shall be operated when taking construction water with the fire hydrant remaining open during the day. Contractor will be charged for construction water on an as-used basis.

The Contractor shall make application to the City of Garden Grove Water Department for installation of a fire hydrant water meter for his construction water and shall make appropriate meter deposits to cover cost of relocation or damage to the meter.

Payment for applying water, including all labor, tools, equipment, and incidentals required for the application of water shall be considered as included in the contract lump sum price and no additional compensation will be allowed therefore.

ARTICLE 6 - CONSTRUCTION YARD SITE

The proposed project is located in residential and/or commercial areas. Contractor shall, at his expense, secure a site for storing materials supplies and equipment. A conscious effort on his part is required, that due regard to the rights of the public must be observed at all times possible obstruction and inconvenience shall be kept to the minimum.

Construction materials shall not be stored in streets, roads or highways for more than three (3) working days after unloading. All materials or equipment not installed or used in the construction within three (3) working days after unloading, shall be stored at the construction yard.

Construction equipment shall not be stored at the work site before its actual use on the work nor for more than three (3) working days after it is no longer needed on the work. All repairs or assembly of equipment that will take two (2) or more working days to repair shall be done at the construction yard. All equipment and materials shall be stored at the yard during weekends, unless otherwise authorized by the Engineer.

Excavated materials shall not be stored in public streets, roads or highways. Excavated materials that may be suitable for backfill shall be stored at a site of Contractor's choice. The Engineer shall, at all times, have a safe access to the site for purposes of inspection and testing.

Full compensation for conforming to the requirements of this article shall be considered as included in the contract lump sum price and no separate payment will be allowed therefore.

ARTICLE 7 - PROJECT APPEARANCE

The Contractor shall maintain a neat appearance to the work site. Asphalt concrete, aggregate base, broken PC concrete, native soil, and debris developed during construction shall be disposed of concurrently within its removal. If stockpiling is necessary, the material shall be removed or disposed of weekly.

Dust caused by the passage of public traffic through the work shall be considered as resulting from the Contractor's performance of work. Whenever the Contractor fails to control dust resulting from the performance of the work, the Engineer may cause such dust to be controlled and costs thereby incurred shall be deducted from moneys due or to become due the Contractor.

Full compensation for conforming to the requirements of this article shall be considered as included in the contract lump sum price and no separate payment will be allowed therefore.

ARTICLE 8 - PUBLIC SAFETY

The Contractor shall conform to the rules and regulations pertaining to safety established by the California Division of Industrial Safety.

The Contractor shall take all necessary precautions to protect the public from the hazards of open excavations. Trenches and other excavations shall either be covered or adequately fenced at night and on weekends or at other times required by the Engineer for safety. No open trenches or any other open excavation shall be left open for more than two (2) working days. Contractor shall backfill all open excavation at his expense.

The Contractor may establish temporary "No Parking Tow Away" zones adjacent to the work zone. Establishment of such zones shall be coordinated with the Garden Grove Police Department, (714) 741-5707, and the City's Traffic Engineer, (714) 741-5189.

Temporary *"No Parking Tow Away"* zone sign shall be posted 72 hours in advance by the Contractor, stating the date and time, for any arterial street. Residential streets shall also be posted 72 hours in advance.

Payment for fencing, safety protection and temporary excavation backfill shall be included in the contract lump sum price and no additional compensation will be allowed therefore.

ARTICLE 9 - ARCHAEOLOGICAL AND PALEONTOLOGICAL DISCOVERIES

If discovery is made of items of archaeological or paleontological interest, the Contractor shall cease excavation of the area of discovery and shall not continue until such time as approved by the Engineer. The Engineer shall then direct excavation operations within the area of discovery.

Discoveries include but are not limited to, dwelling sites, stone or other artifacts, animal bones, human bones and fossils.

The Contractor shall be entitled to an extension of time in accordance with the provisions of Subsection 8-1.07B. Should the Contractor's operations be affected materially, additional work will be paid for as extra work as provided in Section 4, "EXTRA WORK," of the Standard Specifications.

ARTICLE 10 - GEOTECHNICAL INVESTIGATION

The City has not prepared a geotechnical/soil investigation report for this project. The City, therefore, encourages the Contractor to conduct his/her own subsurface exploration before submitting a bid.

By submitting a bid, the Contractor acknowledges that he has satisfied himself as to the nature of the work, including but not restricted to the conditions affecting handling and storage of materials, disposal of excess material, level and amount of groundwater, and ascertaining existing conditions that affect labor, materials and equipment costs.

In the event, groundwater is encountered, the Contractor shall provide and maintain dewatering during construction in accordance with the standard specifications and the requirements of the district's NPDES Order No. 85-83 issued by the California Regional Water Quality Control Board (Santa Ana Region).

All costs for dewatering, when encountered during construction, shall be included in the contract lump sum price and no additional compensation shall be allowed therefore.

ARTICLE 11 – MOBILIZATION

Mobilization shall consist of preparatory work and operations including, but not limited to, those necessary for the movement of personnel, equipment, materials, portable toilets and incidentals to the project site necessary for work on the project and for all other work and operations which must be performed or costs incurred including bonds, insurance, City business license and financing prior to beginning work on the various contract items on the project site. Any bonds that must be posted or proof of insurance issues that arise must be resolved prior to mobilization. Mobilization shall also include the time and labor to move the necessary construction equipment to and from the job site, supervisory time on the job by the Contractor’s personnel to keep the construction site in a safe condition, and all other related work as required for all non-working days during the course of entire contract period. The Contractor is responsible for securing an adequate storage site for equipment and materials.

Payments for Mobilization shall be included in contract lump sum price and shall include full compensation for furnishing all labor, materials, equipment, rental of necessary equipment, materials and storage sites for storage purpose, and incidentals necessary to mobilize in accordance with the paragraph above. No additional compensation shall be allowed.

ARTICLE 12 - TRAFFIC CONTROL

Traffic control shall conform to the latest editions of the California Manual on Uniform Traffic Control Devices (CA MUTCD) and with Caltrans Standard Plan T11 Traffic Control System for lane closure on multi-lane conventional highways. Notes 2 and 6 of the Caltrans Standard Plan T11 regarding illuminated advanced warning signs and cones shall not apply.

A. VEHICLE TRAFFIC CONTROL

A minimum of one (1) eleven foot lane for each direction shall be kept open and maintained for public use at all times except as directed by the Engineer during construction.

B. PEDESTRIAN TRAFFIC CONTROL

A minimum of one four foot wide all-weather pedestrian walkway shall be kept open and maintained to the satisfaction of the Engineer along both sides of each public street at all times during construction.

C. ACCESS TO ADJACENT PROPERTIES

A minimum of one (1) driveway per property shall be accessible and maintained at all times unless otherwise authorized by the City. Temporary drive approach ramps constructed of recycled materials or temporary asphalt (12' minimum width) may be installed as approved by the Engineer. Trench plates may also be used.

D. GENERAL TRAFFIC CONTROLS

Notification letters shall be hand delivered by Contractor two (2) weeks in advance of beginning of construction giving notice of traffic restriction, period of construction, and suggested use of alternate routing. Exact wording on the advanced notification letters will be approved by the Engineer.

Project Sign(s)

Traffic control devices shall comply with Section 12 of the standard specifications.

The Contractor shall prepare and submit traffic control plans at least ten (10) working days prior to commencement of work. The plans shall show all businesses, directional signs, driveway entrances, signs, delineation, tapers, dimensions, etc., for traffic control. No construction will begin until the Contractor's traffic control plans are approved by the City. The plans shall indicate the various phases of work and the proposed traffic control methods for each phase. The plans shall conform to the requirements of the latest edition of the CA MUTCD, and these special provisions.

Flashing arrow signs shall be used. (Battery or solar powered only.)

Temporary tape and/or painted stripes and removal of existing channelization may be required for traffic control.

Placement of temporary pavement marking tape shall consist of applying, maintaining, and later removing temporary traffic stripe (traffic line) and pavement marking tape at the locations shows on the plans or designated by the Engineer in conformance with these special provisions.

Tape for temporary traffic stripes and pavement markings will be a reinforced plastic type especially designed for ease of removal.

Temporary stripes shall be placed to the line established by the Engineer. Completed stripes shall be straight on tangent alignment and shall be on a true arc on curved alignment.

Surfaces on which the tape is to be applied shall be cleaned of all dirt and loose material and shall be dry when the tape is applied. The air temperature and pavement temperature at the time the tape is applied shall be 50°F or above. Tape shall not be applied over existing painted stripes or markings.

After the tape has been applied it shall be rolled slowly with a rubber tired vehicle or roller to ensure complete contact with the pavement surface.

Temporary traffic stripes and pavement markings that are damaged from any cause during the progress of the work shall be repaired or replaced by the Contractor at his expense.

When no longer required for the direction of public traffic, as determined by the Engineer, the tape shall be removed and disposed of outside the highway right of way and all marks used to establish satisfactory lines for the temporary stripes and pavement markings shall be removed from the pavement.

Every effort shall be made by the Contractor to insure traffic safety. If in the opinion of the Engineer additional signing or delineation is required for traffic safety, then the Contractor shall furnish and place the additional signs or delineators at no additional cost to the Agency.

E. ROAD CLOSURE CONDITIONS

When construction conditions do not permit through traffic to use the street as determined by the Engineer, the following conditions will prevail:

- The Engineer must receive notice from the Contractor of any proposed road closure at least 48 hours prior to the actual closure. Before any road closures may be approved by the Engineer, specific detour plans for signing and barricading must be approved by the Traffic Engineer. At the times during the road closure conditions, a ten-foot (10') minimum width access corridor shall be kept open and maintained for emergency vehicles.

F. TRAFFIC CONTROL AND SAFETY

All control, warning and safety devices shall conform to the requirements set forth in the latest edition of the CA MUTCD.

If attention is directed to the existence of a hazard and the Contractor fails to provide such devices, said devices will be placed or caused to be placed by the City. The cost of placement of these devices shall be the sole responsibility of the Contractor and shall be paid for at the rate of $500.00 per hour for labor and the pickup truck, $50.00 per day per barricade, and any other costs incurred by the City relative to traffic control. Said costs, if any, shall be deducted from the progress payments and from the total Contract price for the work.

When entering or leaving roadway carrying public traffic, the Contractor's equipment, whether empty or loaded, shall in all cases yield to public traffic. No excavation within five feet of the traveled way shall remain open no longer than is necessary to perform the work, and in no case shall remain unfenced or unplated overnight or on weekends.

The Contractor shall provide and maintain all signs, barricades, pedestals, flashers, delineators and other necessary facilities for the protection of the motoring public within the limits of the construction area and all its approaches, including advanced signing and barricades. He shall also post proper signs to notify the public regarding the conditions of the roadway, all in

accordance with the provisions of the Vehicle Code, and the CA MUTCD, as published by the US Department of Transportation, Federal Highway Administration.

The Contractor shall conduct his operations so as to provide reasonable access to the adjacent properties and shall have no greater length or quantity of work under construction than he can properly prosecute with a minimum of inconvenience to the public and other contractor engaged on adjacent or related work.

Portable delineators shall be spaced as necessary for proper delineation of the travel way. The spacing between delineators shall not exceed the requirements set forth in the CA MUTCD.

If the traffic cones or portable delineators are damaged, displaced or are not in an upright position from any cause, said cones or portable delineators shall immediately be replaced or restored to their original location in an upright position by the Contractor.

The Contractor shall furnish such flagmen as are necessary to give adequate warning to traffic or to the public of any dangerous conditions to be encountered. Flagmen, while on duty and assigned to give warning to the public of any dangerous conditions to be encountered, shall perform their duties and shall be provided with the necessary equipment in accordance with the current Caltrans "Instructions to Flagmen." The equipment shall be furnished and kept clean and in good working condition by the Contractor at his expense.

Should the Contractor appear to be neglectful or negligent in furnishing warning and protective measures as above provided, the Engineer may direct attention to the existence of a hazard and the necessary warning and protective measures shall be furnished and installed by the Contractor at this expense. Should the Engineer point out the inadequacy of warning and protective measures, such action on the part of the Engineer shall not relieve the Contractor from responsibility for public safety or abrogate his obligation to furnish and pay for these devices.

All existing stop signs and street name signs shall be maintained in visible locations during construction and permanently relocated or removed as directed by the Engineer. Signs, which need not be maintained during construction or permanently relocated, shall be salvaged and returned to City Yard.

Temporary Traffic Lanes

1. Temporary control of traffic in work areas requires the provision of adequate street space to accommodate the traffic demands, particularly during peak traffic hours.
2. Temporary traffic lane requirements for construction activities in arterial streets may be specified on the permit, on the plans or in the specifications. These requirements constitute a part of the work and must be adhered to as rigidly as any other specification.
3. Construction activities on arterial streets shall be planned and scheduled to minimize interference with traffic. Except for emergencies, no construction work shall encroach into a moving lane of traffic between the hours of 6:30 to 8:00 AM or 4:30 to 6:00 AM unless otherwise authorized by the Engineer.
4. All temporary traffic lanes shall be a minimum of eleven feet in width at either direction unless otherwise authorized.

5. Suitable surfacing must be provided for the temporary traffic lanes in work areas. When traffic is diverted from the existing pavement, temporary surfacing shall be provided and shall be in conformance with the current standard specification for such work issued by the City.
6. Construction equipment not actively engaged in the work and employee vehicles shall not be parked near the work in such a manner as to further restrict or obstruct traffic flow. Vehicles and equipment in continuous or frequent use may be operated or parked in the same traffic lanes as the work obstruction.

Control, Warning and Guidance Devices

1. Devices fall into six categories: (1) Signs, (2) Barricades, (3) Delineators, (4) High Level Warning Devices, (5) Warning Lights and (6) Flashing Arrow Signs.

Sign Types

1. Traffic signs are classified into several functional groupings: construction, warning, guide and regulatory.
2. The use of "Regulatory" signs must be approved by the Engineer. When required, all such signs will be provided, installed and maintained by the Contractor.
3. Existing "Regulatory" signs within or adjacent to the work area must be maintained by the Contractor. If existing signs are not appropriate for traffic conditions in the work area, the Engineer must be notified to determine if signs shall be covered, replaced or relocated.
4. Temporary "No Parking" signs shall be installed and removed as directed by the Engineer.
5. Temporary "No Parking" signs shall not be posted on any tree, utility pole or traffic sign.

Sign Placement

1. The location of signs will depend upon alignment, grade, and location of street intersections and posted speed limit. Signs shall face and be visible to oncoming traffic and be mounted to resist displacement. The center of signs shall be at least four and one-half feet above the roadway. Vertical clearance for signs where pedestrian traffic is permitted shall be two feet. "Advance Warning" signs shall be located on the right hand side of traffic lanes.
2. All signs, which are to convey their messages during darkness, shall be reflectorized or illuminated.
3. No signs or supports shall bear any commercial advertising.
4. Warning, Guide and Regulatory signs normally shall be installed immediately before work is to commence and must be removed immediately after work is complete.
5. If at any time a sign is not required, it shall be covered or removed.
6. Construction signs shall be installed in accordance with Section D, General Traffic Controls.

Barricades

1. Barricades shall not be placed in a moving lane of traffic without advance warning, such as a high level warning devices and appropriate delineation.
2. Barricades shall be of three types: Type I, Type II, or Type III.

Delineators

1. All delineators used at night must be reflectorized adequately or internally luminated.
2. Opposing traffic shall be separated by delineators, traffic striping, or raised pavement markers.
3. Where traffic is diverted to the left of an existing double yellow centerline, into a painted median or into a left turn lane, delineators shall be utilized beyond the work area to return traffic to normal lanes.
4. Devices, which could roll into the adjacent traffic lane when hit, shall not be used.
5. Metal or wooden post mounted in concrete-filled buckets or on automobile wheels are examples of types, which are prohibited.
6. Maximum Recommended Delineator and Sign Placement

Traffic Speed	Merging Taper Length	Spacing Transition	Spacing Tangent	Signs Space Between and Advance of Taper
25 mph	125 ft.	25 ft.	35 ft.	100 ft.
30 mph	180 ft.	25 ft.	35 ft.	250 ft.
35 mph	245 ft.	25 ft.	35 ft.	250 ft.
40 mph	320 ft.	25 ft.	35 ft	250 ft.
45 mph	540 ft.	25 ft.	35 ft	350 ft.

High Level Warning Devices

1. High level warning devices shall be at least 9 feet high with legs, base or truck mounting designed to resist overturning.
2. Sandbags may be used to add weight to the base or legs.
3. High-level warning devices shall be equipped with a yoke at the top to accommodate at least three flags.
4. Flags shall be high visibility orange, with stays to keep flags extended.
5. Torn or dirty flags shall be immediately replaced.
6. High level warning devices are not permitted on arterial streets. Flashing arrow signs are required.

Warning Lights

1. Flashers shall be used only to outline the work area or to provide advance warning.
2. Flashers shall not be used to channelize traffic, to separate opposing traffic, or to delineate the path that traffic is to follow.

Flashing Arrow Signs

1. All flashing arrow signs shall meet the following requirements:

Type	Minimize Size	Minimum Number of Panel Lamps	Minimum Legibility Distance

II	36" x 72"	13	¾ mile
I	48" x 96"	15	1 mile

2. Flashing arrow signs are intended to supplement, not replace, other work area traffic control device.
3. Flashing arrow signs are required for each lane closure on an arterial street.

Pavement Striping/Markings

1. Restriping will be considered under the following conditions:

   a) Where traffic is diverted for extended periods.

   b) When traffic is to be diverted to the left of an existing double yellow centerline for two or more consecutive nights.

   c) When the work area is adjacent to an intersection and results in a transition within the intersection.

   d) When the traffic lane is continuously obstructed for more than 5 working days and traffic volumes require two or more lanes in a single direction.

   e) In other unusual situations when traffic and physical conditions require special treatment.

2. The Engineer shall determine the need for and extent of striping removal and restriping.
3. The installation of temporary striping or pavement markers will be the responsibility of the Contractor.

Pedestrian Traffic

1. When the work area encroaches upon a sidewalk, walkway or crosswalk area, special consideration must be given to the pedestrian safety.
2. A minimum of advance warning is required.
3. The pedestrian must be separated from the work area.
4. Protective barricades, fencing, handrails and bridges, together with warning and guidance devices must be used to define the passageway.
5. Pedestrian walkways must be approved prior to installation by the Engineer.
6. Walkways shall be maintained at least four feet in width.
7. Minimum vertical clearance to any obstruction within the walkway must be two feet.
8. At no time shall pedestrians be diverted into a portion of the street without a physical barrier being provided, and in those areas where material can fall, the walkway shall be covered.
9. Appropriate signs and warning must be installed at the construction limits in advance of and crosswalk or pedestrian way that will be closed.

Flag Person Control

1. Flag person will be required:

a) Where workers or equipment intermittently block a traffic lane.

b) Where the traffic plan allows the use of one lane for two directions of traffic.

c) Where the safety of the public and workers determines there is a need.

2. Flag persons should be stationed far enough from the work to slow down or stop vehicles before they enter the work area.
3. Flag persons shall wear orange jacket (vest) for daytime use and a reflectorized belt and harness for nighttime.
4. During daylight hours, flag person shall be equipped with a sign paddle and at night, they shall use a red light.

Pursuant to the provisions of Section 14005 of the Government Code, and pursuant to the provisions of Section 21400 of the California Vehicle Code, that the signs, lights, and devices shall conform to the provisions of the "Manual of Traffic Controls for Construction and Maintenance Work Zones," issued by the Department of Transportation for the State of California.

G. PAYMENT

Payment for **Traffic Control** shall be considered as included in the contract lump sum price and shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in preparation of traffic control plans, approval of traffic control plans, implementation of traffic control, including but not limited to, Advanced Notification Signs, applying, maintaining and removing tape for temporary traffic stripes and pavement markings, complete in place, flag person control, flashing arrow sign, specified in these special provisions and as directed by the Engineer. No additional compensation will be allowed.

ARTICLE 13 – SURVEY WORK AND MONUMENT PRESERVATION

Attention is director to Section 81 of the Standard Specifications and the following Special Provisions.

The services of a land surveyor licensed in the State of California shall be provided by the Contractor to perform all work necessary for establishing control, construction staking, re-establishing monuments and ties, records research, drafting, and all other surveying work necessary to construct the work.

Surveyor shall be resident on the site during all surveying operations and shall personally supervise and certify the surveying work.

Construction Staking and Limits

The Contractor's surveyor shall be responsible for staking horizontal and vertical survey controls for the whole project. Survey work shall include sawcut, limit lines, and removal lines, staking for any PCC, top elevation of cement treated base, earth, aggregate base, and asphalt work, property lines, etc., at 25-foot intervals, BC's, EC's, ¼, ½, and ¾ Δ's, angle points, center lines, and any other control points as required during construction. Contractor shall submit survey cut sheets to the Engineer at the completion of each staking.

Resetting of any construction stakes shall be at contractor's expense.

Grades have not been provided for any of the intersections being reconstructed. It is the Contractor's responsibility to provide grades at the intersections as needed to ensure water flows towards the gutters and to provide smooth taper transitions between the intersections and all adjoining streets.

No flowline grades are provided. The contractor shall straight grade from one end of curb and gutter repair to the other end in order to determine 25' flowline elevation points. If there is a noticeable high point, the contractor shall provide a grade break as needed.

Prior to pulverizing and mixing existing street, the Contractor shall provide a land surveyor licensed in the State of California to stake out in the field the horizontal and vertical survey control points at 50’ intervals for the top of proposed cement treated base section.

Survey Monument Preservation and Ties

The Contractor shall be responsible for protecting all existing horizontal and vertical survey controls, monuments, ties (centerline and corner) and benchmarks located within the limits of the project. If any of the above require removal; relocation or resetting, the Contractor shall, prior to any construction work, and under the supervision of a California licensed Land Surveyor, establish sufficient temporary ties and benchmarks to enable the points to be reset after completion of construction.

Any ties, monuments and bench marks disturbed during construction shall be reset per Orange County Surveyor Standards after construction. Contractor shall also re-set the tie monuments where curb or curb ramps are removed and replaced or new ramps are installed. The Contractor and his sureties shall be liable for, at his expense, any resurvey required due to his negligence in protecting existing ties, monuments, benchmarks or any such horizontal and vertical controls.

The Contractor shall include tie sheet preparation, setting ties, and reestablishing monuments, and the filing of a corner record as required. All ties associated with that monument shall be included for filing to the Orange County Surveyor’s office. The Contractor’s surveyor shall be responsible to meet all requirements stipulated by the County Surveyor regarding the filing of corner records. **A copy of the filing shall also be submitted to the City for their records.**

If there are additional survey monuments and centerline ties not shown on the plans, the Contractor shall be responsible for re-establishing them as well. No additional compensation will be allowed for re-establishment of additional monuments and centerline ties.

Payment for **Construction Surveying** shall be considered as included in the contract lump sum price and shall include performing all construction staking, preservation or re-establishment of permanent survey monuments, ties and markers including centerline ties, filing of all records to the Orange County Surveyor’s office and submitting a copy to the City. Said payment shall include full compensation for furnishing all labor, materials, tools, equipment, and doing all the work described above to complete this project including excavation, backfill and replacement of pavement section, and conforming to the requirements of this article. No separate compensation will be allowed.

ARTICLE 14 – DEWATERING AND DUST, SEDIMENT, AND SOUND CONTROL REQUIREMENTS CLEAN AIR ACT AND WATER POLLUTION CONTROL ACT REQUIREMENTS

Attention is director to Section 13 and 14 of the Standard Specifications and the following Special Provisions.

Dewatering

It is anticipated that storm, surface, and ground water or other water will be encountered at various times and locations during the work and will require dewatering. The Contractor, by submitting a bid, acknowledges that he has investigated project area water conditions and associated risks and has bid accordingly to mitigate these risks. *The Contractor, by submitting a bid, assumes all of the said risk and shall be fully compensated for all work in the contract various items on work.*

When groundwater is encountered, the Contractor shall provide and maintain dewatering during construction in accordance with the requirements of NPDES Permit (Order No. R8-2009-0030, and CAS618030) and the Regional adopted Best Management Practice (BMP) for Dewatering Operations NS-2.

The Contractor shall provide and maintain ample means and devices with which to promptly remove and properly dispose of ground water entering the excavations or other areas of the work at all times during construction. Dewatering shall be accomplished by methods, which will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. The methods, all subject to final approval by the Engineer and may include sump pumps, deep wells, well points, temporary pipelines and other means.

Standby pumping equipment shall be at the job site at all times. A minimum of one standby unit shall be available for immediate installation should any well unit fail. The design and installation of well points or deep wells shall be suitable for the accomplishment of the work. Drawings or details indicating the proposed dewatering system shall be submitted to the City for review.

The Contractor shall dispose of the water from the work in a suitable manner without damaging or soiling adjacent City or private property. Water shall be disposed of in such a manner as not to be a menace to the public health and such disposal shall be performed in accordance with Environmental Protection Agency and State Water Quality Control Board Standards (NPDES permit). Any testing and reports required under NPDES permit shall be performed by the Contractor and submitted to the appropriate agency for approval with copies to the City at no additional cost to the City.

Conveyance of the water shall be such as to not interfere with traffic flow or sewer treatment facilities operations. No water shall be drained into proposed work built or under construction without prior consent of the Engineer.

The Contractor shall conduct his operation in such a manner that storm or other waters may proceed uninterrupted along their existing street or drainage courses. Diversion of water for short reaches to protect construction in progress will be permitted if public or private properties, in the opinion of the Engineer, are not subject to the probability of damage. The Contractor shall obtain written permission from the applicable public agency or property owner before any diversion of water outside the right-of-way will be permitted by the Engineer.

It shall be the Contractor's responsibility to control the surface water entering the work area at no additional cost to the City. *The contractor shall correct damage to the work area as the result of surface water at no cost to the City*.

All compensation due the Contractor for control of water or any other expense incurred due to a water condition shall be included in the contract lump sum price and no additional compensation will be allowed. Full compensation for providing all dewatering of excavations shall be included in the contract lump sum price and shall include all related materials, labor, coordination and approval processing and no additional compensation will be allowed.

Sediment Control. Sediment Control is required per the following:
Per the Federal Clean Water Act, the Contractor is required to eliminate pollution to waters of the United States in regards to this project. This project will require the Contractor to implement "Best Management Practices" (BMP's). This work shall include, but is not limited to site or fabric over the grates and side openings during the full depth reclamation process and the removal of the AC byproduct, immediately cleaning up spilled fluids with an absorbent material and broom, sealing cans containing hazardous liquids immediately after use, removing loose dirt from the work sites daily, covering materials, etc.

a. Contractor is required to provide a sediment control program, including plans, prior to performing any excavation or disturbing any soil, landscape, or pavement.

b. Submit four (4) copies of sediment control plan to City for approval.

c. Sediment control plan shall include emergency 24-hour telephone number(s) of responsible Contractor personnel and details of protective measures, including desilting basins or other temporary drainage and/or control measures.

d. Necessary materials (gravel bags, etc.) or devices, per the approved plan, shall be available on site at convenient locations to facilitate rapid installation or to repair any damaged sediment control measures when rain is imminent. All removable protective devices shown on the plan shall be in place at the end of each day when the five (5) day rain probability forecast exceeds forty (40) percent.

e. Remove all silt and debris from check dams and desilting basins after a rainstorm and as needed to assure proper operation.

f. Contractor is advised that, based upon actual site conditions, other work devices, controls, and/or revisions to the sediment control plan/program may be by the project inspector, at no cost to the City, to satisfy requirements of this article.

Payment for implementing best management practices shall be included in the contract lump sum price and no additional compensation will be allowed and shall include all costs of all documentation; administration and implementation of the sediment control requirements and SWPPP requirements for the entire contract period, and no additional compensation shall be made therefore.

Dust Control

Dust control shall consist of applying water in conformance with Section 14-9.03 of the Standard Specifications, with the following modification:

The Contractor shall never leave the construction premises dusty or with loose dirt on the surface. All spillage, dirt or debris resulting from hauling operations, moving of equipment along or across any private or public property or public traveled way shall be removed immediately at the Contractor's expense.

No separate payment will be made for any work performed or material used to control dust resulting from the Contractor's performance of the work, or by public traffic, either inside or outside the right-of-way. Full compensation for such dust control will be considered as included in the contract lump sum price and no additional compensation will be allowed.

Sound Control

The Contractor shall comply with all local sound control and noise level rules, regulations and ordinances, which apply to any work performed pursuant to the contract. Each internal combustion engine, used for any purpose on the job or related to the job, shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the project without said muffler.

The noise level from the Contractor's operations, between the hours of 9 p.m. and 7 a.m., shall not exceed 86 DBA at a distance of fifty feet (50'). This requirement in no way relieves the Contractor from responsibility for complying with local ordinances regulating noise level.

Said noise level requirement shall apply to all equipment on the job or related to the job, including but not limited to trucks, transit mixers or transient equipment that may or may not be owned by the Contractor. The use of loud sound signals shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel.

Compensation for conforming to the requirements of sound control shall be considered as included in the contract lump sum price and no additional compensation will be allowed therefore.

IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

By submission of this bid, or the execution of this contract or subcontract, as appropriate, the bidder, Contractor, or subcontractor, as appropriate, will be deemed to have stipulated the following:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub. L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub. L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR Part 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.

2. That the Contractor agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed hereunder.

3. That the Contractor shall promptly notify the OSHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.

4. That the Contractor agrees to include or cause to be included the requirements of paragraphs 1 through 4 of this Section in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements (FHWA 1273 Rev. 8/89, 12-4-89).

Full compensation for conforming to the requirements of the Clean Air Act and Federal Water Pollution Control Act shall be considered as included in the contract lump sum price and no additional compensation will be allowed therefore.

ARTICLE 15 - PROTECTION AND RESTORATION OF EXISTING UTILITIES AND NON-HIGHWAY FACILITIES

Attention is directed to Section 5-1.36 and 5-1.37 of the Standard Specifications and the following special provisions:

All utilities including water, gas, oil, telephone, electrical, cable TV, traffic signals, sewer mains and services, storm drains, fiber optic cable, and street light conduit and wires shall be protected in place, except as noted on the project plans.

Abandoned facilities are likely to be encountered on this project. Many abandoned facilities are not available through the public record nor will they be located by USA, however if they are encountered, the abandoned facilities shall be saw cut and removed to accommodate the proposed construction. The facilities shall be capped or backfilled with slurry as deemed appropriate by the Engineer. The Contractor will not be entitled to damages or additional payment for delays due to such abandoned facilities. The City will pay for the transportation and disposal of such abandoned facilities and capping of such facilities on a time and materials basis in accordance with the Standard Specifications.

The City does not guarantee the accuracy of depth, size, type, material and location of all utilities shown on the plan or marked in the field by utility companies. Data was provided to the City based upon available records. It is to be used for information purposes only.

In order to provide lead time to resolve unforeseen utility conflicts, **Contractor shall pothole and ascertain the true location and depth of all underground utilities and services as shown or located within the lines of excavation and/or as marked by their respective owners in the field**. Utilities marked in the field and not shown in the project plan shall be treated the same as if it is shown in the project plans. Contractor shall attempt to expose utilities by excavating an area three (3) feet in all directions around the location shown on the plans or marked in the field. Should the contractor fail to locate the utility, Contractor shall immediately notify the utility purveyor and Engineer and the Contractor shall proceed on schedule. Contractor shall not be entitled to delays, damages or cost for failure to locate a utility by potholing. After exposing the utilities and if in the opinion of the Contractor a utility is in conflict with the proposed improvements, Contractor shall immediately notify the Engineer and allow utilities reasonable time to relocate, realign or remove their facilities at no additional cost to the City.

Contractor shall exercise extreme care in exposing, locating, supporting, protecting and working near existing utilities. Contractor shall hand dig within three feet (3') on all sides of these utilities; main lines, service lines and other utility appurtenances. Contractor shall arrange a compatible work schedule with all utility companies involved. Contractor's attention is also directed to overhead and above ground utilities and poles that exist within the project site that may not be shown on the project plans, but are visible in the field. All utilities above and underground must be protected in place, unless otherwise specified in the project plan.

The Contractor will not be entitled to damages or additional payment for delays attributable to utility relocations or alterations if utilities are correctly located and shown on the plan. The Contractor, however, will be given an extension of time for unforeseen delays due to interferences by utilities. This work includes searching within three (3') feet on both sides of a marked utility in the field (not shown in the plans) that is not found or never existed

All costs incurred for potholing, hand digging, exposing, locating, supporting, protecting, maintaining and providing reasonable time to relocate or resolve conflict of underground and above ground utilities, shall be included in the contract lump sum price and no additional compensation will be allowed therefore.

The Contractor, prior to submitting his/her bid, shall first inquire from the utility owners listed regarding type of facility, line locations, size, material, manhole locations if any, specifications and requirements concerning the protection and support of their respective main, trunk lines, services lines and other appurtenances.

The Contractor is hereby notified that many waterlines in the City are steel encased. These encased waterlines are to be treated as asbestos concrete lines. If they are not supported, they will collapse and all resulting damages and delays will be the sole responsibility of the contractor and no additional compensation or time will be allowed. The costs of obtaining any required permits, protecting and supporting of all utility lines, including service and lateral lines shall be included in the Contract bid price for the various items of work involved, and no additional compensation will be allowed therefore. *No utility line shall be removed from service without written permission from the Engineer. If permitted, then it is the contractor's responsibility to install temporary services as needed in the field and as approved by the Engineer at no cost to the City.*

Contractor shall contact Underground Service Alert (USA) at (800) 422-4133 and request marking of utilities within the project area(s) at least 48 hours prior to beginning of work. The following is a list of utility companies and purveyors who may have underground utilities within the project right-of-way:

• GOLDEN WEST REFINERY	(310) 921-3581
• ORANGE COUNTY SANITATION DISTRICT	(714) 593-7880
• GENERAL TELEPHONE COMPANY	(714) 375-6701
• CITY OF GARDEN GROVE, WATER DEPARTMENT	(714) 741-5395
• CITY OF GARDEN GROVE, TRAFFIC ENGINEERING	(714) 741-5189
• AT&T	(714) 666-5500
• GARDEN GROVE SANITARY DIVISION	(714) 741-5395
• SOUTHERN CALIFORNIA EDISON COMPANY	(714) 973-5453
• SOUTHERN CALIFORNIA GAS COMPANY	(714) 634-3039
• SOUTHERN CALIFORNIA GAS COMPANY – TRANSMISSION DEPARTMENT	(818) 701-3253
• SOUTHERN CALIFORNIA WATER	(714) 535-8010 X 320
• TIME WARNER COMMUNICATIONS	(714) 903-8213
• CHEVRON PIPELINE CO.	(213) 694-7666 / (310) 669-4014
• ARCO	(310) 428-9454
• CRIMSON PIPELINE	(562) 285-4156

Some of the above utilities and purveyors are not Underground Service Alert (USA) members. It shall be the Contractor's responsibility to call, notify and make certain that utilities have responded to his notification. Damage to utilities, caused by failure to notify, is the contractor's sole responsibility.

Contractor shall also protect facilities in place as shown on the plans or as marked in the field, and "To be relocated by others", in both original and relocated positions and any damage to such facilities shall be immediately repaired at no cost to the City.

When damage occurs to existing utilities, Contractor shall notify the owner immediately and have it repaired to the satisfaction of the owner. In the case of damage to water, gas, telephone, cable, traffic, electrical, storm drain, and sewer lines, the Contractor shall repair these facilities to the requirements of the utility owners, within a maximum of 24 hours or sooner as required by the Engineer. Contractor shall have necessary tools, equipment and materials available at all times for

immediate repairs. Any expenditures incidental to maintaining water service to customers shall be borne by the Contractor.

The Contractor is notified therefore, that he is responsible and liable for all costs in rectifying damages to any utilities caused directly because of his operations. At the request of the owner, costs in rectifying such damages can be withheld or deducted from the final progress payment due to Contractor at the discretion of the Engineer.

The Contractor is responsible for protecting water service connections, sewer laterals, telephone conduits, cable TV conduits, electrical conduits, traffic signal conduits and all other utility service connections whose location can be determined or inferred by buildings and other above-ground visible facilities such as valve boxes, manholes, vaults, pull boxes and the like in spite of the fact that they are not shown on the plans or marked in the field. Therefore, the Contractor shall establish the location of such utilities in the field and determine the cost of protecting or relocating those facilities in order to perform the work indicated in the contract documents and includes that cost in his bid. The contractor shall assume that every parcel, including a vacant parcel, is served by a service connection for each type of utility.

All existing improvements, including utilities, shall be protected in place unless otherwise shown on the contract plans or approved by the Engineer. All existing improvements damaged by the contractor in the performance of his work shall be replaced in its original or better condition. This includes, but is not limited to landscaping, trees, irrigation lines, sprinklers, planters, foundations, walls, driveways, sidewalks, mailboxes, parking curbs, and utilities whether they are located on private property or within the public right-of-way.

Payment for protection and/or removing and replacing all facilities and removing all USA markings at end of project shall be considered as included in the various items of work and no additional compensation will be allowed.

Private mailboxes, planters, and other facilities, etc. as shown on plans or within construction areas in the field shall be relocated by the Contractor. Payment for relocations shall be included in the contract lump sum price and no additional compensation will be allowed therefore.

ARTICLE 16 - EXISTING HIGHWAY FACILITIES

All work performed on existing highway facilities shall be done in accordance with Section 15 of the Standard Specifications and other portions of these special provisions with the following exceptions and modifications:

A. Miscellaneous Highway Facilities

Care shall be taken in all work performed in the removal of all traffic signs, devices, barricades, posts, barriers, and guard railings. Such devices, etc., shall be carefully removed by the Contractor as shown on the plans or as directed by the Engineer, cleaned of all adhering materials and shall be stockpiled within project limits for reuse.

Payment for all labor, materials, tools, and equipment used in removing, cleaning, transporting, relocating, and doing all the work involved shall be included by the Contractor in the contract lump sum price and no additional compensation will be allowed therefore.

B. Damaged Portland Cement Concrete Removal and Replacement

Portland cement concrete (PCC) damaged by the contractor's operation shall be removed and replaced in kind. Work shall include all PCC curbs, gutters, cross gutters, spandrels, driveways, driveway approaches, slabs, sidewalks, decorative crosswalks, and all other miscellaneous PCC construction. Concrete shall be removed to neatly sawed edges with saw cuts made to a minimum depth of 1 ½ inch. Concrete sidewalk or driveway to be removed shall be neatly sawed in straight-line parallels either to the curb or at right angles to the alignment of the sidewalk. No section to be replaced shall be smaller than forty-eight inches (48") in either length or width. If the saw cut in sidewalk or driveway would fall within forty-eight inches (48") of a construction joint, expansion joint, or edge, the concrete shall be removed to the joint or edge, except that where the saw cut would fall within twelve inches (12") of a score mark, the saw cut shall be made in and along the score mark. Curb and gutter shall be sawed to a depth of 1 ½ inch on a neat line at right angles to the curb face. PCC and all other material unsuitable for use as fill, as determined by the Engineer, shall be removed from the right-of-way and disposed of by the Contractor at a site of his own choice and he shall pay all costs incidental to the disposal. Sharp edges left on concrete after saw cutting shall be ground in a manner acceptable to the Engineer.

Payment for Portland cement concrete removal and replacement shall be included in the contract lump sum price, that necessitated the PCC removal and no additional compensation will be allowed. Said payment shall include full compensation for furnishing all labor, materials, tools, equipment, incidentals, and performing all the work involved in excavating, removing, replacing, breaking, crushing, saw cutting, backfilling, loading, hauling and disposing of all material, and performing all the work involved. All PCC replacement shall conform to City standards and shall be replaced in kind.

C. Remove and Restore Traffic Striping, Signing, Legends, Pavement Markings and Pavement Markers

Existing pavement markers, when no longer required for traffic lane delineation due to construction, or as directed by the Engineer, shall be removed and disposed of. The Engineer will designate traffic stripes and pavement markings to be removed.

Existing striping and pavement marking shall be removed by sand blasting. Existing pavement markers shall be removed prior to construction of ARHM overlay.

Sandblasting shall be used for the removal of painted traffic stripes and pavement markings and for removal of objectionable material. If such removal operation is being performed within ten feet (10') 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.

Nothing in these special provisions shall relieve the Contractor from his responsibilities as provided in Section 7-38.09, "Public Safety", of the Standard Specifications.

Any depressions or voids left in the roadway because of removing the existing pavement markers will be filled with hot bituminous adhesive or as directed by the Engineer.

Contractor shall provide cat tracks for review prior to final application of final striping. The City of Garden Grove shall have 24 hours of review time prior to approval of the cat tracks. All existing striping shall be restriped to satisfaction of the City Engineer.

Full compensation for removing, disposing and restoring, traffic stripes and pavement markings - including filling voids or depressions created by removing pavement markers, shall be included in the contract lump sum price and shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and performing all work involved, and no additional compensation will be allowed therefore.

D. Damaged Asphalt Concrete Pavement Removal and Replacement

Existing asphalt concrete (AC) damaged by the contractor's operation shall be removed and replaced in kind.

Asphalt concrete removal areas shall be saw-cut prior to removal and removed with caution so as not to damage adjacent improvements. The Contractor shall not use equipment such as stompers, which may damage adjacent pavement or improvements. **The use of stompers and rock wheels will not be allowed for any portion of the work on this project.** The slurry created by saw cutting shall be removed by vacuum during the saw cutting operation.

Asphalt removal shall include removal of existing materials to grade. The Contractor shall implement whatever measures are practical during removal operations to maintain the existing sub-grade integrity. Any subgrade disturbed or removed due to the Contractor not using the extra care outlined or for his convenience, shall be graded and compacted to the required elevations at no cost to the City.

The minimum one (1) foot wide strip of asphalt and necessary base material removal adjacent to PCC curb and gutter, cross gutters, drive approaches, bus pads and spandrel removals shall be replaced with eight (8) inch Asphalt Concrete Base Course prior to the placement of surface course. At no time shall the one (1) foot wide strip of asphalt remain open for more than three (3) calendar days.

Payment for replacing of pavement section shall be included in the contract lump sum price and no additional compensation will be allowed. Said payment shall include full compensation for furnishing all labor, materials, tool, equipment and incidentals and performing all the work involved in replacing AC/AB, street areas and areas damaged by construction and no additional compensation will be allowed.

ARTICLE 17 – CLEARING AND GRUBBING, REMOVALS AND RELOCATONS

In addition to the work outlined in Subsection 300-1 of the Standard Specifications, the following items of work are included under Clearing and Grubbing.

(1) Maintain dust control at all times by watering; including developing a water supply and furnishing, and placing all water required for work done in the contract, including water used for extra work and water used for irrigation purposes.

(2) Provide for traffic control and all signs, barricades, flashers and temporary striping necessary to maintain proper control, in accordance with "WATCH" including maintaining all travel lanes as required.

(3) Protection of utilities, trees, fences, walls and other facilities within the construction zone, except those specifically directed by the Engineer to be removed or relocated.

(4) Mobilization and de-mobilization.

(5) Clearing and removal of debris from site of work.

(6) Removal of structures, as directed by Engineer to be removed or abandoned.

(7) Delay in work necessary to accommodate utility relocations by others.

(8) Other items of work as directed in these specifications.

Payment for clearing and grubbing, mobilization and demobilization shall be considered as included in the contract lump sum price and no additional compensation will be allowed.

ARTICLE 18 - ASPHALT CONCRETE

The asphalt concrete material used for all areas shall comply with the requirements of the Standard Specifications for Public Works Construction, 2012, ed., 2014 Cumulative. The specific type of material used for each type of construction shall comply with the table below. The contractor may supply asphalt concrete materials containing Recycled Asphalt Pavement (RAP) in accordance with the Standard Specifications except the maximum percentage of RAP will be limited to 15 percent of the mix for base course asphalt only. No RAP will be allowed in the surface course mix. Asphalt binder content in the pavement shall be determined by the asphalt mix design$^{\omega}$ requirements of the SSPWC, Section 203-6.2, 2012, ed., 2014 Cumulative.

ARTICLE 19 - AGGREGATE BASE

Aggregate base shall be Class 2 and shall conform to the provisions for Class 2 aggregate base 3/4" maximum as specified in Section 26 of the Standard Specifications and these Special Provisions. Processed miscellaneous base or asphalt containing base will not be allowed.

Sand equivalent by Test Method No. California 217 shall be a minimum of SE 50.

At the time aggregate base is spread, it may have moisture content sufficient to obtain the required compaction. Such moisture shall be uniformly distributed throughout the material.

In lieu of the spreading requirements specified in Section 26-1.03C, aggregate base material shall be spread upon prepared subgrade by means of approved spreading devices which will deposit a uniform window or layer and after spreading as above specified, the material shall be shaped to the requirements of Section 26 of the Standard Specifications. Motor graders may be used for the aforementioned shaping. Tailgate spreading by dump trucks of material will not be permitted except for spot dumping and in areas not readily accessible to approved spreading devices.

Relative compaction of the aggregate base material shall not be less than 95 percent.

Payment for the aggregate base used underneath all applicable PCC improvement items, shall be included in the contract lump sum price and no additional compensation will be allowed.

ARTICLE 20 – PORTLAND CEMENT CONCRETE

All PCC construction work for this article shall conform to Sections 73 and 90 of the Caltrans Standard Specifications. Sub-grade materials shall be compacted to a minimum relative compaction of 95 percent.

All PCC removal work shall conform to Sections 15-3 of the Standard Specifications and shall be included as part of the related PCC construction item. No additional compensation will be allowed therefore. The use of pavement breaking equipment (stomper) is not permitted.

All excavations shall be backfilled as soon as permitted under the specifications so that when the job is closed for the day, the open excavation will be kept at a minimum and adjacent utilities will receive maximum backfill support.

The Contractor shall also cut and remove any tree roots encountered within construction limits to at least six (6) inches below the subgrade. Removal of roots shall be included and No additional compensation will be allowed.

PCC improvements shall be constructed per the following standard plan (see Appendix C) and per these special provisions:

PCC Improvement Item	Garden Grove Standard Plan
Sidewalk	B-106
Median Curb Type A-8	B-112
Curb & Gutter Type C-8	B-113
Drive Approach	B-120
Bus Pad	B-126
Local Depression	B-205A

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Concrete mix design shall be per SSPWC (latest edition) Section 201-1 "Portland Cement Concrete", 303-5.

All concrete shall have a maximum slump of 4” and the same brand, type and source of cement and aggregate shall be used for all Portland Cement Concrete.

No color compounds, etching chemicals or other related construction materials will be allowed to migrate onto adjacent AC pavement surfaces or to flow into adjacent drainage inlets. The Contractor shall be required to mask the adjacent AC pavement areas and place an impermeable fabric secured by gravel bags across the openings of all catch basin openings prior to beginning any PCC improvement work with the potential to generate hazardous materials or otherwise negatively affect the local water quality. Payment for PCC improvement items shall be included in the contract lump sum price and no additional compensation will be allowed.

ARTICLE 21 – ACCESS RAMPS

Existing access ramps not conforming to current ADA standards shall be removed and replaced as shown on the project plans.

All PCC construction work for this article shall conform to Sections 73 of the Caltrans Standard Specifications. Sub-grade materials shall be compacted to a minimum relative compaction of 95 percent.

All PCC removal work shall conform to Sections 15-3 of the Standard Specifications and shall be included as part of the related PCC construction item. No additional compensation will be allowed therefore. The use of pavement breaking equipment (stomper) is not permitted.

All excavations shall be backfilled as soon as permitted under the specifications so that when the job is closed for the day, the open excavation will be kept at a minimum and adjacent utilities will receive maximum backfill support.

New access ramps shall be constructed as shown on the plans, unless otherwise directed by the Engineer. All new ramps shall have zero-inch (0") lip of gutter at the ramp opening and a cast-in-place detectable warning surface per Detectable Warning Surface Article found in the special provisions.

Concrete mix design shall be per SSPWC (latest edition) Section 201-1 "Portland Cement Concrete", Section 303-5, and shall be 520-C-2500 with a maximum 4" slump. The same brand, type and source of cement and aggregate shall be used for all Portland Cement Concrete.

PCC curb & gutter, retaining curbs, adjacent AC/AB slot patch removal and replacement, and PCC spandrel removal and replacement, which are related to the PCC access ramp construction, shall be considered as part of the access ramp. AC slot patch shall be 8" depth and PCC spandrel shall be a minimum depth of eight inches (8") & a minimum width of one foot (1'). PCC spandrel shall be poured monolithically with the curb associated with the access ramp. No additional compensation will be allowed.

Sidewalk and access ramps shall be opened to pedestrian access on the day following the concrete placement, after sufficient curing time. The Contractor must provide a temporary walkable pathway for pedestrians until the AC slot patch has been constructed. In addition, all forms shall be removed, irrigation systems shall be repaired, and backfilled placed within 72 hours following concrete placement at each of the access ramps, sidewalk and curb & gutter reconstruction locations. PCC improvements subject to vehicle loads shall not be opened to vehicle traffic until concrete has cured to a minimum strength of 2,000 psi.

The Contractor shall verify, with a "smart level", that maximum ramp and sidewalk grades do not exceed ADA requirements when marking the required saw cut removal limits and when setting the concrete forms, prior to pouring any access ramp locations. It shall be the Contractor's responsibility to supervise and utilize the proper experienced personnel to ensure that the proper saw cut limits are established for all access ramp locations and the Engineer shall not be responsible to direct the Contractor's crews or otherwise serve in this management capacity. The Engineer or his authorized representative shall be present to verify the concrete forms, prior to pouring any PCC construction improvements.

All traffic signal pull boxes that fall within the proposed PCC ramp and construction limits shall be adjusted to grade and shall be replaced with a No. 6 Christy concrete pull box or approved equal. Plastic pull boxes and lids will not be allowed. Existing pullboxes, if still in good working condition, shall be delivered to the city yard, otherwise, the Contractor shall dispose of the pullbox.

Since the adjustment of pull boxes and pull box covers may require lowering the pull box and pull box cover to grade, said work shall also include the adjustment of conduits and conductors if they cannot be properly contained in the box with necessary clearances at the new ramp finished grade. It is the Contractor's responsibility to review in advance in the field all existing pullboxes, which fall within the proposed PCC ramp construction limits, to confirm whether the existing conduits and conductors will need adjustment when the pullboxes are adjusted to grade and to bid accordingly.

Payment for **Remove Existing and Construct PCC Access Ramp** shall be included in in the contract lump sum price and shall include full compensation for saw cutting, removing and disposing of existing PCC and AC, form work, preparing the sub-grade, pouring concrete, installing cast-in-place detectable warning surfaces, replacing landscaping and irrigation as required to provide room for concrete forms, protecting existing parkway drain pipe, adjusting to grade all pull boxes, conduits, and conductors, adjusting to grade all other utility covers to the new finished grades, protecting existing improvements within and adjacent to the work, furnishing all labor, materials, tools, equipment, incidentals and for completing all work involved as specified herein, and as shown on the project plans. No additional compensation will be allowed.

ARTICLE 22 - DETECTABLE WARNING SURFACE

Detectable warning surface work shall consist of furnishing and installing a cast in place tactile tile module for new concrete access ramps and a surface mounted tactile tile module for all existing concrete access ramps within the project limits.

Detectable warning surface for new concrete access ramps and new sidewalk areas as shown on the plans shall be 3' x 4' cast-in-place. The tile shall be a Yellow Color homogenous throughout the tile. Installation shall be per manufacturer's recommendation unless otherwise directed by the Engineer.

Detectable warning surface for existing concrete access ramps shall be 3' x 4' surface mounted. The tile shall be a Yellow Color homogenous throughout. Installation shall be per manufacturer's recommendation unless otherwise directed by the Engineer.

The manufacturer shall provide a minimum 5-year warranty, guaranteeing replacement when there is a defect in the dome shape, color fastness, sound on cane acoustic quality, or deterioration of the detectable warning surface. The warranty period shall commence on the date of acceptance.

At a minimum, the Contractor shall adhere to the truncated dome mat manufacturer's installation requirements including proper surface preparation and protection of the work and surrounding area.

Payment for installation of cast-in-place detectable warning surface shall be considered in the contract lump sum price and shall include full compensation for all surface preparation, protecting existing improvements within and adjacent to the work, furnishing all labor, materials, tools, equipment, and incidentals, and for completing all work involved as specified herein, as recommended by the manufacturer. No additional compensation will be allowed.

ARTICLE 23 - TRAFFIC SIGNING, STRIPING, PAVEMENT MARKINGS AND MARKERS

This work shall consist of furnishing and placing markers, signing and striping to replace those removed as a result of the construction and as shown on the striping plan and traffic control plans.

All traffic striping and markings placed shall be in Thermoplastic which must comply with Caltrans Standard Specification Section 84-2 and these provisions. All striping layouts and signs shall be per CA MUTCD, latest edition.

The existing traffic striping shall be modified to conform to that shown on the striping plan. Any conflicting striping that is not removed as part of the project shall be removed by wet sand blasting.

Thermoplastic

All thermoplastic stripes (traffic lines) and pavement markings shall receive an enhanced wet-night visibility application.

Submittals

Submit a certificate of compliance for all bonded core elements and glass beads used on the project.

Materials

Thermoplastic traffic stripes and pavement markings with enhanced wet night visibility must consist of a single uniform layer of thermoplastic, bonded core elements, and glass beads as follows:

1. The 1st layer of bonded core elements shall be 3M Bonded Core All Weather Reflective Elements or approved equal for use in thermoplastic traffic stripes and pavement markings. The color of the glass beads must match the color of the stripe or marking to which they are being applied.
2. The 2nd layer of glass beads must comply with AASHTO M 247, Type 2.

Both bonded core elements and glass beads must be surface treated for use with thermoplastic under the bead manufacturer's instructions.

The bonded core elements (surface-drop) shall contain either clear or yellow tinted microcrystalline ceramic beads bonded to the opacified core. *These elements shall not be manufactured using lead, chromate or arsenic*. All "dry performing" microcrystalline ceramic beads bonded to the core shall have a minimum index of refraction of 1.8 when tested using the liquid oil immersion method. All "wet performing "microcrystalline ceramic beads bonded to the core shall have a minimum index of refraction of 2.30 when tested using the oil immersion method.

Gradations for the Bonded Core Elements

Element Gradations Mass Percent Passing (ASTM D1214)		
US Mesh	Micron	"S" series
12	1700	85-100
14	1410	70-96
16	1180	50-90
18	1000	5-60
20	850	0-25
30	600	0-7

A sample of bonded core reflective elements supplied by the manufacturer shall show resistance to corrosion of their surface after exposure to a 1 % solution (by weight) of sulfuric acid. The 1 % acid solution shall be made by adding 5.7 cc of concentrated acid into 1000 cc of distilled water.

Construction
Use a ribbon extrusion or screed type applicator to apply a thermoplastic traffic stripe.

Mobile truck mounted applicators shall be capable of traveling at a uniform, predetermined speed over variable road grades to produce uniform application of striping material, following straight lines and making normal curves in a true arc. The equipment shall be capable of air blasting the pavement, applying the stripe and immediately dropping the bonded core elements and glass beads in a single pass at speeds of up to 8 MPH.

Apply a thermoplastic traffic stripe and both bonded elements and glass beads in a single pass. Apply the thermoplastic 1st, followed immediately by consecutive applications of high-performance bonded elements and then AASHTO M 247, Type 2 glass beads. Use 1 applicator gun for each bonded elements and glass beads.

Glass beads may be applied by hand method on pavement markings.

Apply a thermoplastic traffic stripe at a rate of at least 0.38 pounds per foot of 4-inch wide solid stripe. The applied thermoplastic traffic stripe must be at least 0.090 inch thick.

Apply a thermoplastic pavement marking at a rate of at least 1.06 pounds per square foot. The applied thermoplastic traffic stripe must be at least 0.100 inch thick.

Distribute all glass beads uniformly on traffic stripes and pavement markings. Apply high-performance bonded core elements at a rate of at least 6 pounds per 100 square feet of stripe or marking. Apply AASHTO M 247, Type 2 glass beads at a rate of at least 8 pounds per 100 square feet of stripe or marking. The combined weight of the 2 types of glass beads must be greater than 14 pounds per 100 square feet of stripe or marking.

Quality Control and Assurance
Within 7 calendar days of applying a thermoplastic traffic stripe or pavement marking with enhanced wet night visibility, the Contractor shall test the retroreflectivity using a reflectometer in the presence of the Engineer under ASTM E 1710 (dry method) and ASTM E2832 (Wet continuous). Retroreflectivity must be a minimum of 700 millicandelas per square meter per lux for white stripes and markings and 500 millicandelas per square meter per lux for yellow stripes and markings. Retroreflectivity measurements of arrows, lead lines, skip lines, and cross walks shall be taken and recorded at regular intervals within the project limits and as requested by the Engineer. An authorized City representative shall be present during the measurement taking. The Contractor shall provide all equipment and traffic control necessary to conduct field tests.

Paint
Paint for median curb noses shall be highly reflective premixed rapid dry white with glass beads.

Glass beads shall be AASHTO M 247, Type 2 and shall be mechanically applied at a rate of 6 to 8 pounds of beads per gallon of paint. Glass beads shall be applied to crosswalks and striping by a dispensing device developed for this purpose or other methods approved by the Engineer. Streets and surrounding areas are to be kept clean of excess beads.

Raised Pavement Markers

Type “A”, “AV”, “D” and “G” markers shall be placed as required. Fire Hydrant spotter Stimpsonite No. 88 Blue, or approved equal, shall be installed per manufacturer’s instructions and located as directed by the Engineer.

Cat Tracking
The Contractor shall install "Cat Tracking” all traffic striping and show locations for pavement markings within **3** days after new pavement has been placed. The Engineer shall have 7 days to review all markings in the field and approve or modify striping and markings. Upon receiving direction to proceed, the Contractor shall place striping, markings and traffic signal loop detectors within 7 days.

Application of Thermoplastic

- Existing surfacing which is to receive the thermoplastic material shall be mechanically wire brushed to remove all dirt and contaminants. Surfaces of new portland cement concrete pavement to receive the thermoplastic material shall be mechanically wire brushed or abrasive blast cleaned to remove all laitance and curing compound.

- Existing pavement markers that are damaged by blast cleaning or wire brushing shall be removed and replaced by the Contractor at the Contractor’s expense.

- Thermoplastic material shall be applied only to dry pavement surfaces and only when the pavement surface temperature is above 10 C {50 F}.

- A primer, of the type recommended by the manufacture of the thermoplastic material, shall be applied to all asphaltic surfaces over 6 months old and to all portland cement concrete surfaces. The primer shall be applied immediately in advance of, but concurrent with, the application of thermoplastic material. The primer shall be applied at the application rate recommended by the manufacturer and shall not be thinned.

- Preheaters with mixers having 360-degree rotation shall be used to preheat material.

- The thermoplastic material shall be applied to the pavement at a temperature between 200C {400F} and 220C {425F}, unless a different temperature is recommended by the manufacturer.

- The thermoplastic material shall be applied by either spray or extrusion methods in a single uniform layer.

- **Stencils** shall be used when applying thermoplastic material for pavement markings.

- The pavement surface to which thermoplastic material is applied shall be completely coated by the material and the voids of the pavement surface shall be filled.

Application Equipment

- **Stencils** and hand-operated equipment shall be used to place thermoplastic pavement markings. Stencils shall conform to the dimensions shown on the plans.

- The thermoplastic striping machine shall consist of a rubber-tired vehicle that is maneuverable to the extent that straight lines can be followed and normal curves can be made in true arcs. It shall be capable of applying thermoplastic and glass beads at the rates specified. The striping machine shall be equipped with the following: (a) a pointer or sighting device not less than 1.5m {5 feet} long and extending from the front of the machine; (b) a

pointer or sighting device extending from the side of the machine to gauge the distance from the centerline for painting gaps of broken stripes; (c) a positive acting cutoff device to prevent depositing thermoplastic in gaps of broken stripes; (d) shields or an adjustable air curtain for line control; (e) pressure regulators and gages (if pneumatically operated) that are in full view of the operator; (f) thermoplastic supply line; (g) thermoplastic storage tank with a mechanical agitator that operates continuously during thermoplastic operations; (h) two separate applicator guns for dispensing each bonded elements and glass beads located behind the applicator nozzle and which is controlled simultaneously with applicator nozzle; and (i) calibrated rods for measuring the volumes for thermoplastic and glass beads in the thermoplastic tanks.

- Spray equipment shall be of a proper type and of adequate capacity for the work. Applications assemblies and orifices shall be of the proper sizes.

- Where the configuration or location of a traffic stripe is such; that the use of the thermoplastic machine is unsuitable, thermoplastic and glass beads may be applied by methods and equipment approved by the Engineer. The Engineer will determine if the striping machine is unsuitable for a particular use.

Protection From Damage
The contractor shall take special care to protect existing reflective pavement markers and shall, at his own expense, replace all coated markers. Newly placed traffic stripes and pavement markings shall be protected from damage by public traffic or other causes until the thermoplastic material has sufficiently hardened.

Traffic Signing
The Contractor shall remove existing signage and posts as shown on the plans and shall install new signs and posts per the minimum requirements of California MUTCD, latest edition and plan requirements.

Signing: Signing shall be in accordance with CaMUTCD, except as modified or supplemented herein.

a) Post-mounted traffic signs shall be installed on “Unistrut” galvanized 2” square steel tubing with an anchor sleeve/breakaway base support, or approved equal.
b) All permanent signs shall be reflectorized using 3M high intensity grade sheeting for post mounted signs and 3M Diamond Grade sheeting for mast arm mounted non-illuminated street name signs. Sign material shall be 0.10-inch thick sheet aluminum, alloy 6061-T6 or alloy 5052-H36 or H38 and be manufactured in accordance with the latest revision of the California Manual of Uniform Traffic Control Devices (California MUTCD), latest edition.
c) Signs shall be provided with an “anti-graffiti” coating.
d) New signs shall be installed using new metal posts set at a minimum of 30-inch depth.
e) The length of the metal post shall be sufficient to provide a 7-foot clearance between the finished grade and the bottom of the sign.

Signs and posts shall also be installed in accordance with Americans with Disabilities Act (ADA) clearance requirements.

In addition, any sign not being replaced that has graffiti or any unwanted material (stickers, etc.) shall be completely cleaned by the Contractor. If sign is bent, the Contractor shall return sign to its' original shape.

The Contractor shall fill any void in the sidewalk from any removed post with concrete.

Payment for **Traffic Signing, Striping, Pavement Markings and Pavement Markers** shall be included in the contract lump sum price and shall include full compensation and shall include full compensation for furnishing all labor, materials, tools, equipment, and all incidentals required for placing traffic stripes (regardless of the number, widths, and patterns of individual stripes involved in each traffic stripe), installing pavement markings and markers, installing bonded elements and glass beads, cat tracking, installing traffic signs and posts, removing signs and posts, cleaning or reshaping existing signs, and painting curbs complete in place. Removal of all existing stripes, signs, posts and pavement markers not conforming to the striping and signing plan shall also be included in the contract price per lump sum, and no additional compensation will be allowed. Also included in the contract price shall be the removal of all USA markings. No additional compensation will be allowed. All work shall in accordance with the project plans, these specifications, the special provisions, and as directed by the Engineer.

ARTICLE 24 – TRAFFIC SIGNAL INDUCTIVE LOOP DETECTORS

Traffic signal vehicle detection shall be the inductive loop type and shall conform to Section 86-5.01A, "Inductive Loop Detectors," of the Standard Specifications and these Special Provisions.

The conductors for the inductive loops and their installation shall conform to the requirements described as Type 1 loop wire, in Section 86-5.01A(4), "Construction Materials," Section 86-5.01A(5), "Installation Details," of the Standard Specifications and "Loop Installation Procedure," and 2010 Caltrans Standard Plan ES-5B.

The loop detector configuration and layout as shown on the construction plans is diagrammatic only and is not necessarily the location where the detector loops will be placed or indicative of the number of runs required for the loops. The City Traffic Engineer or inspector prior to placement shall approve the detector loop layout in the field.

Loop wire shall be 16 AWC stranded with .080 inches of cross link polyethylene installation.

The lead in cable shall be a minimum 16 AWG stranded high-density polyethylene, two conductors, twisted and shielded. Only one splice shall be permitted where the loop and the lead in are jointed. **IMPORTANT:** The loop wire in the pull box shall be twisted a minimum of 5 turns per foot and the splice must be soldered and completely waterproofed. Do not allow water to leach down the wire into the splice. Connect one end of the shield to earthy ground (at the cabinet) and insulate the other end with no possible path to earth ground.

In the roadway, all saw cuts for Type C inductive loops shall be a minimum of two and one-quarter inches (2-¼") deep and shall have a minimum of four (4) turns. The wire shall be installed with sufficient tension to keep it in the bottom of the slot when sealant is poured but should be left flexible enough to give with pavement shifts. A backer rod or approved equal shall be used to hold the wire down. Corner shall be core-drilled with a minimum eight (8) inch diameter core drill or rounded. NO ANGLE SAW CUTS ARE PERMITTED. The lead-in wire from the loop to the pull box shall be twisted. Each loop lead in shall be in separate saw cuts. At the point where the curb line and road surface meet shall be core drilled to provide the loop wire flex.

Where sawed slots cross two different types of pavement material or two different panels of PCC pavement, a 3/4-inch PVC pipe shall be installed across the joint, as shown in "Curb Termination

Details-Type B" on Caltrans Standard Plan ES-5D, to contain the loop conductors and act as an expansion/deflection fitting.

Residue resulting from slot cutting operations shall not be permitted to flow across shoulders or lanes occupied by public traffic and shall be removed from the pavement surface.

Slots shall be filled with 3M loop sealant or approved equal.

The Contractor shall test the detectors with a motor-driven cycle, as defined in the California Vehicle Code, that is licensed for street use by the Department of Motor Vehicles of the State of California. The unladen weight of the vehicle shall not exceed 220 pounds and the engine displacement shall not exceed 100 cubic centimeters. Special features, components or vehicles designed to activate the detector will not be permitted. The Contractor shall provide an operator who shall drive the motor-driven cycle through the response or detection area of the detector at not less than 3 miles per hour nor more than 7 miles an hour.

Testing of the detectors shall be performed twice, once prior to and once after the construction of the ARHM surface course. The Contractor shall be responsible for any damage to the detectors as result of his operations in constructing the ARHM surface course and he shall bear the cost of removing and replacing the detectors including the cost of the removal and construction of the ARHM surface course.

All advanced loops shall be separated by each lane and additional DLC's shall be installed to the traffic controller cabinet. The City traffic signal maintenance personnel shall make the connection within the cabinet.

Connection of the loop wires within the pull box shall be accomplished by soldered connection with heat shrink protection cover. The Contractor shall meg each loop and provide the Engineer with a certified copy of the results. The value acceptable is 20,000 to 60,000 Hz, with a minimum drift of .001 to .002. When spade lugs are used anywhere in the loop circuit, they shall be soldered to the wire.

Payment for installation of **Traffic Signal Detector Loop** shall be included in the contract lump sum price and shall include full compensation for loop, lead-in, and hook-up and for furnishing all tools, equipment, materials, labor and incidentals and for doing all the work as shown on the plans, as specified in these Special Provisions and as directed by the Engineer, and no additional compensation will be allowed therefore.

ARTICLE 25 – VIDEO DETECTION SYSTEM

The video detection system must be operational and approved by the City Traffic Engineer before any work that takes the traffic detection loops out of service may begin. The work under this Article shall be performed in accordance with these provisions, the Plans, and the Standard Specifications.

SYSTEM REQUIREMENTS

The video vehicle detection system shall include HD camera (at least 720p) with zoom lens and vehicle detection processor in one compact unit, with internal heater and integrated adjustable sunshield, all mounting hardware (video detector camera mounting bracket or video detector camera pole mount extension bracket), the communications interface panel, the detector port

master, video detector cable, mounting brackets, all associated equipment or miscellaneous fittings (cabinet wiring), and all labor, materials, and equipment required to complete the installation and make the video detection system fully operational. All of the video detection system components shall be current production equipment produced by the same manufacturer (for system operation compatibility purposes) unless otherwise noted herein or approved in advance by the Engineer.

SUBMITTALS.

(a) Fabrication Drawings. The Contractor shall submit Fabrication Drawings.

(b) Documentation Requirements. Three (3) advance copies of equipment manuals furnished by the manufacturer shall be submitted to the Engineer. The Engineer will verify the manufacturer's equipment manual as part of the test and integration process. The equipment manual incorporating the Engineers corrections and comments integrated by the Contractor into the operations and maintenance manual. The manual shall, as a minimum, include the following:

(1) Complete and accurate schematic diagrams.
(2) Complete installation and operation procedures.
(3) Complete performance specifications (functions, electrical, mechanical, and environmental) of the unit.
(4) Complete accurate troubleshooting, diagnostic, and maintenance procedures.

CONSTRUCTION REQUIREMENTS. All work associated with Video Vehicle Detection System shall be completed prior to activation of the video detection system.

The Contractor shall make the necessary changes to the signal equipment to integrate the video vehicle detection system into the signal control operation. The Contractor shall be responsible for furnishing all training, labor, materials, cables, connectors, mounting brackets, tools, equipment, shipping, and incidental items necessary to complete the installation and make the video vehicle detection system fully operational.

Installation of the video vehicle detection system shall include the installation of any and all associated equipment, including, but not limited to, the following:

(a) Video Detector Camera Assembly. The Contractor shall furnish one (1) video detector camera assembly per approach and all associated enclosures and incidental work necessary to complete the installation and make the video vehicle detection system fully operational. This will also require providing configuration software, all miscellaneous hardware, connectors, and documentation.

(b) Communications Interface Panel. The Contractor shall furnish one (1) Communications Interface Panel per cabinet and incidental work necessary to complete the installation and make the video vehicle detection system fully operational.

(c) Video Detector Cable. The Contractor shall furnish the specified cable type, all connectors, sealing tape, and incidental work necessary to complete the installation of the Video Detector Cable between the Video Detector Camera Assembly with the Communications Interface Panel in the traffic control cabinet, and make the video vehicle detection system fully operational.

(e) Video Detector Camera Mounting Bracket. The Contractor shall furnish one (1) Video Detector Camera Mounting Bracket per Video Detector Camera and all associated equipment, labor, materials, tools, and incidental work necessary to attach the camera mounting bracket to a mast arm or camera extension bracket, complete the installation, and make the video vehicle detection system fully operational.

Video Detection System Requirements

1. System Hardware: the video detection system shall be comprised of two major hardware components: a video sensor and a communications interface panel. An optional wired input/output card shall be available for certain cabinet types.

1.1 Video Sensor: The video detection system shall include a video sensor that integrates a high-definition (HD) camera with an embedded processor for analyzing the video and performing detection.

- Camera and Processor: The camera shall be a color CMOS imaging array. The camera shall have HD resolution of at least 720p (1280x720 pixels). The camera shall include a minimum 10X optical zoom. It shall be possible to zoom the lens as required to satisfy across-the-intersection detection objectives, including stop line and advance detection. It shall be possible to zoom the lens remotely from the TMC for temporary traffic surveillance operations or to inspect the cleanliness of the faceplate. The camera shall have direct, real-time iris and shutter speed control by the integrated processor. The processor shall support H.264 video compression for streaming output.

- Video Sensor Enclosure Assembly: The camera and processor shall be housed in a sealed IP-67 enclosure. The faceplate of the enclosure shall be glass and shall have hydrophilic coating on the exterior surface to reduce debris accumulation and maintenance. The faceplate shall have a thermostatically-controlled indium tin oxide (ITO) heater applied directly on the interior surface to keep the faceplate clear of condensation, snow, ice and frost. An adjustable aluminum visor shall shield the faceplate from the sun and extraneous light sources. An integral aiming sight shall assist in aiming the camera for the detection objectives. A removable rear cap and cable strain relief shall seal the power connection. The rear cap shall be tethered to the enclosure to avoid dropping the cap during installation. The rear cap shall be fastened to the body of the video sensor with a single, captive bolt. The rear cap and enclosure shall include Gore breathers to equalize internal and external pressure. The sensor shall be self-supporting on manufacturer's mounting brackets for easier fastening during installation. It shall be possible to rotate the field-of-view 360° without changing the angle of the visor.

- Power and Communications: Power and communications for the video sensor shall be carried over a single three conductor cable. Termination of the three-conductor cable shall be inside the rear cap of the enclosure on a three-position, removable Phoenix terminal block. Each conductor shall be attached to the Phoenix plug via a screw connection. The video sensor shall operate normally over an input voltage range of 89 to 265 VAC at 50 or 60 Hz. Power consumption shall be no more than 16 watts typical. No supplemental surge suppression shall be required outside the cabinet. All communications to the video sensor shall be broadband-over-power via the same three-conductor cable that powers the unit. Coaxial cable shall not be required.

1.2 Communications Interface Panel: The video detection system shall include an interface panel in the traffic cabinet that manages communications between the video sensors, the traffic management center, a maintenance technician, and the traffic cabinet itself.

- Video Sensor Connection: The communications interface panel shall provide connection

points for four video sensors. Each sensor connection shall be a 3-pole terminal block, which supplies power and broadband-over-power communications to the sensor. The broadband-over-power communications shall provide a throughput of 70 to 90 Mbps. The broadband-over-power connection shall support at least 1,000 feet of cabling to the video sensor. Each video sensor connection shall include a power switch. There shall be an LED for each video sensor to indicate the state of the power to the sensor and an LED for each video sensor to indicate the status of communications. Each video sensor connection shall contain a resettable fuse. Each video sensor connection shall provide high-energy transient protection.

- Traffic Management Center (TMC) Communications: An Ethernet port shall be provided to connect to a remote Traffic Management Center (TMC). The TMC connection shall support 10/100/1000 Mbps Ethernet communication. The communications interface panel shall proxy all network requests that arrive on the TMC connection to avoid unwanted network traffic from reaching the broadbandover-power network between the communications interface panel and the video sensors. All communications to the video detection system through the TMC connection shall be to a single IP address.

- Local User Communications: A wired Ethernet port shall be provided to connect the technician at the cabinet to the video detection system for setup and maintenance purposes. The maintenance port shall support 10/100/1000 Mbps Ethernet communication. All communications to the video detection system through the maintenance port shall be to a single IP address. The maintenance port shall support DHCP to automatically assign an IP address to the user's computer, if desired. An 802.11g Wi-Fi access point shall allow wireless connection to the video detection system at the cabinet for setup and maintenance purposes. All communications to the video detection system through the Wi-Fi access point shall be to a single IP Address. The Wi-Fi access point shall support DHCP to automatically assign an IP Address to the user's computer. The Wi-Fi access point shall include a dipole, omnidirectional antenna. A momentary pushbutton shall allow the user to turn the Wi-Fi access point on or off. The Wi-Fi access point shall turn itself off automatically after a period of inactivity from connected devices. An LED shall indicate when the Wi-Fi access point is enabled. The Wi-Fi access point shall operate simultaneously with the wired maintenance port and with the TMC connection.

- Traffic Controller Connection: The communications interface panel shall provide one connection to communicate to the traffic controller through the cabinet. The traffic controller connection shall support a TS2 Type 1 compatible SDLC interface. The traffic controller connector shall be a 15-pin female metal shell D subminiature type connector to support a standard NEMA TS2 or TEES SDLC cable. The traffic controller connection shall support a protocol interface to SDLC-capable traffic controllers (NEMA or TEES). The traffic controller connection shall support the NEMA TS2 SDLC protocol to include up to 64 detector outputs and 32 inputs. The traffic controller connection shall be able to connect to a wired input/output card, which supports wired I/O in cabinets without a SDLC-capable controller. The wired I/O data communications link shall support at least 24 outputs and 16 inputs. It shall be possible to connect and use both SDLC communications and communication to the wired input/output card simultaneously.

- USB Ports: The communications interface panel shall include two USB 2.0 ports. If a communications interface panel fails to start and run due to a software or operating system failure, it shall be possible to reinstall all system and application software from a USB memory stick without necessitating removal of the communications interface panel from the cabinet.

- Power: The communications interface panel shall accept input voltage in the range of 89-265 VAC, 50/60 Hz power from the transient-protected side of the cabinet. The communications interface panel shall be protected by two slow blow fuses. Spares shall be attached to the panel.

1.3. Wired Input/Output Card: The video detection system shall support an optional wired input/output card that communicates with the communications interface panel for real-time detection states and other I/O to the traffic controller. The card may reside in a standard detector rack or shelf-mount enclosure with power module. The optional wired input/output card shall comply with the form factor and electrical characteristics to plug directly into a NEMA type C or D detector rack or Caltrans TEES Input File. The card shall occupy two slots of the detector rack. The card shall provide four detector outputs on its rear-edge connector. A front connector shall provide communication to the communications interface panel. A front connector shall allow 16 inputs and 24 contact-closure detector outputs for wiring into the cabinet. A front panel LED for each of the 16 inputs and 24 outputs shall indicate the state of the input or output. The wired input/output card shall support optional expansion cards in other slots. Each expansion card shall support 4 outputs to the back edge of the card. The wired input/output card shall support optional harnesses for connection to Input Files or C1, C4, C11, and C12 ports to support Type 170 or Type 2070 controllers.

2. System Software: The video detection system shall include management software for configuration, monitoring and data collection purposes.

- Management Software: Management software shall be a Windows-based application. The software shall be compatible with Windows 7 and Windows 10 operating systems. The software shall communicate with the video detection system via Ethernet. The management software shall automatically determine all video sensors and communications interface panels available on the local network and populate a list of all devices. The management software shall provide the user a means to name individual video sensors and communications interface panels. The management software shall provide a means for the user to zoom the camera optics while viewing a live video stream. The management software shall provide a means for the user to calibrate distances in the field of view.

  The management software shall provide the user a means to create 4-sided detection zones in the field of view using either a still snapshot or live video. The management software will overlay an outline of each detection zone over the background image. It shall be possible for the user to place detection zones anywhere in the field of view for stop line detection and/or advance detection. It shall be possible for the user to set the desired color of both the on and off states of the detection zone overlay. It shall be possible for the user to alter the size and shape of any previously created zone. It shall be possible for the user to overlap zones, either partially or fully. It shall be possible for the user to name each zone uniquely. It shall be possible for the user to assign each zone to detect vehicles, to detect bicycles, or to detect both, and to specify different outputs for each type. It shall be possible for the user to assign the same output to multiple zones such that the output will be on if any of the zones are detecting a vehicle or bicycle. It shall be possible for the user to assign a single zone to more than one output such that if a vehicle or bicycle is detected, all the assigned outputs shall be turned on. The management software shall be capable of creating at least 99 detection zones per video sensor.

  It shall be possible for the management software to retrieve all configuration parameters from video sensors or communications interface panels. It shall be possible for the user to save all the settings for a video sensor or a communications interface panel to a laptop file. The management software shall provide a means to read or import all the settings from a previously saved configuration file for a video sensor or a communications interface panel. The management software shall be able to download a new version of the application software into a communications interface panel and its attached video sensors.

  The management software shall provide a screen to monitor operation of a video sensor. The monitoring screen shall include a live video stream from the video sensor with at least HD 1280x720 pixel resolution. The monitoring screen shall show indications of detection in real time by changing the color of the detection zone. It shall be possible for the user to configure different indications for vehicle detections vs. bicycle detections when both are configured for the same zone. The monitoring screen shall include the following optional, configurable objects. It shall be possible for the user to size and position them anywhere on the screen and to change the color and size of text. An indication of when an output is on or

off, along with a user-configurable name for that indicator. The current time in the video sensor. A user-configurable title or name. The version number of the video sensor software. It shall be possible for the user to turn the overlay graphics on or off with a single setting.

The management software shall provide a screen to monitor operation of the intersection with a quad-view video stream from the communications interface panel. The quad-view video stream shall have a resolution of at least HD 1280x720 pixels, where each of the sensor videos comprising the quad-view shall be at least 640x360 pixels. It shall be possible for the user to configure the order that the sensor videos appear in the quad-view. The real-time quad-view video stream shall be capable of displaying the overlay graphics for all four sensors simultaneously. While monitoring the video of a single video sensor or of the quad-view, it shall be possible for the user to request a "snapshot" or single-frame image to save to a named file on a laptop. While monitoring the video of a single video sensor or of the quad-view, it shall be possible for the user to record a period of the video to save to a named file on a laptop.

3. System Functionality: The video detection system shall provide the following features and functionality.

- Detection Performance: The video detection system shall detect the presence of vehicles in defined zones and turn on the assigned output when the vehicle is present in the zone. For detection zones placed at the stop line, the probability of not detecting the presence of a vehicle shall be 1% or less under all operating conditions when the video sensor is installed and configured properly. For detection zones placed at the stop line, the probability of falsely detecting a vehicle that is not present shall be 3% or less under all operating conditions when the video sensor is installed and configured properly. It shall be possible to place advance detector zones such that the farthest point of the zone is up to 600 feet from the video sensor. Advance detector zone placement shall include 2-3 car lengths of field-of-view beyond the farthest point of the zone.

  To ensure statistical significance for the above detection performance specifications, the data shall be collected over 24-hour time intervals (so as to avoid a single lighting condition) and will contain a minimum of one hundred (100) vehicles per lane. The calculations of detection performance will not include turning movements where vehicles do not pass through the detectors, vehicle lane-change anomalies, or where they stop short or stop beyond the combined detection zones.

- Failsafe Mode: The video detection system shall provide a failsafe mode for each video sensor. If the failsafe mode is enabled, all programmed presence detection outputs for the video sensor shall be turned on, thus placing constant calls to the controller. When failsafe mode is disabled, all outputs revert to normal on/off operations. The video sensor shall continuously monitor the overall contrast in the video. If the overall contrast falls below a preset level (such as caused by dirty faceplate, severe glare, extreme fog, or temporary ice/snow on the faceplate), the sensor shall enable the failsafe mode. When sufficient contrast is restored in the video, the sensor will disable the failsafe mode. The communications interface panel shall continuously monitor the connectivity status of the attached video sensors. If any video sensor goes offline due to either electrical failure or internal software failure, the communications interface panel shall enable the failsafe mode for that video sensor. If the video sensor comes back online, failsafe mode shall be disabled.

- Data Collection: The video detection system shall automatically collect and store traffic flow data in non-volatile memory for later retrieval and analysis. No additional hardware or software shall be necessary. The data shall include vehicle counts and vehicle average speeds. The management software shall be able to retrieve collected data for a specified period of time or for all currently stored data and save into a standard CSV file.

- Operations Log: The communications interface panel and each video sensor shall maintain a time-stamped operations log of routine and special events in non-volatile memory for later retrieval and analysis.

- Time Synchronization: The video detection system and management software shall provide three methods to synchronize the time of day clocks in the communication interface panel and the video sensors, as follows: Manual time synchronization operation by the user, which sets the time to the current time on the laptop where the management software is running. A configuration setting to allow the communications interface panel to automatically obtain time from the NEMA TS2 protocol on the SDLC channel and broadcast it to the video sensors. A configuration setting to allow the communications interface panel to automatically obtain time from up to five Network Time Protocol (NTP) sources and broadcast it to the video sensors.

- Video Streaming: In addition to the ability to view video streams in the management software, it shall be possible to view video from individual sensors or to view the quad-view from the communications interface panel using a third-party video player application on a tablet, smartphone or laptop computer.

Installation

Camera shall be placed to minimize occlusions of left turn lanes. Occlusions can be minimized by installing the camera on the signal mast arm, in line with the lane striping between the left turn lane and the through lanes. Cameras installed on signal mast arm shall use a manufacturer supplied City p r e -approved 28´ extended camera mount. At intersections where the left and through movements go together as standard operation and left turn movements are not protected, the camera can be mounted on a luminaire arm with standard camera mounting bracket.

Camera shall be aimed so that the area of detection is in the top half of the video image. Typically the farthest away detector shall be at the top of the image, and at least four (4) cars shall be visible behind the stop line, in the top half of the video image. No horizon shall be allowed in the video image.

The Contractor shall install the video detection system to achieve the desired field of detection as shown on the Plans or as directed by the Engineer. All equipment shall be installed and wired in a neat and orderly manner in conformance with the manufacturer's instructions. The camera shall be affixed to the support structure in accordance with the manufacturer's instruction to provide the optimal field of detection. Video detection camera locations shown on the Plans are for illustration purposes only.

The Contractor shall perform a site survey with a representative of the manufacturer of the video vehicle detection system at all project locations. The purpose of the survey shall be to optimize the performance of the video vehicle detection equipment when it is installed at the various overhead and side-fired mounting locations and ensure that it will meet the accuracy requirements specified herein. The results of this survey shall be submitted to the Engineer in a report which lists all locations with any recommended location shifts, sensor mounting adjustments, camera angle lens adjustments, and desired detection zone locations. The cost of the site survey, including the use of a bucket truck or other method to obtain an elevated vantage point, shall be included in the cost of each intersection's respective video vehicle detection system pay item.

Cable to be installed in conduit shall be pulled with a minimum of dragging on the ground or pavement. This shall be accomplished by means of reels mounted on jacks or approved devices conveniently located for unreeling cable directly into the conduit. Powdered soapstone, talc, or other approved lubricants shall be used when inserting cable into the conduit. Cable shall be

pulled through conduit by means of a cable or cables. Wiring within junction boxes and cabinets shall be neatly arranged.

When conductors and cables are pulled into conduits, all ends of conductors and cables shall be taped to exclude moisture, and shall be so kept until they are attached to the Camera and the Communications Interface Panel in the traffic controller cabinet.

Conductors entering the traffic controller cabinet shall be neatly dressed and laced along the base and back of the traffic cabinet to the Video Detector Communications Interface Panel. Spare conductors (if any) shall be tied together with their ends taped. At least five feet (5) of slack shall be left for each conductor in the traffic controller cabinet at the Video Detector Communications Interface Panel.

Routing of the Video Detector Cable shall provide a drip loop for protection of the camera and connector.

GUARANTEE:

The contractor shall guarantee the entire work constructed by him under this contract and will fully meet all requirements as to quality of workmanship and materials furnished by him. The Contractor shall make, at his own expense, any repairs or replacements made necessary by defects in workmanship or materials furnished by him that becomes evident within three (3) years after acceptance by the City for all work. The Contractor shall restore to full compliance with the requirements of these specifications, any part of the work, which during the three (3) year period is found to be deficient with respect to any provision of the plans and specifications. The Contractor shall make all repairs and replacements upon receipt of written orders from the Engineer. If the Contractor fails to make the repairs and replacements promptly, the City may do the work and the Contractor and his surety shall be liable to the City for the cost.

Payment for **Furnish and Install Video Detection System** shall be included in the Contract Lump Sum price bid and shall include full compensation for furnishing all labor, materials, tools and equipment and doing all the work involved in installing and providing the video detection system, and ensuring its complete operation within the three year guarantee period and no additional compensation will be allowed therefore.

ARTICLE 26 – TRAFFIC SIGNAL AND SAFETY LIGHTS

1. Description:

Furnishing, modifying, testing, and/or installing traffic signals, controllers, cabinets, lighting, and sign illumination systems, and payment therefore, shall conform to the provisions of the California Standard Specifications and Standard Plans (most recent), and these Special Provisions:

Traffic signal modifications are to be performed at the following intersections:

1.

Unless it is indicated on the Plans or specified in either the Notes or Special Provisions, all equipment and materials including, but not limited to: Poles, standards, pedestals, post, signal faces, signal heads, directional louvers, back plates, pedestrian heads, pedestrian push buttons, signs, luminaires, illuminated street name signs, mounting hardware, controller

assemblies, cabinets, conduits, conductors, pull boxes, foundations and vehicle detector loops shall be furnished and installed by the Contractor and shall be new and shall be included in the total bid and no additional compensation will be allowed.

2. Equipment List and Drawings:

The Contractor shall furnish two maintenance manuals for all controller units, master controller units, auxiliary equipment, vehicle detector sensor units, control units, amplifiers, signal preemption equipment, and preemption emitters. The maintenance manual and operation manual may be combined into one manual. The maintenance manual or combined maintenance and operation manual shall be submitted at the time the controllers are delivered for testing or, if ordered by the Engineer, previous to purchase. The maintenance manual shall include, but need not be limited to, the following items:

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

The manufacturer shall provide warranty service of control equipment for one year from the day the unit is turned on in the intersection.

Contractor shall provide three originals of project manufacturer's warranties, guarantees, equipment brochures, instruction sheets, manufacturer's certifications, and operation and maintenance manuals.

The controller cabinet schematic wiring diagram and intersection sketch shall be mounted on the cabinet door.

The Contractor is required to submit to the Engineer "Record Drawings" prints prior to the City's accepting the installations. The prints shall indicate in red all deviation from the contract plans, such as: Location of poles, pull boxes and runs, depths of conduit, number of conductors, and other appurtenant work, for future reference.

3. Guarantee:

The Contractor shall guarantee the entire work constructed by him under this contract and will fully meet all requirements as to quality of workmanship and materials furnished by him. The Contractor shall make, at his own expense, any repairs or replacements made necessary by defects in workmanship or materials furnished by him that becomes evident within one (1) year after acceptance by the City for all work and to restore to full compliance with the requirements of these specifications, any part of the work which during the one (1) year period is found to be deficient with respect to any provision of the plans and specifications. The Contractor shall make all repairs and replacements promptly upon receipt of written orders from the Engineer. If the Contractor fails to make the repairs and replacements promptly, the City may do the work and the Contractor and his surety shall be liable to the City for the cost.

4. Maintaining Existing and Temporary Electrical Systems:

The Contractor, if needed, shall provide and install a complete and workable temporary electrical system during construction. The Engineer prior to it being implemented shall approve said system. The Contractor shall pay for temporary service.

The Contractor shall notify Traffic Engineering (phone number 714-741-5189) at least 48 hours prior to disconnecting any signal indications.

Installation of temporary facilities or wiring for the convenience of the Contractor during the progress of the work must be submitted in writing and approved by the Engineer. The cost of installation and removal of such temporary facilities or wiring shall be at the Contractor's expense. A copy of the proposed temporary facilities or wiring shall be delivered to the Engineer at the preconstruction conference for review.

All vehicle and pedestrian indications, detectors, and control equipment, shall be maintained and operational except during shutdown hours. The signal system shutdown shall be limited to the period between the hours of 9:00 a.m. and 3:00 p.m.

When an existing system or temporary system is being modified, the cost for maintaining the existing and/or the temporary electrical systems, work not shown on the plans or specified in the Special Provisions, and which is considered by the Engineer as necessary to keep all or any part of the system in effective operation shall be included in the contract total price for the traffic signal modification, and no additional compensation will be allowed.

5. Protection of Existing Utilities:

Known utilities are indicated on the plans. Prior to performing construction work, the Contractor shall request each utility company to locate their facilities. The Contractor shall protect in place and be responsible for, at his own expense, any damage to any utilities during construction of the items shown on the plans.

6. Scheduling of Work:

The Contractor may perform sub-surface work consisting of the installation of conduit, foundations, and detectors, prior to receipt of all electrical materials and equipment, and may begin said work with permission from the Engineer within 10 days of the date of execution of contract.

Above ground signal work shall not commence until such time that the Contractor notifies the Engineer, in writing, of the date that all electrical materials and equipment are received, and said work shall start within ten (10) days after said date.

No materials or equipment shall be stored at the job sites until receipt of said notification by the Engineer. The job sites shall be maintained in neat and orderly condition at all times.

All striping, pavement markings, and signing, shall be by Contractor, per the plans and special provisions.

7. Excavating and Backfilling:

Per Section 86-2.01 and these Special Provisions, backfilling in roadway area shall be with one (1) sack PCC slurry bottom of roadway surfacing material unless otherwise directed by the Engineer or shown on the plans. Excavation in the roadway area shall not be done by trenching or rock wheeling.

The Contractor shall contact the Traffic Engineer to verify foundation location layout prior to excavating for traffic signal poles and related foundations.

8. Sidewalk Removal:

Sidewalk shall be removed from score line to score line or at joints, unless previous cuts exist for the purpose of installing or removing signal equipment.

9. Foundations:

Foundations shall be located and installed as shown on the Plans, or as directed by the Engineer. No foundation shall be located within three feet of a fire hydrant.

When a foundation is to be abandoned, it shall be removed completely.

In lieu of placing grout under the base plate of posts, standards, or pedestals, the top two inches of the concrete foundation shall be poured after they are in position. The exposed portions of the foundations shall be formed to present a neat appearance. At locations where sidewalks are being constructed the top two inches of the foundation shall be omitted and shall be part of the sidewalk construction.

Portland Cement Concrete for foundations shall conform to Section 90-1 of the Standard Specifications and shall contain not less than 700 pounds of cement per cubic yard and shall attain a compressive strength not less than 3,000 psi at 7 days. Contractor shall submit three copies of the certified P.C.C. mix design to the Engineer prior to placement.

10. Standards, Steel Pedestals, and Posts:

The location of all standards shall be in accordance with dimensions shown on the Plans, and as approved by the Engineer. Existing signal standards, pedestals, signal indications, pedestrian indications, and posts that are to be removed shall be delivered to the City of Garden Grove Maintenance Yard or as noted on the plans. **ALL SIGNAL POLE SUBMITTALS SHALL BE SUBMITTED IMMEDIATELY AFTER AWARD OF PROJECT. SIGNAL POLES AND MAST ARMS SHALL BE ORDERED WITHIN 3 DAYS OF APPROVAL OF SUBMITTALS.**

11. Conduit:

Conduit shall be the size shown on the plans, and shall be schedule 80 PVC.

Insulated bonding bushings will be required.

Existing conduits to be incorporated into the new system that are found to be cracked, broken, or bent shall be repaired by the contractor and the cost shall be included in the total bid.

Existing conduit not reused may be abandoned in place.

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

Rigid metal conduit, to be used as a drilling or jacking rod, shall be fitted with suitable drill bits for size hole required.

In addition to the minimum depth requirement of Section 86-2-05C, "Installation", the following maximum depths shall apply:

(a) Twenty four (24) inches below grade in sidewalk areas and curbed paved median areas.

(b) Thirty six (36) inches below grade in all other areas.

12. Pull boxes:

All new pull boxes shall be No. 6, except where shown otherwise or approved by the Engineer.

Existing pull box lids which are cracked, broken or chipped shall be replaced by the Contractor and if a replacement lid is not available, the Contractor shall furnish and install a new pull box of the same size or larger in its place and the cost shall be included in the total bid.

Plastic pull boxes and/or lids shall not be used.

13. Conductors and Wiring:

The provisions of Section 86-2.09 not withstanding, all conductors, including spares, shall be banded and labeled at each end. Labels shall designate the location of the other end of each separate conductor. Locations shall be described as the cabinet or pole location on the plans.

Conductors, except for existing irrigation/sprinkler wiring which shall be protected in place or returned to its original location as directed by the Engineer, shall be new and shall be supplied and installed by the Contractor as specified in the Conductor Table and/or as necessary to provide a complete and operational system acceptable to the Engineer.

Unless specified otherwise or permitted by the engineer, splices in traffic signal conductors shall not be made between terminal blocks. **NO OPEN FLAME SOLDERING WILL BE PERMITTED.**

When spade lugs are used anywhere, the lugs shall be soldered to the wire.

Existing conductors and wiring shall be removed from abandoned conduit.

Signal Cable

Where shown on the plans, signal cable shall be installed in lieu of individual conductors. Signal cable shall not be spliced, except for the 28-conductor signal cable when it is shown on the plans to be spliced.

Each signal cable, except 28-conductor, shall be marked, in each pull box, showing the signal standard to which it is connected.

Signal cable shall conform to the following:

A. The cable jacket shall be black polyethylene with an inner polyester binder sheath, and shall be rated for 600 V and 75°C. All cables shall have clear, distinctive and permanent markings on the outer surface throughout the entire length of the cable showing the manufacturer's name or trademark, insulation designation, number of conductors, conductor sizes and the voltage rating of the jacket. Filler material, if used, shall be polyethylene material.

B. Individual conductors in the cable shall be solid copper with Type THWN insulation, and shall conform to the requirements in Section 86-2.08, "Conductors," and ASTM Designation: B 286. The minimum thickness of Type THWN insulation, at any point, shall be 12 mils for conductor sizes No. 14 and No. 12, and 16 mils for conductor size No. 10. The minimum thickness of the nylon jacket shall be 4 mils at any point.

Three-Conductor Cable (3CSC)

The 3-conductor signal cable shall consist of three No. 14 conductors. The cable jacket shall have a minimum average thickness of 44 mils and a minimum thickness at any point of 36 mils. The nominal outside diameter of the cable shall not exceed 0.40-inch. The color code of the conductors shall be blue/black stripe, blue/orange stripe and white/black stripe.

The 3 conductor cable shall be used for pedestrian push buttons and a spare.

Five-Conductor Cable (5CSC)

The 5-conductor signal cable shall consist of five No. 14 conductors. The cable jacket shall have a minimum average thickness of 44 mils and shall have a minimum thickness at any point of 36 mils. The nominal outside diameter of the cable shall not exceed 0.50-inch. The color code of the conductors shall be red, yellow, brown, black and white.

Nine-Conductor Cable (9CSC)

The 9-conductor cable shall consist of eight No. 14 conductors and one No. 12 conductor. The cable jacket shall have a minimum average thickness of 60 mils and shall have a minimum thickness at any point of 48 mils. The nominal outside diameter of the cable shall not exceed 0.65-inch. The color code for the No. 12 conductor shall be white. The color code for the No. 14 conductors shall be as follows:

red	yellow/black stripe
yellow	brown/black stripe
brown	black
red/black stripe	white/black stripe

Twelve-Conductor Cable (12CSC)

The 12-conductor signal cable shall consist of eleven No. 14 conductors and one No. 12 conductor. The cable jacket shall have a minimum average thickness of 60 mils and shall have a minimum thickness at any point of 48 mils. The nominal outside diameter of the cable shall not exceed 0.80-inch. The color code for the No. 12 conductor shall be white. The color code and functional connections for the No. 14 conductors shall be as follows, unless otherwise approved by the Engineer:

Color Code	Termination	Phase
Red	vehicle signal red	2, 4, 6, or 8
yellow	vehicle signal yellow	2, 4, 6, or 8
brown	vehicle signal green	2, 4, 6, or 8
red/black stripe	vehicle signal red	1, 3, 5, or 7
yellow/black stripe	vehicle signal yellow	1, 3, 5, or 7
brown/black stripe	vehicle signal green	1, 3, 5, or 7
black/red stripe	spare, or use as required for red or DONT WALK	
black/white stripe	spare, or use as required for yellow	
black	spare, or use as required for green or WALK	
red/white stripe	ped signal DONT WALK	
brown/white stripe	ped signal WALK	

The 12-conductor cable shall be used for vehicle signals, pedestrian signals, spares and the signal common.

Twenty Eight-Conductor Cable (28CSC)

The 28-conductor signal cable shall consist of 27 No. 14 conductors and one No. 10 conductor. The cable jacket shall have a minimum average thickness of 80 mils and shall have a minimum thickness at any point of 64 mils. The nominal outside diameter of the cable shall not exceed 0.90-inch.

The signal commons in each 28-conductor cable shall be kept separate except at the signal controller.

Each 28-conductor cable shall be labeled in each pull box, "C1" or "C2."

The cable identified "C1" shall be used for signal Phases 1, 2, 3 and 4. The cable identified "C2" shall be used for signal Phases 5, 6, 7 and 8.

The color code for the No. 10 conductor shall be white. The color code and functional connections for the No. 14 conductors shall be as follows:

Color Code	Termination	Phase
red/black stripe	vehicle signal red	2 or 6
yellow/black stripe	vehicle signal yellow	2 or 6
brown/black stripe	vehicle signal green	2 or 6
red/orange stripe	vehicle signal red	4 or 8
yellow/orange stripe	vehicle signal yellow	4 or 8
brown/orange stripe	vehicle signal green	4 or 8
red/silver stripe	vehicle signal red	1 or 5
yellow/silver stripe	vehicle signal yellow	1 or 5
brown/silver stripe	vehicle signal green	1 or 5
red/purple stripe	vehicle signal red	3 or 7
yellow/purple stripe	vehicle signal yellow	3 or 7
brown/purple stripe	vehicle signal green	3 or 7
red/2 black stripes	ped signal DONT WALK	2 or 6
brown/2 black stripes	ped signal WALK	2 or 6
red/2 orange stripes	ped signal DONT WALK	4 or 8
brown/2 orange stripes	ped signal WALK	4 or 8
red/2 silver stripes	overlap A, C red	OLA, OLC
brown/2 silver stripes	overlap A, C green	OLA, OLC
red/2 purple stripes	overlap B, D red	OLB, OLD
brown/2 purple stripes	overlap B, D green	OLB, OLD
blue/black stripe	ped push button	2 or 6
blue/orange stripe	ped push button	4 or 8
blue/silver stripe	overlap A, C yellow	OLA(y), OLC(y)
blue/purple stripe	overlap B, D yellow	OLB(y), OLD(y)
white/black stripe	ped push button common	
black/red stripe	railroad preemption	
black	spare	

14. Service:

The Contractor shall coordinate with Southern California Edison to provide appropriate electrical service. The Contractor shall furnish and install a Type II service equipment enclosure and equipment as shown on the plans.

Service shall be provided by the Southern California Edison Company (SCE). The Contractor shall notify the Engineer 21 calendar days prior to requiring the meter set for the service cabinet.

All pull boxes placed between the electrical service point and the service equipment enclosure shall be 13x24 inches and shall conform to SCE specifications.

15. Equipment Testing:

The testing of all equipment and materials shall be performed at Econolite Control Products, Inc., 1250 N. Tustin Ave. Anaheim, CA 92807.

The Contractor shall be responsible for the transporting of all equipment and materials to and from the designated test facility and shall submit to the City, in triplicate, copies of the quality assurance documentation a minimum of 48 hours prior to the delivery of the equipment and materials to the job site, and the cost for said testing and transportation shall be included in the lump sum contract price for the traffic signal modifications/installation and no additional compensation shall be made therefore.

16. Functional Testing:

The sixth paragraph in Section 86-2.14C, "Functional Testing", of the Standard Specifications is amended to read:

Except for new or modified lighting circuits and sign illumination systems, the local agency will maintain the system or systems during the test period and will pay the cost of electrical energy for the operation of all of the facilities that are undergoing testing. The cost of any necessary maintenance performed by the State or local agency, except electrical energy, shall be at the Contractor's expense and will be deducted from any moneys due, or to become due, the Contractor.

The functional test for each lighting system shall consist of not less than 14 days. If unsatisfactory performance of the system develops, the conditions shall be corrected and the test shall be repeated until the 14 days of continuous, satisfactory operation is obtained.

The sixth paragraph in Section 86-2.14, Functional Testing, of the Standard Specifications, is amended to read:

During the test period, the City or its representative will maintain the system or systems. The cost of any maintenance necessary, except electrical energy and maintenance due to damage by public traffic, shall be at the Contractor's expense and will be deducted from any moneys due, or to become due, the Contractor.

The eighth paragraph in Section 86-2.14, "Functional Testing", of the Standard Specifications, is amended to read:

A shutdown of the electrical system resulting from damage caused by public traffic or from a power interruption shall not constitute discontinuity of the functional test.

17. Painting:

All reused electrical equipment and materials such as: cabinets, metal signal heads, signal head mountings, brackets and fittings, outside of visors, pedestrian push button housings, and pedestrian signal head housings and visors, and back faces of back plates shall be repainted per Section 86-2.16 of the Standard Specifications, and the cost shall be included in the lump sum contract price for the traffic signal modifications/installation, including all equipment on the existing traffic signal pole located.

18. Controller Cabinet Assembly:

The Contractor shall furnish and install the new controller cabinet assembly as stated herein and as necessary to provide a complete and workable system, meeting the requirements of the plans and these Special Provisions. The controller cabinet assembly shall consist of traffic signal controller (or reuse existing as specified on the plan), NEMA P44 TS2 Type I

cabinet, cabinet components including but not limited to load switches, flashers, flash transfer relays, malfunction management units (MMU), Bus Interface Units (BIU), cabinet power supply and any new equipment as required for the operation shown on the plans.

TRAFFIC SIGNAL CONTROLLER

The Contractor shall furnish and install NEMA TS2 Fully-Actuated Advanced Traffic Controller (ATC). **The CONTRACTOR shall furnish and install Econolite ASC/3 traffic signal firmware on the ATC Controller.** The controller shall be capable of being supervised by the City's existing Econolite CENTRACS traffic monitoring software at the City's Traffic Management Center**.**

1. Enclosure: The controller shall be compact so as to fit in limited cabinet space. It shall require no more than 7" shelf depth. External dimensions shall not be larger than 8.5" x 15.2 1/4" x 6.375" (H x W x D). The top and bottom of the chassis shall be made from extruded aluminum and include an integral handle on the back for easy transport. The sides shall be constructed of injection molded polycarbonate. The model, serial number, and program information shall be displayed on the outside of the controller.

2. Electronics: The electronics shall be modular in design and shall consist of vertical circuit boards. Horizontal circuit boards shall not acceptable. In the interest of reliability, no sockets shall be used for any electronic device. All devices shall be directly soldered to the printed circuit board. Surface mount parts shall be used for the majority of the electronic components in the controller. A built-in, high-efficiency switching power supply shall generate the primary, +5VDCinternal voltage, an isolated +24 VDC for internal and external use, VSTANDBY, LINESYNC, POWERUP and POWERDOWN signals. All voltages shall be regulated. The 120 or 220VAC fuse shall be mounted on the front of the controller. Protection for the 24VDC supply shall be provided by a resettable electronic fuse.

All printed circuit boards shall meet the requirements of the NEMA Standard plus the following requirements to enhance reliability. Both sides of the printed circuit board shall be covered with a solder mask material. The circuit reference designation for all components and the polarity of all polarized capacitors and two-leaded diodes shall be clearly marked adjacent to the component. Pin 1 for all integrated circuit packages shall be designated on all printed circuit boards. All printed circuit board assemblies shall be coated on both sides with a clear moistureproof and fungus-proof sealant. Timing of the controller traffic application shall be derived from the AC power line.

To facilitate the transfer of user-programmed data from one controller to another, a data-key receptacle for using a separate 2070-style, serial flash memory device shall be an available hardware option. In addition, two USB sockets and one SD Card socket shall be provided for memory devices that can be used for data transfer. These data transfer devices shall be easily removable and directly accessible from the outside of the controller. The controller will not require this data-key, USB memory thumb drive, or SD Card to be present for proper operation.

All controller software shall be stored in Flash Memory devices. The controller software shall be easily updated without the removal of any memory device from the controller. The use of removable PROMS or EPROMS from the controller shall not be acceptable. The controller shall include an option that allows updating software using a Windows based computer, a USB memory thumb drive, or an SD card.

3. ATC Engine Board: The controller shall include an ATC engine board compliant to ATC standard 5.2b and proposed version 6.10. The engine board shall include a PowerPC 83XX family processor with QUICC engine. The engine board shall have a minimum of the following memory: 128Mbytes of DDR2 DRAM memory used for application and OS program execution. 64 Mbytes of FLASH memory used for storage of OS Software and user applications. 2MB of SRAM memory used for non-volatile parameter storage. The engine board shall provide the seven ATC serial ports, Ethernet, USB and all other control signal required by ATC standard. The operating system shall be Linux 2.6.35 or later

4. Graphical User Interface: The controller shall include an advanced graphics card. The graphics card shall enable the following: Graphical display of status and programming selections. The status displays shall include direction arrows for each of the phases and overlaps. The selection of programming sections menus shall be by use of icons. Programming shall use touch data entry, allowing touch gestures to select yes/no, select enable/disable, pull-down list selections, and more. Touch selection of status and programming. Swiping to advance from one screen to the next. Program values shall be entered through either the keypad or the touch screen.

The controller shall allow connection of a tablet to the controller. The tablet connection shall be by Wi-Fi connection either by a Wi-Fi to USB adapter or an Ethernet to Wi-Fi adapter. Once connected it shall be possible to observe the exact same graphics displays as are visible on the touch screen of the controller. It shall be possible to change the controller's programming values from the tablet while it is connected.

5. Front Panel: The front of the controller shall consist of a panel for the display, keyboard and connectors for all necessary user connections. The display shall be a seven-inch (7"), color, TFT (Thin Film Transistor) LCD (Liquid Crystal Display) with high brightness. It shall be readable in direct sunlight. The display shall perform over the NEMA temperature range and shall have a resolution of 800 X 480 with an 18 bit color depth. The luminous intensity shall be a minimum of 800 nits. The display shall include an industrial, resistive touch screen that can be operated with gloved hands. The touch screen and display shall not be affected by condensation or water drops.

Front-panel operator inputs shall be via touch screen or by clearly labeled elastomeric keypad. These shall include a 10-digit numeric keypad, Main and Sub keys, toggle keys, special function and enter keys, six function keys, status and help keys and a large four-direction cursor control key. The front panel shall include a built in speaker for enhanced controller audio feedback. The front panel shall include a tri-color status LED.

6. Ethernet Ports: The controller shall have the capability of supporting Ethernet communications, using TCP/IP communications protocols. The controller shall provide four front-panel Ethernet ports. Two of the ports shall be connected to Ethernet switch ENET1 and the other two shall be connected to Ethernet switchENET2

7. USB Ports: The controller shall provide two USB 2.0 ports. USB ports shall be used for USB thumb drives to update software, upload or download configuration, or uploading logged data.

8. Connectors: All non-optional interface connectors shall be accessible from the front of the controller in the NEMA Configured Controller models. Configurations shall be offered to accommodate different versions, as follows: NEMA TS2 Type 1, NEMA TS2 Type 2, NEMA TS1. The D connector shall be compatible with the Econolite Model ASC/2, ASC/2S, and

ASC/3 D connectors. To facilitate special applications the controller shall have the capability of assignment of any input or output function to any input or output pin respectively on the interface connectors, with the exception of Flashing Monitor, Controller Voltage Monitor, AC+, AC-, Chassis Ground, 24VDC, Logic Ground and TS2 Mode bits.

The controller shall as a minimum have the following communications ports: Port 1 SDLC for communications to other devices in the cabinet. Port 2 serial port for systems communications. Console serial port for local communications. An optional telemetry module shall utilize TDM/FSK data transmission at 1200 baud or 9600 baud over two pairs of wires. This module shall include the Econolite 25-pin D-sub connector. Ports on ATC-2070 communication slots. Serial communications shall operate at from 1200 to 115.2 K baud.

9. Serviceability. All electronic modules including the power supply shall be easily removable from the controller using a screwdriver as the only tool. All power and signal connections to the circuit boards shall be via plug-in connectors.

10. Data Key. A data-key and receptacle shall be available for use as a database storage device (backup) or as a database transfer module. It shall be capable of storing a minimum 2MB of data. The data-key shall be hot swappable, so that it can be inserted and removed without powering down the controller. The data-key shall be capable of storing the entire controller database and shall retain the information without use of battery or capacitor backup. The controller shall not require this key to be present during normal operation. If the data-key is present the controller shall automatically backup the database to the data key 20 minutes following the last data change.

Any deviation from these specifications must be submitted in writing noting, in itemized detail, any deviation. This must be attached to the Bid Sheet at the time and date of the Bid Opening. The Engineer has the right to reject any and all bids that do not meet these specifications.

The Contractor shall arrange with the controller manufacturer to have a signal technician present at the time the controller assembly is turned on. The technician shall be fully qualified to work on the controller assembly, and shall be employed by the controller manufacturer.

NEMA P44 TS2 TYPE I CABINET AND CABINET COMPONENTS

1. Cabinet Design and Construction: The cabinet shall be constructed from type 5052-H32 aluminum with a minimum thickness of 0.125 inches. The cabinet shall be designed and manufactured with materials that will allow rigid mounting, whether intended for pole, base or pedestal mounting. The cabinet must not flex on its mount. A rain channel shall be incorporated into the design of the main door opening to prevent liquids from entering the enclosure. The cabinet door opening must be a minimum of 80 percent of the front surface of the cabinet. A stiffener plate shall be welded across the inside of the main door to prevent flexing. The top of the cabinet shall incorporate a 1-inch slope toward the rear to prevent rain accumulation.

Unless otherwise specified, the cabinet shall be supplied with a natural aluminum finish. Sufficient care shall be taken in handling to ensure that scratches are minimized. All surfaces shall be free from weld flash. Welds shall be smooth, neatly formed, free from cracks, blowholes and other irregularities. All sharp edges shall be ground smooth. Where painted cabinets are specified, the exterior shall be degreased and primed with a spray applied iron

phosphate coat- equivalent to a four-stage iron phosphate coat prior to painting. The final coat shall consist of a powder coat paint (TGIC or equivalent) applied with a minimum thickness of 2 mils. All seams shall be sealed with RTV sealant or equivalent material on the interior of the cabinet.

All cabinets shall be supplied with a minimum of one removable shelf manufactured from 5052-H32 aluminum. Shelf shall be a minimum of 10 inches deep. The shelf shall have horizontal slots at the rear and vertical slots at the front of the turned down side flange. The shelf shall be installed by first inserting the rear edge of the shelf on the cabinet rear sidewall mounting studs, then lowering the shelf on the front sidewall mounting studs. The shelf shall be held in place by a nylon tie-wrap inserted through holes on the front edge of the shelf and around the front sidewall mounting studs. The front edge of the shelf shall have holes punched every 6 inches to accommodate tie-wrapping of cables/harnesses.

A minimum of one set of vertical "C" channels shall be mounted on each interior wall of the cabinet for the purpose of mounting the cabinet components. The channels shall accommodate spring mounted nuts or studs. All mounting rails shall extend to within 7 inches of the top and bottom of the cabinet. Sidewall rail spacing shall be 7.88 inches center-to-center. Rear wall rail spacing shall be 18.50 inches center-to-center. The main door and police door-in-door shall close against a weatherproof and dust-proof, closed-cell neoprene gasket seal. The gasket material for the main door shall be a minimum of 0.250 inches thick by 1.00 inch wide. The gasket material for the police door shall be a minimum of 0.250 inches thick by 0.500 inches wide. The gaskets shall be permanently bonded to the cabinet.

The lower section of the cabinet shall be equipped with a louvered air entrance. The air inlet shall be large enough to allow sufficient air flow per the rated fan capacity. Louvers must satisfy the NEMA rod entry test for 3R ventilated enclosures. A non-corrosive, vermin- and insect-proof, removable air filter shall be secured to the air entrance. The filter shall fit snugly against the cabinet door wall. The roof of the cabinet shall incorporate an exhaust plenum with a vent screen. Perforations in the vent screen shall not exceed 0.125 inches in diameter. The main door on a size 3 or larger cabinet shall be equipped with a three-point latching mechanism.

The handle on the main door of the cabinet shall be manufactured from cast aluminum or stainless steel. The handle shall include a hasp for the attachment of an optional padlock. The cabinet door handle shall rotate counter-clockwise to open. The handle shall not extend beyond the perimeter of the main door at any time. The lock assembly shall be positioned so that the handle shall not cause any interference with the key when opening the cabinet door.

The main door hinge shall be a one-piece, continuous piano hinge with a stainless steel pin running the entire length of the door. The hinge shall be attached in such a manner that no rivets or bolts are exposed. The main door shall include a mechanism capable of holding the door open at approximately 90, 145, and 165 degrees under windy conditions. The main door of a size 3, or 4 cabinet shall include a mechanism capable of holding the door open at approximately 90 and 165 degrees under windy conditions. May be provided with two doors, one front, one back. The main door shall be equipped with a Corbin tumbler lock number 1548-1 or exact equivalent. Minimum of two keys shall be supplied. The police door-in-door shall be provided with a treasury type lock Corbin No. R357SGS or exact equivalent and has a minimum of one key.

All base mounted cabinets require anchor bolts to properly secure the cabinet to its base. The cabinet flange for securing the anchor bolts shall not protrude outward from the bottom

of the cabinet. When a size 3, 4, or 5 cabinet is base mounted, two anchor bolts shall be required for proper installation. Size 6 and 7 cabinets, four anchor bolts shall be required for proper installation.

Each cabinet shall be of sufficient size to accommodate all equipment. At a minimum, the minimal cabinet sizes are as follows: Size 3 cabinets - 40" H x 24" W x 15" D, Size 4 cabinets - 46" H x 24" W x 16" D, Size 5 cabinets - 48" H x 30" W x 16" D, Size 6 cabinets - 52" H x 44" W x 24" D, Size 7 cabinets - 72" H x 44" W x 24" D.

Main door shall incorporate a shroud to cover the filtered louvered openings as appropriate for the design. The assembly is secured on the interior of the door over the filtered Louvers. The Shroud is louvered downward and matches the door louvers. All enclosures must be constructed, approved and marked in accordance with the requirements for Type 1 Industrial Control Panel Enclosures contained in UL 508A, the Standard for Industrial Control Panels. Enclosure must meet NEMA 3R rating requirements and be marked with UL approval sticker.

2. Terminals and Facilities/Main Panel Design and Construction: The main panel shall be constructed from 5052-H32 brushed aluminum of 0.125 inches minimum thickness and installed so as to minimize flexing when plug-in components are installed. All 8-, 12- and 16-position main panels are provided with a mounting mechanism which allows easy access to all wiring on the rear of the panel. Lowering of the main panel can be accomplished without the use of hand tools. Complete removal can be accomplished by the use of simple hand tools.

The terminals and facilities shall be available as a minimum in the following configurations:

a. Configuration #1 - Four load switch sockets, two flash transfer relay sockets, one flasher socket, 1- BIU sockets(expandable to 2), one 8-channel detector rack with one BIU, and one Type-16 MMU.
b. Configuration #2 - Eight load switch sockets, four flash transfer relay sockets, one flasher socket, 1- BIU sockets(expandable to 2), one 8-channel detector rack with one BIU, and one Type-16 MMU
c. Configuration #3 - Twelve load switch sockets, six flash transfer relay sockets, one flasher socket, 2- BIU sockets, one 16-channel detector rack with one BIU, and one Type-16 MMU.
d. Configuration #4 - Sixteen load switch sockets, six flash transfer relay sockets, one flasher socket, 2- BIU sockets, one 16-channel detector rack with one BIU, and one Type-16 MMU.

All load switch and flash transfer relay socket reference designators shall be silk-screen labeled on the front and rear of the main panel to match drawing designations. Socket pins shall be marked for reference on the rear of the panel. A maximum of eight load switch sockets may be positioned horizontally or stacked in two rows on the main panel. Main panels requiring more than eight load switch sockets shall be mounted in one horizontal row. All load switches shall be supported by a bracket, extending at least half the length of the load switch.

The 4- and 8- load switch position main panels shall have all field wires contained within one or two row(s) of horizontally mounted terminal blocks. The 12- and 16-load switch position main panels shall have all field wires contained on two rows of horizontally mounted terminal blocks. The upper row shall be wired for the pedestrian and overlap field terminations. The lower row shall be reserved for phase one through phase eight vehicle field terminations. As

an alternate a 12 or 16 position horizontal main panel and field terminal configuration may be used.

All field output circuits shall be terminated on a non-fused barrier type terminal block with a minimum rating of 10 amps. All field input/output (I/O) terminals shall be identified by permanent alphanumerical labels. All labels shall use standard nomenclature per the NEMA TS2 specification. It shall be possible to flash either the yellow or red indication on any vehicle movement and to change from one color indication to the other by use of a screwdriver. Field terminal blocks shall be wired to use four positions per vehicle or overlap phase (green, yellow, and red, flash). It shall not be necessary to de-buss field terminal blocks for flash programming.

The main panel shall contain at least one flasher socket (silk screen labeled) capable of operating a 15 amp, 2 pole, NEMA solid-state flasher. The flasher shall be supported by a bracket, extending at least half its length. One RC network shall be wired in parallel with each group of three flash-transfer relays and any other relay coils. All logic-level, NEMA-controller and Malfunction Management Unit input and output terminations on the main panel shall be permanently labeled. Cabinet prints shall identify the function of each terminal position. At a minimum, three 20-position terminal blocks shall be provided at the top of the main panel to provide access to the controller unit's programmable and non-programmable I/O. Terminal blocks for DC signal interfacing shall have a number 6-32 x 7/32 inch screw as minimum.

All main panel wiring shall conform to the following wire size and color:

- Green/Walk load switch output - brown wire - 14 gauge
- Yellow load switch output - yellow wire - 14 gauge
- Red/Don't Walk load switch - red wire output - 14 gauge
- MMU (other than AC power) - violet wire - 22 gauge
- Controller I/O - blue wire - 22 gauge
- AC Line (power panel to - black wire main panel) - 8 / 10 gauge
- AC Line (main panel) - black wire - 10 gauge
- AC Neutral (power panel to - white wire main panel) - 8 / 10 gauge
- AC Neutral (main panel) - white wire - 10 gauge
- Earth ground (power panel) - green wire - 8 gauge
- Logic ground - gray wire - 22 gauge
- Flash programming - Orange wire
- Flasher terminal - Black wire red or yellow field terminal - 14 gauge

All wiring, 14 AWG and smaller, shall conform to MIL W 16878/1, type B/N, 600V, 19-strand tinned copper. The wire shall have a minimum of 0.010 inches thick PVC insulation with clear nylon jacket and rated to 105 degrees Celsius. All 12 AWG and larger wire shall have UL listed THHN/THWN 90 degrees Celsius, 600V, 0.020 inches thick PVC insulation and clear nylon jacketed. Connecting cables shall be sleeved in a braided nylon mesh or poly-jacketed. The use of exposed tie-wraps or interwoven cables is unacceptable.

All Terminals and Facilities configurations shall be provided with BIU wiring assignments consistent with NEMA TS2-1998 specifications. All Terminals and Facilities configurations shall be provided with sufficient RS-485 Port 1 communication cables to allow for the intended operation of that cabinet. Each communication cable connector shall be a 15 pin metal shell D subminiature type. The cable shall be a shielded cable suitable for RS-485 communications. All main panels shall be pre-wired for a Type-16 Malfunction Management Unit. All wiring shall be neat in appearance. All cabinet wiring shall be continuous from its

point of origin to its termination point. Butt type connections/splices are not acceptable. All connecting cables and wire runs shall be secured by mechanical clamps. Stick-on type clamps are not acceptable.

The grounding system in the cabinet shall be divided into three separate circuits (AC Neutral, Earth Ground, and Logic Ground). These ground circuits shall be connected together at a single point as outlined in the NEMA TS2 Standard. The main panel shall incorporate a relay, designated as K1, to remove +24 VDC from the common side of the load switches when the intersection is placed into mechanical flash. The relay shall have a momentary pushbutton to apply power to the load switch inputs for ease of troubleshooting. The relay shall have a momentary pushbutton to apply power to the load switch inputs for ease of troubleshooting. All pedestrian push button inputs from the field to the controller shall be opto-isolated through the BIU and operate at 12 VAC. All wire (size 16 AWG or smaller) at solder joints shall be hooked or looped around the eyelet or terminal block post prior to soldering to ensure circuit integrity. Lap joint soldering is not acceptable.

3. Power Panel Design and Construction: The power panel shall integrated into the main panel and be located on the lower right portion of the cabinet. The power panel shall be wired to provide the necessary filtered power to the load switches, flasher(s), and power bus assembly. The power components shall be equipped with a removable plastic front cover for technician protection. The design will allow a technician to access the main and auxiliary breakers without removing the protective front cover.

The power panel portion of the main panel shall include the following components:

a. A minimum of a 40-amp main breaker for 12- or 16- position cabinets or a minimum of a 30 amp breaker for 4- or 8-position cabinets. This breaker shall supply power to the controller, MMU, signals, cabinet power supply and auxiliary panels. Breakers shall be at minimum, a thermal magnetic type, U.L. listed for HACR service, with a minimum of 10,000 amp interrupting capacity.
b. A minimum of one (1) 15-amp auxiliary breaker. This breaker shall supply power to the fan, light and GFI utility outlet.
c. An EDCO model SHP-300-10 or exact approved equivalent surge arrester.
d. A 50 amp, 125 VAC radio interference line filter.
e. A normally-open, 75 amp, Solid State Signal buss relay. The SSR shall be a Crydom Model # HA4875H or approved equal.
f. A minimum of one (1) 8-position neutral bus bar capable of connecting three #12 wires per position.
g. A minimum of one (1) 6-position ground bus bar capable of connecting three #12 wires per position.
h. A minimum of one (1) NEMA type 5-15R GFI utility outlet.

4. Power Bus Assembly: The power bus assembly shall be manufactured from 0.090", 5052-H32 aluminum. It shall provide filtered power for the controller, malfunction management unit, cabinet power supply, and all auxiliary equipment. It shall include the SDLC Bus connecting cables wired into a surface-mounted terminal block. As an alternate SDLC Bus connections may be made via an SDLC Hub Assembly. The Power Bus Assembly shall house the following components:

a. A minimum of three and a maximum of six power connectors.
b. Two terminal strips to hardwire the power connections.
c. SDLC terminal block with pre-wired cables or SDLC Hub Assembly

All cabinet equipment requiring filtered power to operate shall be connected to the power bus assembly by a 12-pin Molex Robotic Type connector Model# 54332-1270 or exact equivalent or hardwired directly to the supplied terminal blocks. An SDLC Hub Assembly shall include a minimum of three and maximum of eight D-Subminiature Female 15 pin (DB15) connectors that are wired in series.

5. Auxiliary Cabinet Equipment: The cabinet shall be provided with a thermostatically controlled (adjustable between 55-160 degrees Fahrenheit) ventilation fan in the top of the cabinet plenum. The fan plate shall be removable with the use of simple hand tools for serviceability. A minimum of one exhaust fan shall be provided. The fan shall be a ball bearing type fan and shall be capable of drawing a minimum of 100 cubic feet of air per minute. The Fan/Thermostat assembly shall be connected to the Power panel by means of a 4 position plug-in cable.

At minimum, a 40-watt incandescent refrigerator lamp and socket mounted on an aluminum bracket shall be mounted in the cabinet to sufficiently illuminate the field terminals. The lamp shall be wired to either a 15-amp ON/OFF toggle switch mounted on the power panel or to a door activated switch mounted near the top of the door. Alternately, a 40-watt incandescent lamp mounted on a 14-inch flexible arm shall be included. The flexible arm shall be permanently mounted to the middle of the cabinet door. The lamp shall be wired to either a 15-amp ON/OFF toggle switch mounted on the power panel or to a door activated switch mounted near the top of the door. Alternately, a fluorescent lighting fixture shall be mounted on the inside top of the cabinet near the front edge. The fixture shall be rated to accommodate at minimum a F15T8 lamp operated from a normal power factor UL or ETL listed ballast. The lamp shall be wired to either a 15-amp ON/OFF toggle switch mounted on the power panel or to a door activated switch mounted near the top of the door. Alternately, an LED cabinet lighting system may be used to illuminate the internal structure of the cabinet assembly. The LED cabinet lighting shall be Luxem Bright LED modules Model#772-W0013 and approved power supply.

A resealable print pouch shall be mounted to the door of the cabinet. The pouch shall be of sufficient size to accommodate one complete set of folded cabinet prints. A minimum of two sets of complete and accurate cabinet drawings shall be supplied with each cabinet.

6. Vehicle Detection: A minimum of one Loop Detector Rack shall be provided in each cabinet. Detector racks shall be available in two configurations. These configurations shall be integrated on top left side portion of the main panel.

a. Configuration #1 - Shall support up to eight channels of loop detection (either four 2 channel detectors or two 4 channel detectors), two 2 channel preemption devices, and one BIU. This configuration shall be included as a standard on the 8-position main panel assembly.
b. Configuration #2 - Shall support up to 16 channels of loop detection (either eight 2 channel detectors or four 4 channel detectors), two 2 channel preemption devices and one BIU. This configuration shall be included as a standard on the 12 or 16 position main panel assembly.

Detector rack BIU mounting shall be an integral part of the detector rack. All BIU rack connectors shall have jumper address pins corresponding to the requirements of the TS2 specification. The jumpers may be moved to change the address of any individual rack. The address pins shall control the BIU mode of operation. BIUs shall be capable of being interchanged with no additional programming. Each cabinet shall contain detector interface panels for the purpose of connecting field loops and Loop Detector Racks. The panels shall

be manufactured from FR4 G10 fiberglass, 0.062 inches thick, with a minimum of 2 oz. of copper for all traces.

One 8-position interface panel shall be provided for an 8 channel rack cabinet and one 16-position interface panel shall be provided for a 16 channel rack cabinet. The interface panel shall be secured to a mounting plate and attached to the left wall of the cabinet. Each interface panel shall allow for the connection of eight or sixteen independent field loops. A ground bus terminal shall be provided between each loop pair terminal to provide a termination for the loop lead-in cable ground wire. Each interface panel shall provide a 10 position terminal block to terminate the field wires for up to two 2 channel preemption devices.

Lightning protection device mounting holes shall be provided to accommodate an Edco SRA-16C, or Edco SRA-6, or Edco LCA-6, or a varistor lightning protection device. Lightning protection devices shall not be provided unless specifically called for in the special provisions of this specification. A cable consisting of 20 AWG twisted pair wires shall be provided to enable connection to and from the panel to a detector rack. The twisted pair wires shall be color coded red and white wire. All termination points shall be identified by a unique number and silk screened on the panel.

Each detector rack shall accommodate rack mountable preemption devices such as EMTRAC or Opticom. Each detector rack shall be powered by the cabinet power supply and be connected to the power bus assembly by means of a 12-pin Molex Robotic type connector Model# 54332-1270 or exact equivalent.

7. Cabinet Test Switches and Police Panel: A test switch panel shall be mounted on the inside of the main door. The test switch panel shall provide as a minimum the following:

a. SIGNALS ON/OFF SWITCH - In the OFF position, power shall be removed from signal heads in the intersection. The controller shall continue to operate. When in the OFF position, the MMU shall not conflict or require reset.
b. AUTO/FLASH SWITCH - When in the flash position, power shall be maintained to the controller and the intersection shall be placed in flash. The controller shall not be stop timed when in flash. Wired according to NEMA-TS2-2003 the MMU forces the controller to initiate the start-up sequence when existing flash.
c. STOP TIME SWITCH - When applied, the controller shall be stop timed in the current interval.
e. CONTROL EQUIPMENT POWER ON/OFF - This switch shall control the controller, MMU, and cabinet power supply AC power.

Momentary test push buttons for all vehicle and pedestrian inputs to the controller are not required. The TS2 controller to be provided with the cabinet assembly shall provide vehicular and pedestrian call inputs from its keyboard while in the standard status display.

The police door switch panel shall contain the following:

a. SIGNALS ON/OFF SWITCH - In the OFF position, power shall be removed from signal heads in the intersection. The controller shall continue to operate. When in the OFF position, the MMU shall not conflict or require reset.
b. AUTO/FLASH SWITCH – When in the flash position, power shall be maintained to the controller and the intersection shall be placed in flash. The controller shall be stop timed when in flash. Wired according to NEMA-TS2-1998 the MMU forces the controller to initiate the start-up sequence when exiting flash.

c. AUTO/MANUAL SWITCH - Cabinet wiring shall include provisions for an AUTO/MANUAL switch and a momentary push button or hand cord. The AUTO/MANUAL switch and push button or hand cord shall not be provided unless it is called for in the CUSTOMER SPECIFICATION.
d. COORD/FREE SWITCH - Cabinet wiring shall include provisions for COORD/FREE switch. The COORD/FREE switch shall not be provided unless it is called for in the CUSTOMER SPECIFICATON.

All toggle type switches shall be heavy duty and rated 15 amps minimum. Single- or double-pole switches may be provided, as required. Any exposed terminals or switch solder points shall be covered with a non-flexible shield to prevent accidental contact. All switch functions must be permanently and clearly labeled.

All wire routed to the police door-in-door and test switch push button panel shall be adequately protected against damage from repetitive opening and closing of the main door. All test switch panel wiring shall be connected to the main panel via a 50-pin Molex Robotic type connector Model# 54332-5001, or exact equivalent. Wiring from the main panel to the test switch panel shall be connected to the switch panel via a 30-pin Molex Robotic type connector Model# 54332-3070 or exact equivalent.

8. Controller Telemetry Interface Panel: A telemetry interface harness and interface panel shall be supplied with each cabinet assembly when specified in the special provisions. The harness shall be a minimum of 6 feet long and shall consist of two twisted shielded pairs, 22 AWG wire with drain wire in an overall jacket, terminated to a 9-pin "D" type connector at one end. The pin out of the 9 pin connector shall be in exact accordance with the NEMA TS2 Standard. The opposite end of the harness shall be terminated on a 10-position EDCO PCB-1B or exact equal lightning protection socket base.

All terminal block designations and peripheral board-mounted components shall be labeled as to their number and function and shall correspond to the cabinet wiring diagrams. The following signals shall be accessible from the telemetry interface panel:

- Local controller command lines 1 & 2
- Local controller read back lines 1 & 2
- Master controller command lines 1 & 2
- Master controller read back lines 1 & 2
- Earth grounds

A socket mounted communication line transient protection device shall be supplied with the telemetry interface panel. The device shall be an EDCO model PC642C-008D or exact approved equivalent. The transient protection device shall be wired in series with the telemetry communication circuit. Communication line impedance shall be matched to the transmitter output impedance to minimize noise on the communication lines. The panel shall allow connection of a 620 ohm resistor across the command and read back lines, where necessary.

9. Auxiliary Devices:

Load Switches: Load switches shall be solid state and shall conform to the requirements of Section 6.2 of the NEMA TS2 Standard. Signal load switches shall have a minimum rating of 10 amperes at 120 VAC for an incandescent lamp load. The front of the load switch shall be provided with three indicators to show the input signal from the controller to the load switch. Load switches shall be dedicated per phase. The use of load switches for other partial

phases is not acceptable. The full complement of load switches shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed.

Flashers: The flasher shall be solid state and shall conform to the requirements of section 6.3 of the NEMA TS2 Standard. Flashing of field circuits for the purpose of intersection flash shall be accomplished by a separate flasher. The flasher shall be rated at 15 amperes, double pole with a nominal flash rate of 60 FPM.

Flash Transfer Relays: All flash transfer relays shall meet the requirements of Section 6.4 of the NEMA TS2 Standard. The coil of the flash transfer relay must be de-energized for flash operation. The full complement of relays shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed.

Malfunction Management Units (MMU): Each cabinet assembly shall be supplied with one MMU as defined by the requirements of Section 4 of the NEMA TS2 Standard. Malfunction Management Units shall be a Type 16. The MMU shall be Econolite Control Products, Inc. Model MMU-16 (EDI Model MMU-16) or approved equal.

Bus Interface Units (BIU): All BIUs shall meet the requirements of Section 8 of the NEMA TS2 Standard. The full complement of Econolite Control Products, Inc. Model 32860G1 Bus Interface Units shall be supplied with each cabinet to allow for maximum phase and function utilization for which the cabinet is designed. Each Bus Interface Unit shall include power on, transmit and valid data indicators. All indicators shall be LEDs.

Cabinet Power Supply: The cabinet power supply shall meet the requirements of Section 5.3.5 of the NEMA TS2 Standard. The cabinet power supply shall provide LED indicators for the line frequency, 12 VDC, 12 VAC, and 24 VDC outputs. The cabinet power supply shall provide (on the front panel) jack plugs for access to the +24 VDC for test purposes. One cabinet power supply shall be supplied with each cabinet assembly and shall be wired directly to the Power Bus Assembly via a 12-pin Molex Robotic type connector Model# 54332-1270or exact equivalent.

10. Warranty:

The controller and Malfunction Management Unit shall be warranted by the manufacturer against mechanical and electrical defects for a period of two years from date of shipment. The manufacturer's warranty shall be supplied in writing with each cabinet and controller. Second party extended warranties are not acceptable. The cabinet assembly and all other components shall be warranted for a period of one year from date of shipment. Any defects shall be corrected by the manufacturer or supplier at no cost to the City.

Full compensation for controller cabinet assembly shall be included in the contract lump sum price and shall include full compensation for furnishing all labor, tools, equipment, materials, incidentals, and doing all work involved and no additional compensation will be allowed.

19. Signal Faces and Signal Heads:

Polycarbonate signal heads may not be used. All new signal heads shall be 12".

All visors shall have twist-on attaching ears to facilitate installation.

Full circle visors shall be uniform in diameter throughout their length.

All signal faces shall have back plates.

Where signal heads are mounted on the side of poles, they shall be mounted on the side away from the traveled roadbed, and as approved by the Engineer.

All Red, Green, and Yellow (including Arrows) indications shall be ITE approved meeting the last requirements. (See Additional Standards for testing requirements)

The cost of all Signal Faces and Signal Heads shall be included in the lump sum contract price for the traffic signal modifications/installation and no further compensation will be permitted.

20. Pedestrian Countdown Signals:

All new pedestrian signals shall be ITE approved L.E.D.'s with solid filled international symbol (hand/man) and shall be Pedestrian Countdown Signal.

The pedestrian countdown signal shall be 16"x18" Incandescent Look manufactured by DIALIGHT or approved equal.

The specifications for the pedestrian countdown signal are as follows:

- Operating Voltage Range: 80VAC to 135VAC (120VAC nominal)
- Operating Temperature Range: -40 degrees Celsius to 74 degrees Celsius
- Power Factor >0.9
- Total Harmonic Distortion<20%
- Meets FCC Title 47, Subpart B, Section 15 regulations for electrical noise
- Conforms to MIL-STD-810F for rain and blowing rain.
- Conforms to MIL –STD-883, Test Method 1010, for temperature cycling requirements
- Conforms to MIL-STD-883, Test Method 2007, for mechanical vibration.

The hood described in Section 86 -4.05D, "Visors", of the Standard Specifications shall be provided.

The cost of all Pedestrian Countdown Signals shall be included in the lump sum contract price for the traffic signal modifications/installation and no further compensation will be permitted.

21. Luminaires

All luminaires shall be LED type, LEOTEK GREEN COBRA (model number GCM2-40F-MV-NW-GY-1A-WL-RWG) or approved equal. Luminaires shall be supplied with photoelectric controls installed in the service panel per section 24 of these Special Provisions. The cost of

luminaires shall be included in the lump sum contract price for the traffic signal modifications/installation and no further compensation will be permitted.

22. Pedestrian Push Buttons:

All pedestrian push button signs shall be the R10-3e (5”x7 3/4”) and modular pedestrian station shall be Campbell Company MPS 57 mount (green). Pedestrian push buttons shall be Campbell Company Model 200 (green). Contractor shall supply new pedestrian push button assemblies. Contractor shall provide and install all appurtances necessary for intended operation. The cost of pedestrian push buttons shall be included in the lump sum contract price for the traffic signal modifications/installation and no further compensation will be permitted.

23. Internally Illuminated Street Name Signs:

Internally illuminated street name sign color shall conform to the State specifications for blue background with white letters with 8" upper case and 6" lower case letters. All internally illuminated street name signs shall be SIGNMASTER LED T12 Sign Lamp Bi-Directional (Model # CERT LED BD T12-8-52-CL-5.0K-SP-120/277VAC).

All internally illuminated street name signs shall be supplied with photoelectric controls installed in the service panel per section 24 of these Special Provisions. The cost of internally illuminated street name signs shall be included in the lump sum contract price for the traffic signal modifications/installation and no further compensation will be permitted.

24. Photoelectric Controls:

Photoelectric controls shall conform to the provisions in Section 86-6.11 (Caltrans Standard Specifications 2010), "Photoelectric Controls", of the Standard Specifications and these Special Provisions.

Photoelectric controls shall be Type V.

25. Removing Reinstalling or Salvaging Electrical Equipment:

Contractor shall be responsible for the shipping and delivery of the existing traffic signal controller and cabinet to the City yard. The cost for shipping and delivery shall be considered as included in the lump sum price and no further compensation shall be permitted.

26. Ground Rod Electrode

Contractor shall install a Ground Rod Electrode at all new signal installations listed in this project. Payment for the Ground Rod Electrode installation shall be included in the contract lump sum price and no further compensation shall be permitted.

Concrete Encased Electrode. An electrode encased by at least 2 in. of concrete, located within or near the bottom of a concrete foundation or footing that is in direct contact with the earth, consisting of at least 20 ft. of one or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less than ½ in. diameter, or consisting of at least 20 ft. of bare copper conductor not smaller than No. 4. Reinforcing bars shall be permitted to be bonded together by the usual steel tie wires or other effective means.

Rod and Pipe Electrodes. Rod and pipe electrodes shall not be less than 12 ft. in length, shall consist of the following materials, and shall be installed in the following manner.

Electrodes of pipe or conduit shall not be smaller than ¾ in. trade size and, where of iron or steel, shall have the outer surface galvanized or otherwise metal coated for corrosion protection.

Electrodes of rods or iron or steel shall be at least 5/8 in. in diameter. Stainless steel rods less than 5/8 in. in diameter, nonferrous rods, or their equivalent shall be listed and shall not be less than ½ in. in diameter.

The electrode shall be installed such that at least 8 ft. of length is in contact with the soil. It shall be driven to a depth of not less than 8 ft. except that, where rock bottom is encountered, the electrode shall be driven at an oblique angle not to exceed 45 degrees from the vertical or shall be buried in a trench that is at least 2 ½ ft. deep. The upper end of the electrode shall be flush with or below ground level unless the aboveground end and the grounding electrode conductor attachment are protected against physical damage as specified in the 2001 California Electrical Code, Section 250-10.

All Ground Electrodes shall comply with the 2001 California Electrical Code.

27. Flash Protection:

Refer to the National Electrical Code, 2005 Edition, Article 110 – Requirements for Electrical Installations, Section 110.16 – Flash Protection, also see Exhibit 110.8 which displays one example of a warning sign required by Section 110.16.

28. Emergency Vehicle Preemption (EVP) System

Emergency vehicle preemption equipment and software installed in traffic signalized intersections shall be compatible with City's existing EVP emitters (Opticom 792 and 795 series emitters manufactured by Global Traffic Technologies). The CONTRACTOR shall demonstrate in the field that the EVP equipment installed is compatible with the City's existing EVP emitters and existing traffic signal firmware Econolite ASC/3.

The EVP system components to be furnished and installed on this project shall include optical detectors, mounting clamps, phase selectors, system racks (if necessary), cable and system software as shown on the plans or listed in the special provisions. All components shall be from the same manufacturer. The system shall offer compatibility with NEMA, Econolite ASC3 and Cobalt signal controllers.

The EVP system shall employ optical communication to identify the presence and classification of designated priority vehicles and to cause the traffic signal controller to advance to and/or hold a desired traffic signal display selected from phases normally available. The matched set of components, which make up the system, shall cause the existing traffic controller to be manipulated upon recognition of the signal from the vehicle emitter. This communication shall be effective to the optical detectors at or near the intersection over a line-of-sight path of up to at least 2500 feet under clear atmospheric conditions.

The system shall operate on a first come, first served basis or on a selected priority basis. The system shall be designed to yield to other priority demands such as railroad, etc. The system shall interface with existing traffic signal controllers without compromising normal operation or existing safety provisions. The EVP System shall consist of an encoded optical emitter, optical detector cable, and encoded type phase selectors.

To assure desired performance, the system shall provide the synergy of all principle components, matched and proven through integrated testing and extensive functional experience.

Phase selection shall be activated by an optical transmitted encoded signal of 14.035 or 9.639Hz, with modulation, from a single light source or upon the actuation of a test switch or remote call signal to the phase selector.

The system shall provide for up to three optical detectors to be connected to each channel to provide continuous line-of-sight contact between the optical emitter and the optical detector units.

Optical Detector – The optical detector shall be a lightweight, weatherproof device capable of sensing and transforming pulsed optical energy into electrical signals usable by the phase selection equipment. The unit shall be high-impact polycarbonate construction with non-corrosive hardware. The unit shall be designed for simple mounting at or near an intersection on mast arm, pedestal, or pipe.

The unit shall be available in three optical inputs and electrical output configurations to accept:

* Optical signals from two directions and outputs two discrete electrical signal.
* Optical signals from two directions and outputs a single electrical signal.
* Optical signal from a single direction and outputs a single electrical signal.

The Optical Detector shall be mounted on the mast arm using an approved mounting clamp. Placement of the optical detector shall be determined in the field by the engineer, or as shown on plans. CONTRACTOR shall be responsible for relocating Optical Detector(s) if CONTRACTOR fails to notify Engineer prior to timing and turn-on of signals.

Mounting Clamps

The Pelco Ab-0155 or approved equal. The CONTRACTOR shall furnish and install mounting brackets as shown on plans.

Encoded Phase Selector

The CONTRACTOR shall furnish and install the Encoded phase selector sufficient for intended operation. The phase selector (s) shall be intended for use with California / New York 170, 2070 and NEMA (National Electrical Manufacturers Association) controllers.

The following information shall be stored in the activity log for each valid signal received:

Class, Code, Priority, Direction, Call Duration, Final Greens, Final Green duration and the time call ended in real time.

System Card Rack

The CONTRACTOR shall furnish and install system card rack (If necessary) sufficient for up to 2 encoded phase selectors. The system card rack and any electronics, wiring and devices required to interface with the traffic signal controller and the detector units in the controller at each intersection.

Detector Cable

The detector cable shall be durable, shielded 3- conductor cable with a drain wire. It shall conform to the requirements of the manufacturer of the system.

It shall be the responsibility of the CONTRACTOR or agency, that the authorized dealer of the emergency preemption equipment shall be present for the traffic signal lighting function test. To insure installation and functioning of the EVP equipment, the representative from the dealer shall be certified and factory trained on the latest edition of the equipment and software. The dealer shall provide a test vehicle with the latest emitter to test and verify satisfactory operation of the EVP equipment, to insure a secure system with proper vehicle codes and classifications of emergency vehicles.

Substantiated Warranty

The manufacturer shall warrant that, provided the priority control system has been properly installed, operated and maintained, component parts of a matched system that prove to be defective in workmanship and / or material during the first (5) years from the date of shipment from the manufacture will be covered in a documented system-protection plan, plus provide an added (5) year maintenance coverage for repair or replacement at a fixed charge for a total of (10) years of product coverage.

Full compensation for furnishing all labor, materials, tools, equipment, incidentals and doing all the work involved in installing EVP optical detectors, EVP cabling, EVP discriminators, EVP card racks, EVP mounting system, warranty, software, manuals, training and all other work involved shall be considered as included in the lump sum price bid for various items of work and no additional compensation will be allowed therefore.

Compensation for furnishing and installing the EVP Emitters shall be considered as included in the bid price for the lump sum bid of the various items of work and no additional compensation are allowed therefore.

Full compensation for traffic signal and intersection lighting and for complying with all requirements of this article shall be included in the contract lump sum price and shall include full compensation for furnishing all labor, tools, equipment, materials, incidentals, and doing all work involved and no additional compensation will be allowed.

ARTICLE 27 – FIBER OPTIC SPLICE VAULTS/BOXES (IF APPLICABLE)

Fiber Optic Splice Vaults/Boxes shall be installed where shown on the plans. The Fiber Optic Splice Vaults/Boxes shall serve fiber optic cable and splice closures in accordance to the details shown on the project plans. The Fiber Optic Splice Vaults/Boxes shall be per LADOT Standard Drawing Numbers S-79.02A (Fiber Optic Splice Box I) and S-79.02B (Fiber Optic Splice Box II), EXCEPT the "LADOT" label on the Fiber Optic Splice Vaults/Boxes lids shall be omitted. The fiber optic splice vault/box lids shall be labeled "INTERCONNECT" on the steel cover plate.

Metallic or non-metallic cable racks shall be installed on the interior of both sides of the splice vaults in order mount the proposed splice closure. The rack shall be capable of supporting a load of 100 pounds, minimum, per rack arm. Racks shall be supplied in lengths appropriate to the box in which they will be placed. Rack arms shall not be less than 6 inches in length. All metallic cable racks shall be fabricated from ASTM Designation: A36 steel plate and shall be hot-dip galvanized after fabrication. Steel plate, hardware and galvanizing shall be in accordance with the requirements of Section 75, "Miscellaneous Metals," of the State Specifications

Fiber Optic Splice Vaults/Boxes shall not be installed in any part of a driveway, wheelchair ramp or other traveled way unless specified by the ENGINEER or his/her assigned representative.

Fiber Optic Splice Vaults/Boxes locations shown on the plans is diagrammatic only. Fiber Optic Splice Vaults/Boxes shall be placed with their longest dimension adjacent to and parallel to the back of curb unless otherwise approved by the ENGINEER or his/her assigned representative. Fiber Optic Splice Vaults/Boxes shall be installed near the back of sidewalk unless approved by the ENGINEER or his/her assigned representative.

CONTRACTOR shall verify all utilities in the vicinity of the Fiber Optic Splice Vaults/Boxes prior to the installation. Any deviation from the plans due to field constraints shall not be considered as additional work.

Payment for furnishing and installing Fiber Optic Splice Vault/Boxes shall be considered as included in the contract lump sum price bid for the various bid items and shall be full compensation for furnishing all labor; material, equipment and incidentals necessary to perform the items of work and no additional compensation will be allowed therefor.

ARTICLE 28 – COMMUNICATIONS CABLE PLANT (IF APPLICABLE)

FIBER OPTIC CABLE

Fiber optic cable shall conform to the details shown on the plans and these Special Provisions.

FIBER OPTIC GLOSSARY

DEFINITIONS

The following definitions shall apply to these special provisions:

A. **Backbone** —Fiber cable that provides connections between the TMC and City Hall.

B. **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, modem or another fiber (patch panel).
C. **Connectorized** —The termination point of a fiber after connectors have been affixed.
D. **Connector Module Housing (CMH)** .—A patch panel used to terminate singlemode fibers with most common connector types. It may include a jumper storage shelf and a hinged door.
E. **Couplers** —Devices which mate fiber optic connectors to facilitate the transition of optical light signals from one connector into another. They are normally located within FDUs, mounted in panels. They may also be used unmounted, to join two simplex fiber runs.
F. **Drop Cable** —Fiber cable that provides connections between a distribution cables to a field element. Typically these run from a splice vault to a splice tray within a field cabinet. Drop cables are usually short in length (less than 20m) and are of the same construction as outside plant cable. The term "breakout cable" is used interchangeably with drop cable.
G. **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.
H. **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. Fan out terminations shall not be used for more than 6 fibers. Using a patch panel would be appropriate.
I. **Fiber Distribution Frame (FDF)** —A rack mounted system to be installed in the Transportation Management Center (TMC), and City Hall that consists of a standard equipment rack, fiber routing guides, horizontal jumper troughs and Fiber Distribution Units (FDU). The FDF serves as the termination and interconnection of passive fiber optic components from cable breakout, for connection by jumpers, to the equipment.
J. **Fiber Distribution Unit (FDU)** —An enclosure or rack mountable unit containing both a patch panel with couplers and splice tray(s). The unit’s patch panel and splice trays may be integrated or separated by a partition.
K. **F/O** —Fiber optic.
L. **Jumper** —A short cable, typically one meter or less, with connectors on each end, used to join two CMH couplers or a CMH to active electronic components.
M. **Light Source** —Portable fiber optic test equipment that, when coupled with a power meter, is used to perform end-to-end attenuation testing. It contains a stabilized light source operating at the wavelength of the system under test.
N. **Link** —A passive section of the system, the ends of which are connectorized. A link may include splices and couplers. For example, a video link may be from a F/O transmitter to a video multiplexer (MUX).
O. **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.
P. **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.

Q. **Optical Time Domain Reflectometer (OTDR)** —Fiber optic test equipment similar in appearance to an oscilloscope that is used to measure the total amount of power loss in a F/O cable between two points. It provides a visual and printed display of the losses associated with system components such as fiber, splices and connectors.
R. **Patchcord** —A term used interchangeably with "jumper".
S. **Patch Panel** —A precision drilled metal frame containing couplers used to mate two fiber optic connectors.
T. **Power Meter** —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 optical power being received at the end of the link.
U. **Segment** —A section of F/O cable that is not connected to any active device and may or may not have splices per the design.
V. **SMFO** —Singlemode Fiber Optic Cable.
W. **Splice** —The permanent joining of two fiber ends using a fusion splicer.
X. **Splice Closure** —A environmentally sealed container used to organize and protect splice trays. The container allows splitting or routing of fiber cables from multiple locations. Normally installed in a splice vault/box.
Y. **Splice Tray** —A container used to organize and protect spliced fibers.
Z. **Splice Vault/Box** —An underground container used to house excess cable and/or splice closures.

ARTICLE 29 – FIBER OPTIC OUTSIDE PLANT CABLE GENERAL (IF APPLICABLE)

Each fiber optic outside plant cable (FOP) for this project shall be all dielectric, moisture blocking gel, with water swellable tape, duct type, with loose buffer tubes and shall conform to these special provisions. Cables with singlemode fibers shall contain singlemode (SM) dual-window (1310 nm and 1550 nm) fibers in the quantities shown below and on the plans.

The optical fibers shall be contained within loose buffer tubes. The loose buffer tubes shall be stranded around an all dielectric central member. Aramid yard and/or fiberglass shall be used as a primary strength member, and a polyethylene outside jacket shall provide for overall protection.

All fiber optic (F/O) cable on this project shall be from the same manufacturer, who is regularly engaged in the production of this material.

The cable shall comply with all the requirements of the United States Department of Agriculture Rural Electrification Administration (REA) specifications REA-PE-90 an as described elsewhere in these Special Provisions.

The cable shall be qualified as compliant with RUS Federal Rule 7CFR1755.900.

CABLE TYPE	DESCRIPTION
	12 Strand Singlemode F/O Drop Cable
	48 SMFO
	120 SMFO

FIBER CHARACTERISTICS

Each optical fiber shall be glass and consist of a doped silica core surrounded by concentric silica cladding. All fibers in the buffer tube 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 required fiber grade SM shall reflect the maximum individual fiber attenuation, to guarantee the required performance of each and every fiber in the cable.

The coating shall be a dual layered, UV cured acrylate. The coating shall be mechanically or chemically strippable without damaging the fiber.

The cable shall comply with the optical and mechanical requirements over an operating temperature range of -40ºC to +70ºC. 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 (-40ºC to +70ºC) for singlemode 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 singlemode fiber measurement is made at 1550 nm.

For all fibers the attenuation specifications shall be a maximum attenuation for each fiber over the entire operating temperature range of the cable. Singlemode fibers within the finished cable shall meet the requirements in the following table:

Fiber Characteristics Table	
Parameters	SM
Type	Step Index
Core diameter	8.3 μm (nominal)
Cladding diameter	125 μm ± 1.0μm
Core to Cladding Offset	≤1.0 μm
Coating diameter	250 μm ± 15 μm
Cladding Non-circularity Defined as: [1-(min. cladding dia4 max. cladding dia.)] x 100	≤2.0%
Proof/Tensile Test	345 Mpa
Attenuation: @850 nm @1310 nm (SM) @1550 nm	NA ≤0.4 dB/km ≤0.4 dB/km ≤0.3 dB/km
Attenuation at the Water Peak	≤2.1 dB/km@ 1383 ±3 nm
Bandwidth: @850 nm @1310 nm (SM)	N/A N/A
Chromatic Dispersion:	
Zero Dispersion Wavelength	1301.5 to 1321.5 nm
Zero Dispersion Slope	≤0.092 ps/(nm^2 *km)
Maximum Disperson:	≤3.3ps/(nm*km) for 1285 to 1330 nm <18 ps/(nm*km) for 1550 nm
Cut-off Wavelength	<1250 nm
Numerical Aperture (measured in accordance with EIA-455-47 (FOTP-47)	N/A
Mode Field Diameter (Petermann II)	9.3±0.5 μm at 1300 nm 10.5 +1.0 μm at 1550 nm

COLOR CODING

Optical fibers 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)

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 filing 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

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

A. Buffer tubes
B. Central Member
C. Filler Rods
D. Stranding
E. Core and Cable Flooding
F. Tensile Strength Member
G. Ripcord
H. Outer Jacket

Buffer Tubes – Loose buffer tubes shall provide clearance 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 and shall not adhere to the inside of the tube. Each buffer tube shall contain 6 or 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 of the fibers, yet designed to permit safe intentional “scoring” and breakout, without damaging or degrading the internal fibers.

Buffer tube filing compound shall be a homogenous hydrocarbon-based gel with anti-oxidant additives and used to prevent water intrusion and migration. 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.

Each buffer tube shall be distinguishable from other buffer tubes in the cable by means of color coding as specified above the fibers.

Central Member – The central member which functions as an anti-buckling element 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 – Fillers may be included in the cable to lend symmetry to the cable cross-section where needed. 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 overcoated 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 with sufficient tension to secure the buffer tubes to the central member without crushing the buffer tubes. The binders shall be non-hygroscopic, 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 yards and/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 each sheath removal.

Outer Jacket – The jacket shall be free of holes, splits, and blisters and shall be medium or high density polyethylene (PE), or medium density cross-lined polyethylene with minimum nominal jackets thickness of 1000 $\pm$ 76 μm. 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 have clear, distinctive and permanent markings showing 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. The height of the marking shall be approximately 0.09-inches.

ARTICLE 30 – GENERAL CABLE PERFORMANCE SPECIFICATIONS (IF APPLICABLE)

The F/O cable shall withstand water penetration when tested with a one meter static head or equivalent continuous pressure applied at one end of a one meter length of filled cable for one hour. No water shall leak through the open cable end. Testing shall be done in accordance with EIA – 455-82 (FOTP-82), "Fluid Penetration Test for fluid-Blocked fiber Optic Cable."

A representative sample of cable shall be tested in accordance with EIA-455-81A. "Compound Flow (Drip) Test for Filled Fiber Optic Cable". No preconditioning period shall be conducted. The cable shall exhibit no flow (drip or leak) at 80^{8} as defined in the test method.

Crush resistance of the finished F/O cables shall be 220 N/cm applied uniformly over the length of the cable without showing evidence of cracking or splitting when tested in accordance with EIA-455-41 (FOTP-41), "compressive Loading Resistance of Fiber Optic Cables." The average increase in attenuation for the fibers shall be $\leq$0.10 dB at 1550 nm (singlemode) for a cable subjected to this load. The cable shall not exhibit any measurable increase in attenuation after removal of load. Testing shall be in accordance with EIA 455-41 (FOTP-41), except that the load shall be applied at the rate of 3mm to 20mm per minute and maintained for 10 minutes.

The cable shall withstand 25 cycles of mechanical flexing at a rate of 30 $\pm$1 cycles/minute. The average increase in attenuation for the fibers shall be $\leq$0.20 dB at 1550 nm (singlemode) at the completion of the test. Outer cable jacket cracking or splitting observed under 10x magnification shall constitute failure. The test shall be conducted in accordance with EIA-455-104 (FOTP-104), "Fiber Optic Cable Cyclic Flexing Test," with the sheave diameter a maximum of 20 times the outside diameter cable. The cable shall be tested in accordance with Test conditions I and II of (FOTP-104).

The cable shall withstand 20 impact cycles with total impact energy of 5.9 Nm. The average increase in attenuation for the fibers shall be $\leq$0.20 dB at 1550 nm (singlemode). The cable jacket shall not exhibit evidence of cracking or splitting. The test shall be conducted in accordance with EIA-455-25 (FOTP-25), "Impact Testing of Fiber Optic Cables and Cable Assemblies."

The finished cable shall withstand a tensile load of 2700 N without exhibiting an average increase in attenuation of greater than 0.20 dB. The test shall be conducted in accordance with EIA-455-33 (FOTP-33), "fiber Optic Cable Tensile Loading and Bending Test." The load shall be applied for one-half hour in Test condition II of the EIA-455-33 (FOTP-33) procedure.

PACKAGING AND SHIPPING REQUIREMENTS

Documentation of compliance to the required specifications shall be provided to the ENGINEER or his/her assigned representative prior to order the material.

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

The completed cable shall be packaged for shipment on 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. 13 feet of cable length on each end of the cable 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 also be included 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 thirty times the diameter of the cable. The F/O cable shall be in one continuous length per reel with no factory splices in the fiber. The minimum total length of each reel shall be 19,000 feet. Each reel shall be marked to indicate the direction the reel should be rolled to prevent loosening of the cable.

Two copies of the installation procedures and technical support information shall be furnished to the ENGINEER or his/her assigned representative at least two weeks subsequent to the start of the scheduled delivery.

ARTICLE 31 – FIBER OPTIC CABLE INSTALLATION (IF APPLICABLE)

Installation procedures shall be in conformance with the procedures specified by the cable manufacturer for the specific cable being installed. The CONTRACTOR shall submit the manufacturer's recommended procedures for pulling fiber optic cable at least 20 working days prior to installing cable. Mechanical aids may be used provided that a tension measuring device, and a break away swivel are placed in tension to the end of the cable. The tension in the cable shall not exceed 2225 N or the manufacturer's recommended pulling tension, whichever is less.

During cable installation, the bend radius shall be maintained at a minimum of twenty times the outside diameter. The cable grips for installing the fiber optic cable shall have a ball bearing swivel to prevent the cable from twisting during installation.

F/O cable shall be installed using a cable pulling lubricant recommended by the F/O cable, and a pull tape conforming to the provisions described under "conduit" elsewhere in these special provisions. CONTRACTOR's personnel shall be stationed at each splice vault and pull box through which the cable is to be pulled to lubricate and prevent kinking or other damage.

F/O cable shall be installed without splices except where specifically allowed on the plans. Any midspan access splice or FDU termination shall involve only those fibers being spliced as shown on the plans. Cable splices shall be located in splice closures, installed in splice vaults shown on the plans. A minimum of 60 feet of slack shall be provided for each F/O cable at each splice vault, unless noted otherwise. Slack shall be divided equally on each side of the F/O splice closure. A minimum of 20 feet of slack shall be provided for each F/O No. 6E pull box, unless noted otherwise. A minimum of 12 feet of slack shall be provided for each F/O No. 6 pull box, unless noted otherwise.

At the CONTRACTOR's option, the fiber may be installed using the air blown method. If integral innerduct is used, the duct splice points or any temporary splices of innerduct used for installation must withstand a static air pressure of 758 kPa.

The fiber installation equipment must incorporate a mechanical drive unit or pusher, which feeds cable into the pressurized innerduct to provide a sufficient push force on the cable, which is coupled with the drag force created by the high-speed airflow. The unit must be equipped with controls to regulate the flow rate of compressed air entering the duct and any hydraulic or pneumatic pressure applied to the cable. It must accommodate longitudinally ribbed, or smooth wall ducts from nominal 0.5 to 2 inches inner diameter. Mid assist or cascading of equipment must be for the installation of long cable runs. The equipment must incorporate safety shutoff valves to disable the system in the event of sudden changes in pneumatic or hydraulic pressure.

The equipment must not require the use of a piston or any other air capturing device to impose a pulling force at the front end of the cable, which also significantly restricts the free flow of air through the inner duct. It must incorporate the use of a counting device to determine the speed of the cable during installation and the length of the cable installed.

WARRANTY

The CONTRACTOR performing all fiber work shall be a **Corning Cable Systems LAN-scape® Extended Warranty Program SM (EWP) Member** and must provide written warranty certification and evidence of current EWP program membership. ***Any bids submitted by a CONTRACTOR that does not meet this requirement shall be considered a non-responsive bid.***

Materials and workmanship hereinafter specified and furnished shall be fully guaranteed by the Vendor and/or Manufacturer for ***Twenty-Five years*** from transfer of title against any defects. Defects, which may occur as the result of faulty materials within Twenty-Five years after installation and acceptance by the CITY, shall be corrected by The Vendor at no additional cost to the CITY. The Vendor shall promptly, at no cost to The CITY, correct or re perform (including modifications or additions as necessary) any nonconforming or defective work within ***Twenty-Five years*** after completion of the project of which the work is a part.

The period of the Vendor's, warranty(s) for any items herein are not exclusive remedies, and the CITY has recourse to any warranties of additional scope given by the Vendor to the CITY and all other remedies available at law or in equity. The Vendor's warranties shall commence with acceptance of/or payment for the work in full. If The Vendor procures equipment or materials under the Contract, The Vendor shall obtain for the benefit of The CITY'S equipment and materials warranties against defects in materials and workmanship to the extent such warranties are reasonably obtainable.

The Vendor shall pass along to the CITY any additional warranties offered by the manufacturers, at no additional costs to the CITY, should said warranties extend beyond the ***one-year*** period specified herein.

This warranty shall in no manner cover equipment that has been damaged or rendered unserviceable due to negligence, misuse, acts of vandalism, or tampering by the CITY or anyone other than employees or agents of the Vendor. The Vendor's obligation under its warranty is limited to the cost of repair of the warranted item or replacement thereof, at The

Vendor's option. Insurance covering said equipment from damage or loss is to be borne by The Vendor until full acceptance of equipment and services.

FIBER AIR BLOWN METHOD

At the CONTRACTOR'S option, installation of cable into conduit, ducts or subducts may be performed using "Air Blown Method".

The "Air Blown Method" shall be an installation method that uses a mechanical device combined with a high speed flow of compressed air to place cables into conduits, ducts or subducts.

The "Air blown Method" shall conform to the following:

The method shall install cable without exceeding the cable manufacturers' tensile and compressive strength ratings. The mechanical device shall be used to provide a pushing force on the cable into the conduit.

The cable installation equipment shall also have, at minimum, the following features:

1. Controls to regulate the flow rate of compressed air entering the conduit, duct or subduct, and any hydraulic of pneumatic pressure applied to the cable.

2. Safety shutoff valves to disable the system in the event of sudden changes in pneumatic or hydraulic pressure. Measuring device to determine the speed of the cable during installation and the length of the cable installed.

Information on the proposed "Air Blown Method" shall be submitted to the ENGINEER or his/her assigned representative. The submittal shall include, but not be limited to, the following items:

1. Project description;

2. List or plan sheet marked to identify the conduits and cables involved;

3. Equipment description and specifications;

4. Manufacturer's test data covering the performance of the equipment and cable stress in a typical installation using cable equivalent to cable to be installed on this project; and

5. User/Installer Manual for the equipment and installation procedures.

Within 30 days after the approval of the contract, the CONTRACTOR shall submit 2 copies of the proposed "Air Blown Method" to the ENGINEER or his/her assigned representative. The CONTRACTOR shall allow 15 days for the ENGINEER or his/her assigned representative to review the proposed "Air Blown Method". If revisions are required, as determined by the ENGINEER or his/her assigned representative, the CONTRACTOR shall revise and resubmit the proposed "Air Blown Method" within 5 days of receipt of the ENGINEER or his/her assigned representative's comments and shall allow 5 days for the ENGINEER or his/her assigned representative to review the revisions. Upon approval of the proposed "Air Blown Method", 2 additional copies of the proposed "Air Blown Method" incorporating the required changes shall be submitted to the ENGINEER or his/her assigned representative. Minor changes or clarifications to the initial submittal may be made and attached as amendments

to the proposed "Air Blown Method". In order to allow construction activities to proceed, the ENGINEER or his/her assigned representative may conditionally approve, in writing, the proposed "Air Blown Method" while minor revisions or amendments are being completed.

The submitted "Air Blown Method" shall not be used until the "Air Blown Method" has been approved in writing by the ENGINEER or his/her assigned representative.

SPLICING

Any field splices shall be done in a splice vault/box as shown on the plans. All splices in splice vaults/boxes shall be done in splice trays, housed in splice closures.

All fiber splices shall be the 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.

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

The individual fibers shall be looped one full turn within the splice tray to avoid micro bending. A 1.75 inches 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.

The CONTRACTOR will be allowed to splice a total of 2 (two) fibers to repair any damage done during mid-span access splicing without penalty. Any single fiber may not have more than 3 (three) unplanned splices.

If any fiber requires more than 3 unplanned splices, the entire length of F/O cable must be replaced at the CONTRACTOR's expense (including splicing). The replacement fiber optic cable shall be identical to the original cable manufacture and shall be approved by the ENGINEER or his/her assigned representative.

Payment for Splicing shall be considered as included in the contract lump sum price bid for **Installation of HAWK Pedestrian Signal** and shall be full compensation for furnishing all labor, material, equipment and incidentals necessary to perform the items of work and no additional compensation will be allowed therefor.

ARTICLE 32 – FIBER OPTIC SPLICE CLOSURE (IF APPLICABLE)

Splice Closures

The splice closures shall be "Preformed Line Products" brand, "Coyote Closure" Catalog No. COYOTE00060 (or ENGINEER approved equivalents) for loose tube buffer type fiber dielectric cables, as specified on the plans. The closures will contain the proper number of splice trays appropriate to the necessary number of splices with single mode SC type connectors, as specified on the plans. The splice closures will be assembled per manufacturers recommendations.

Splice closures that are to be installed in #6 pullboxes shall be a Corning 4" closure model #SCF-4C18-01.

The splice closure shall handle/manage a minimum of 120 splices unless otherwise specified.

Vinyl markers shall be used to identify each spliced fiber in the trays as described under "Fiber Optic Cable Labeling" elsewhere in these special provisions.

Each splice shall be individually mounted and mechanically protected in the splice tray.

The CONTRACTOR shall provide all mounting hardware required to securely mount the closures to the wall of the splice vault/box. The fiber optic splice closures shall be securely fastened or bolted to the sidewall of the fiber optic splice vault/box using standard hardware found in communication manholes.

The fiber splice closure shall be mounted horizontally in a manner that allows the cables to enter at the end of the closure. Not less than 30 feet of each cable total 60 feet shall be coiled in the vault to allow the fiber splice closure to be removed for future splicing.

The unprotected fibers exposed for splicing within the closure shall be protected from mechanical damage using the fiber support tube or tubes and shall be secured within the fiber splice closure.

Upon completion of the splices, the splice trays shall be secured to the inner closure.

The CONTRACTOR shall verify the quality of each splice prior to sealing the splice closure. The splice closure shall not be sealed until link testing is performed and is approved by the ENGINEER or his/her assigned representative.

The closure shall be sealed using a procedure recommended by the manufacturer that will provide a waterproof environment for the splices.

Care shall be taken at the cable entry points to ensure a tight salt resistant and waterproof seal is made which will not leak upon aging.

Two copies of the manufacturer’s product technical specification information shall be furnished to the ENGINEER or his/her assigned representative prior to ordering the equipment for his/her written approval.

Payment for furnishing and installing Splices Closures shall be considered as included in the contract lump sum price bid for traffic signal modifications/installation and shall be full compensation for furnishing all labor, material, equipment and incidentals necessary to perform the items of work and no additional compensation will be allowed therefor.

ARTICLE 33 – CABLE ASSEMBLIES AND COMPONENTS (IF APPLICABLE)

ACTIVE CABLE ASSEMBLIES AND COMPONENTS

The F/O assemblies and components shall be compatible components, designed for the purpose intended, and manufactured by a company regularly engaged in the production of material for the fiber optic industry. All components or assemblies shall be best quality, non-corroding.

The CONTRACTOR shall provide the F/O assemblies and components product technical specification information including warranties to the ENGINEER or his/her assigned representative prior to ordering the equipment for his/her written approval.

PASSIVE CABLE ASSEMBLIES AND COMPONENTS

The F/O assemblies and components shall be compatible components, designed for the purpose intended, and manufactured by a company regularly engaged in the production of material for the fiber optic industry. All components or assemblies shall be best quality, non-corroding, with a design life of at least 20 years.

The cable assemblies and components manufacturer shall be ISO9001 registered.

ARTICLE 34 – FIBER OPTIC CABLE LABELING (IF APPLICABLE)

General

The CONTRACTOR shall label all fiber optic cabling in a permanent consistent manner. All tags shall be of a material designed for long term permanent labeling of fiber optic cables and shall be marked with permanent ink on non-metal types, or embossed lettering on metal tags. Metal tags shall be constructed of stainless steel. Non-metal label materials shall be approved by the ENGINEER or his/her assigned representative. Labels shall be affixed to the cable per the manufacturer's recommendations and shall not be affixed in a manner which will cause damage to the fiber. Handwritten labels shall not be allowed.

Label all fiber optic cables, indicating the street name or location and type of circuit (drop cable, distribution, 12, 48, or 120 count, as shown on the plans).

Cable Identification

1. **Cables** – All cables shall be clearly labeled with an identification code at all terminations, even if no connections or splices are made, and at all splice vault entrance and exit points.

2. **Cable to Cable Splices** – All cable jackets entering the splice closure shall be labeled with an identification code.

3. **Cable to Fiber Distribution Units** – The cable jackets shall be clearly labeled at entry to the FDU in accordance with a unique identification code. In addition, each fiber shall be labeled with the Fiber ID and pigtails shall be labeled at the connector with the Fiber ID. The FDU shall be clearly labeled with the Cable ID on the face of the FDU. If multiple cables are connected to the FDU, each block of connectors relating to each individual cable shall be clearly identified by a single label with the Cable ID. Individual connections shall be clearly marked on the face of the FDU in the designated area with the Fiber ID.

4. **Fiber** – Fibers labels shall be placed next to the connectors of the individual fibers.

5. **Patch Panels** – The cable jackets shall be clearly labeled at entry to the Patch Panel with a unique identification code. In addition, each fiber shall be labeled with the Fiber ID and pigtails shall be labeled at the connector with the Fiber ID. The Patch panel shall be clearly labeled with the Cable ID on the face of the Panel. If multiple cables are connected to the Patch Panel, each block of connectors relating to each individual cable shall be clearly identified by a single label with the Cable ID. Individual connections shall be clearly marked on the face of the Panel in the designated area with the Fiber ID.

Payment for furnishing and installing Fiber Optic Cable Labeling for the various types shall be considered as included in the contract lump sum price bid for traffic signal modifications/installation and shall be full compensation for furnishing all labor, material, equipment and incidentals necessary to perform the items of work and no additional compensation will be allowed therefor.

ARTICLE 35 – FIBER OPTIC CABLE TERMINATIONS

General

Fiber optic outside plant (FOOP) cable entering a building shall be routed as described in these special provisions and as shown on the plans. The cable shall continue within the conduit to the designated termination point for cable termination. All components shall be the size and type required for the specified fiber.

Cable Termination

Once the fiber optic cable arrives within the Traffic Signal Controller Cabinets, it shall be routed within conduit to a rack mounted Fiber Distribution Unit (FDU).

Factory terminated pigtails shall then be spliced to the incoming cable.

At the FDU, the cable jacket of the FOIP or outside plant cable, shall be removed exposing the aramid yarn, filler rods, and buffer tubes. The exposed length of the buffer tubes shall be at least the length recommended by the FDU manufacturer which allows the tubes to be secured to the splice trays. Each buffer tube shall be secured to the splice tray in which it is to be spliced. The remainder of the tubes shall be removed to expose sufficient length of the fibers in order to properly install on the splice tray, as described in "Splicing," elsewhere in these special provisions.

The cable shall then be spliced to factory terminated pigtails, secured with tie wraps and routed to its appropriate fiber distribution frame/unit (FDF/U) as shown on the plans.

When applicable, moisture blocking gel shall be removed from the exposed buffer tubes and fibers. The transition from the buffer tube to the bundle of jacketed fibers shall be treated by an accepted procedure for sleeve tubing, shrink tube and silicone blocking of the transition to prevent future gel leak. Manufacturer directions shall be followed to ensure that throughout the specified temperature range gel will not flow from the end of the buffer tube. The individual fibers shall be stripped and prepared for splicing.

Factory terminated pigtails shall then be spliced and placed in the splice tray.

All fibers inside a fiber optic cable entering a Fiber Distribution Unit (FDU) or wall mountable interconnect center (WIC) such as at the Traffic Signal Controller Cabinets, Field Communication Hub(s) or TMC, shall be terminated and labeled. Attention is directed to "Fiber Distribution Unit" and “Wall Mountable Interconnect Center (WIC)” elsewhere in these special provisions.

A transition shall then be made, with flexible tubing, to isolate each fiber to protect the individual coated fibers. The final transition from bundle to individual fiber tube shall be secured with an adhesive heat shrink sleeve. Refer to Fan Out Termination, elsewhere in these special provisions.

Fiber Optic Cable Assemblies and Pigtails

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

Pigtails – Pigtails shall be of simplex (one fiber) or duplex (two fibers) construction, in 900 μm tight buffer form, surrounded by aramid for strength, with a PVC jacket with manufacturer identification information. Singlemode cable jackets shall be yellow in color. Duplex pigtails shall be of duplex round cable construction, and shall not have zipcord (Siamese) construction. The two inner simplex jackets shall be color coded white and slate, respectively, to provide easy visual identification for polarity. All pigtails shall be at least three (3) feet in length.

Connectors – Connectors shall be of the ceramic ferrule SC type for singlemode. Indoor SC connector body housings shall be either nickel plated zinc or glass reinforced polymer construction. Outdoor SC connector body housing shall be glass reinforced polymer.

The associated coupler shall be of the same material as the connector housing.

All F/O connectors shall be the 2.5 mm SC connector ferrule type with Zirconia Ceramic material with a PC (Physical Contact) pre-radiused tip.

The SC connector operating temperature range shall be -40°C to +70°C. Insertion loss shall not exceed 0.4 dB for singlemode, and the return reflection loss on singlemode connectors shall be at least -55 dB. Connection durability shall be less than a 0.2 dB change per 500 mating cycles per EIA-455-21A (FOTP-21). All terminations shall provide a minimum 222 N pull out strength. Factory test results shall be documented and submitted to the ENGINEER or his/her assigned representative prior to installing any of the connectors.

Singlemode connectors shall have a yellow color on the body and/or boot that renders them easily identifiable.

Field terminations shall be limited to splicing of adjoining cable ends and/or cables to SC pigtails.

SC Couplers – The SC Couplers shall be made of polymer construction that is consistent with the material forming the associated SC connector body. The design mechanism for mounting the couplers to the ITU connector panel may be achievable using metal clips or fasteners but shall coincide with the ITU panel punch-outs.

All coupler sleeves shall be of the cylinder split ceramic or clover leaf design.

The operating temperature range for couplers shall be the same as that specified for the SC connectors.

Payment for furnishing and installing Fiber Optic Cable Terminations shall be considered as included in the contract lump sum price bid for traffic signal modifications/installation and shall be full compensation for furnishing all labor, material, equipment and incidentals necessary to perform the items of work and no additional compensation will be allowed therefor.

ARTICLE 36 – FAN OUT TERMINATION

A fan out termination shall be required as designated by the ENGINEER or his/her assigned representative or described in these special provisions.
The fan out termination shall consist of a splice connector and the appropriate number of fiber optic pigtails which will be fusion spliced to the incoming fibers.

The pigtail shall be contained in a housing that will provide strain relief between the incoming fiber optic cable plant jacket, buffer tubes, fibers and pigtail jacket material.

Each fiber shall be spliced to a pigtail with a factory installed and polished SC connector, as specified elsewhere in these special provisions. The splices shall then be encapsulated in a weatherproof housing. Each connector shall have a weatherproof cap to protect it from the elements. The pigtail shall be of simplex (one fiber) construction, in a 900 μm tight buffer form, surrounded by Aramid yarn for strength. The buffer shall have a PVC jacket with manufacturer identification information, and a nominal outer jacket diameter of 0.12 inch. Single mode simplex cable jackets shall be yellow in color. All pigtails shall be at least six feet in length.

Each pigtail shall be labeled, as specified elsewhere in these special provisions, and secured onto the cable using clear heat shrink tubing.

Payment for furnishing and installing Fan Out Terminations shall be considered as included in the contract lump sum price bid for traffic signal modifications/installation and shall be full compensation for furnishing all labor, material, equipment and incidentals necessary to perform the items of work and no additional compensation will be allowed therefor.

ARTICLE 37 – FIBER OPTIC SYSTEM TESTING AND DOCUMENTATION

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 and,
(3) After installation.

The CONTRACTOR shall provide all personnel, equipment, instrumentation and materials necessary to perform all testing. The ENGINEER or his/her assigned representative 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.

A minimum of 15 working days prior to arrival of the cable at the site, the CONTRACTOR shall provide detailed test procedures for all field-testing for the ENGINEER or his/her assigned representative's review and approval. The procedures shall identify the tests to be performed and how the tests are to be conducted. Included in the test procedures shall be the model, manufacturer, configuration, calibration and alignment procedures for all proposed test equipment.

Documentation of all test results shall be provided to the ENGINEER or his/her assigned representative within 2 working days after the test is completed.

FACTORY TESTING

Documentation of compliance with the fiber specifications as listed in the fiber characteristics table shall be supplied by the original fiber manufacturer. Before shipment, but while on the shipping reel, 100 percent of all fibers shall be tested for attenuation. Copies of the results shall be attached to the cable reel in a waterproof pouch and submitted to the CONTRACTOR and to the ENGINEER or his/her assigned representative.

ARRIVAL ON SITE

The cable and reel shall be physically inspected on delivery and the attenuation shall be measured for 100 percent of the fibers. The failure of any single fiber in the cable to comply with these special provisions is cause for rejection of the entire reel. Test results shall be recorded, dated, compared and filed with the copy accompanying the shipping reel in a weather proof envelope. Attenuation deviations from the shipping records of greater than 5 percent shall be brought to the attention of the ENGINEER or his/her assigned

representative. The cable shall not be installed until completion of this test sequence and the ENGINEER or his/her assigned representative provides written approval. Copies of traces and test results shall be submitted to the ENGINEER or his/her assigned representative. 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 or his/her assigned representative.

AFTER CABLE INSTALLATION

After the fiber optic cable has been pulled but before breakout and termination, 100 percent of all the fibers shall be tested with an OTDR for attenuation. Test results shall be recorded, dated, compared and filed with the previous copies of these tests. Copies of traces and test results shall be submitted to the ENGINEER or his/her assigned representative. If the OTDR test results are unsatisfactory, the F/O cable segment will be unacceptable. The unsatisfactory segment of cable shall be replaced with a new segment, without additional splices, at the CONTRACTOR'S expense. The new segment of cable shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the ENGINEER or his/her assigned representative.

Singlemode fibers shall be tested at 1310 nm and 1550 nm. Attenuation readings for each direction shall be recorded on the cable data sheet.

OUTDOOR SPLICES

At the conclusion of all outdoor splices at one location, and before they are enclosed and sealed, all splices shall be tested with the OTDR, in both directions. Splices in segments shall be tested at 1310 nm and at 1550 nm. Individual fusion splice losses shall not exceed 0.07 dB. Measurement results shall be recorded, dated, validated by the OTDR trace printout and filed with the records of the respective cable runs. Copies of traces and test results shall be submitted to the ENGINEER or his/her assigned representative. If the OTDR test results are unsatisfactory, the splice shall be unacceptable. The unsatisfactory splice shall be replaced at the CONTRACTOR'S expense. The new splice shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the ENGINEER or his/her assigned representative.

ARTICLE 38 – DISTRIBUTION INTERCONNECT PACKAGE TEST AND DOCUMENTATION

All the components of the passive interconnect package (FDUs, pigtails, jumpers, couplers and splice trays as shown on the plans and in these special provisions) shall comprise a unit from a manufacturer who is regularly engaged in the production of the fiber optic components.

In developing the distribution interconnect package, each SC termination (pigtail or jumper) shall be tested for insertion attenuation loss with the use of an optical power meter and light 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 assembly is complete, the manufacturer shall visually verify that all tagging, including loss values, is complete. Then as a final quality control measure, the manufacturer 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.

The final test results shall be recorded, along with previous individual component values, on a special form assigned to each FDU. The completed form shall be dated and signed by the Manufacturer's Quality control supervisor. One copy of this form will be attached in a plastic envelope to the assembled FDU unit. Copies will be provided separately to the CONTRACTOR and to the ENGINEER or his/her assigned representative, and shall be also be maintained on file by the manufacturer or supplier.

SYSTEM VERIFICATION AT COMPLETION

OTDR Testing – 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. Print out shall include at least link number, fiber color, buffer color and cable number. 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 disk shall be submitted to the ENGINEER or his/her assigned representative. 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 or his/her assigned representative.

Power Meter and Light Source. 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 or his/her assigned representative.

Cable Verification Worksheet. The Cable Verification Worksheet shown in the **Link Loss Budget Worksheet** on the next page shall be completed for 100 percent of all links in the fiber optic system, using the data gathered during cable verification. The completed worksheets shall be included as part of the system documentation.

Test Failures. If the link loss measured from the power meter and light source exceeds the calculated link loss, or the actual location of the fiber ends does not agree with the expected location of the fiber ends (as would occur with a broken fiber), the fiber optic link will not be accepted. The unsatisfactory segments of cable, or splices shall be replaced with a new segment of cable or splice at the CONTRACTOR'S expense. The OTDR Testing, power meter and light source testing and Cable Verification Worksheet shall be completed for the repaired link to determine acceptability. Copies of the test results shall be submitted to the ENGINEER or his/her assigned representative. 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 one splice and one connector. The removal of only the small section containing the failure and therefore introducing new unplanned splices will not be allowed.

SECTION 7 - SPECIAL PROVISIONS (Continued)

Link Loss Budget Worksheet

Contract No._____

CONTRACTOR:_____

Approved by City of Garden Grove:_____

Date: _____ Operator: _____

Link Number: _____ Fiber Color: _____

Buffer Color:_____ Cable No.: _____

Test Wavelength (Circle one): 1310 1550

Expected Location of fiber ends:
End 1:_____End 2: _____

OTDR Test Results		
Forward Loss:	_____ dB	1A
Reverse Loss:	_____ dB	1B
Average Loss:	_____ dB	1C
Power Meter and Light Source Test Results:		
Forward Loss:	_____ dB	2A
Reverse Loss:	_____ dB	2B
Average Loss [(2A + 2B)/2]:	_____ dB	2C
Calculated Fiber Loss:		
Length of the link (from OTDR):	_____ km	3A
Allowed loss per km of fiber:	0.4 dB/km	3B
Total Allowed Loss due to the fiber (3A * 3B):	_____ dB	3C
Calculated Splice Loss:		
Number of Splices in the Link:	_____	4A
Allowed Link Loss per Splice:	0.07 dB	4B
Total Allowed Loss due to Splices (4A * 4 B):	_____ dB	4C
Calculated Link Loss:		
Connector Loss:	0.9 dB	5A
Total Link Loss (5A + 3C + 4C):	_____ dB	5B
Cable Verification:		
Compare Power Meter Average Loss to Calculated Link Loss (2C – 5B):	_____ dB	6A

If the value of 6A is greater than zero, the link has failed the Test. See Test Failures elsewhere in these special provisions.

To Be Completed by City of Garden Grove:
Resident Engineer's Signature: _____
Cable Link Accepted: _____

ARTICLE 39 – FIBER OPTIC SYSTEM ACCEPTANCE TESTING

Acceptance testing includes the preparation of an acceptance test plan, conducting acceptance tests and subsequent retests, and documentation of the results.

Final acceptance tests shall be conducted after the site test results have been reviewed and accepted by the ENGINEER or his/her assigned representative. These tests include the complete system in normal operations. The CONTRACTOR shall submit five copies of the acceptance test plan to the ENGINEER or his/her assigned representative for written approval prior to commencement of acceptance testing. The acceptance test plan shall address the full testing requirements of the specifications. The acceptance test plan shall detail all tests to be performed, the test results which are expected and the test schedule. The acceptance test plan will include the following major test and acceptance categories:

- Physical inspection
- Performance tests

The CONTRACTOR shall test the fiber optic cable only according to the approved acceptance test plan and shall provide all test equipment, labor and ancillary items required to perform the testing. The test equipment shall be certified to be calibrated to the manufacturers' specifications. The model and part numbers and date of last calibration of all test equipment shall be included with the test results.

Acceptance testing shall not commence until all material required by the Contract is delivered, installed, and aligned and all production test and site test documentation and results have been approved by the ENGINEER or his/her assigned representative. All acceptance test results shall be fully documented and such documentation provided as a condition of acceptance.

Physical Inspection

The physical inspection shall consist of inspecting all installed material to ensure workmanship satisfies the specified requirements.

Final Acceptance

The system will not be accepted until all of the following conditions have been met as follows:

- Physical and performance acceptance tests have been completed and the results are approved by the ENGINEER or his/her assigned representative
- All documentation has been completed and submitted to the ENGINEER or his/her assigned representative
- All connections that were changed to perform acceptance tests are restored and tested

Payment for Fiber Optic System Testing and Documentation shall be considered as included in the contract lump sum price bid for traffic signal modifications/installation and shall be full compensation for furnishing all labor, material, equipment and incidentals necessary to perform the items of work and no additional compensation will be allowed therefore.

ARTICLE 40 — SINGLEMODE FIBER OPTIC ETHERNET SWITCH

The Contractor shall furnish and install the following singlemode fiber optic Ethernet switch as shown on plans.

Cisco IE-3000-4TC 4 Port Hardened Switch
Cisco GLC-FE-100LX-RGD 10/100 SM SFP, 10KM (2 quantity)
Cisco PWR-IE3000-AC Power Supply

The Ethernet switch must be environmentally hardened and intended for industrial applications. The switch must meet, at a minimum, the following requirements:

1. A minimum of four (4) 10/100 ports and 2 dual-purpose uplinks. Each dual-purpose uplink port has one active port either 10/100/1000 copper or SFP fiber.
2. Capability to support up to two expansion modules with various combinations.
3. Layer 3 IP Services Image
4. DC input range 18VDC-60VDC
5. Support for SFP modules to provide uplink connectivity supporting 100 BASE-LX, 100BASE-FX, 1000BASE-SX, 1000BASE-LX, and 1000BASE-ZX options.
6. Swappable Flash memory
7. Supports Simple Network Management Protocol (SNMP) (v1/v2/v3)
8. DHCP port-based allocation
9. HTTPS access
10. Embedded Event Manager (EEM)
11. Support Virtual LANs (VLANs)
12. 802.1q trunking
13. IGMPv3 snooping
14. IGMP filtering
15. Per-port broadcast, multicast, and unicast
16. Supports IEEE 802.1d Spanning Tree Protocol
17. IEEE 802.1x with VLAN assignment, guest VLAN, and voice VLAN
18. MAC address filtering and notification
19. Secure Shell (SSH) Protocol v2
20. Dynamic Host Configuration Protocol (DHCP) snooping
21. Inter-VLAN IP routing protocols (static, Routing Information Protocol Version 1 (RIPv1), RIPv2, and RIPng)
22. Advanced IP unicast routing protocols (Open Shortest Path First (OSPF), Interior Gateway Routing Protocol (IGRP), Enhanced IGRP (EIGRP), Border Gateway Protocol Version 4 (BGPv4), and Intermediate System-to-Intermediate System (IS-IS))
23. Protocol Independent Multicast (PIM) for IP multicast routing, including PIM sparse mode (PIM-SM), PIM dense mode (PIM-DM), and PIM sparse-dense mode
24. IPv6 routing (OSPFv6 and EIGRPv6)
25. 128 MB DRAM
26. 64 MB Compact Flash memory
27. Configurable up to 2,000 MAC addresses
28. Configurable up to 1,000 IGMP groups and multicast routes
29. Configurable up to 3,000 unicast routes
30. Operating temperature = -40 to +75 degrees Celsius
31. Relative humidity = 10%-95%, non-condensing
32. Maximum power consumption = 15.1W
33. Input voltage and currents supported – 18-60VDC/44-57V input

All connectors, indicators, and replaceable components must be permanently marked and traceable to the supplied documentation, including schematics and parts list. The external markings must include the material function name, model number, serial number, and manufacturer's name. The switch must have a minimum MTBF of 60,000 hours. The MTBF must be calculated in accordance with the methods described in Mil-Std HDBK 217F for a temperature of 55ºC for naval sheltered.

Contractor shall provide Category 5E (Cat-5E) cable to connect the field device(s) to the Ethernet switch. All Cat-5E cables must be a minimum of 10 feet long, and suited to the field cabinet layout and environment. The Cat-5E jumpers must be external grade cable with field-rated RJ45 connectors, and must meet all TIA Cat-5E standards (TIA-568-B).

The Ethernet switch must provide the Ethernet interconnections that are necessary for all dedicated Ethernet segments, shared workgroup Ethernet segments, and Ethernet segments virtually extended from the field locations to within the TMC. The Ethernet access switch also provides the mechanism for distributing IP-encoded video to workstations and IP-decoders. The TMC Ethernet switch must be fully integrated with the Ethernet access switches and the Hub Ethernet switches with all system functions as required by these requirements.

Contractor shall install Ethernet switches inside the proposed/existing cabinets as shown on plans. The Ethernet switches shall be connected to existing/proposed fiber optic patch panels via fiber optic jumper cables; and traffic signal controllers via manufacture's recommended cables. Connectors shall be SC type and cables shall be per the manufacture's requirements. The Contractor or his/her assigned representative shall make the final connections within the traffic signal controller cabinet.

The Contractor shall verify the Ethernet switches are tested prior to installation and after installation in order to provide complete communication between the TMC and the field elements. The Engineer or his/her assigned representative shall be notified two working days prior to all field tests. The Contractor shall provide the Ethernet switches shop drawings/product specifications for the Engineer or his/her assigned representative's written approval prior to ordering the equipment. The Contractor shall coordinate with the City's IT Department for network system integration in order to provide complete communication between the TMC and the field elements.

Payment for Singlemode Fiber Optic Ethernet Switch shall be considered as included in the contract lump sum price for the traffic signal modifications/installation and shall be full compensation for furnishing all labor, material, equipment and incidentals necessary to perform the items of work and no additional compensation will be allowed therefore.

ARTICLE 41 - COMPLETION AND ACCEPTANCE

Upon receipt of the Contractor's written assertion that the work has been completed, the Engineer or his authorized representative will inspect the work for acceptance. Because of the subsequent inspection, a "punch list" shall be prepared by the Engineer and submitted to the Contractor for compliance and/or repair.

The project is considered certifiable for completion and acceptance when all liens and/or claims for labor, materials, tools and equipment have been paid for and all liens and/or claims releases are received by the City; when all Contract items of work have been completed, including changes to the plan, with acceptable workmanship; when all repairs to damaged existing utilities, appurtenances and improvements have been completed and accepted by the respective owners; when all survey monuments and other survey markers have been re-set and a copy of centerline monuments

submitted to the proper authorities; when all USA markings have been removed; and when the project site and all areas occupied by the Contractors are left in a neat and presentable condition. All corrections noted in the "punch list" must be approved and accepted by the Engineer.

The contractor shall submit as-built plans to the Engineer before the final acceptance of the project and to end the contract working days.

If, in the Engineer's judgment, the work has been completed and is ready for acceptance, he will so certify to the City Council, which will accept the completed work. The Engineer will, in his certification, give the date when the work was completed. This will be the date when the Contractor is relieved from responsibility to protect the work and the end of assessment of liquidated damages. Retention shall be released after the Notice of Completion is recorded by the County Recorder.

Full compensation for conforming to the requirements of this article shall be considered as included in the Contract lump sum price and no separate payment will be allowed therefore.

City of Orange Standard Plans

Excerpts and Material Specifications

CITY OF ORANGE STANDARD PLAN EXCERPTS & MATERIAL SPECIFICATIONS

TRAFFIC SIGNAL BATTERY BACK-UP CABINET

1 SCOPE

1.1 The Battery Back-up System (BBS) shall provide reliable emergency power to a traffic signal in the event of a power failure or interruption. That is, the BBS shall be capable of providing power for full run-time operation (UPS Mode) for an intersection (all colors, green, yellow, and red, INCLUDING PEDESTRIAN INDICATIONS) or flashing mode (Red Flash Mode) operation for an intersection.

1.2 The BBS shall include, but not be limited to the following: inverter/charger, power transfer relay, batteries, a separate manually operated non-electronic bypass switch (see Figure 1 - BBS Block Diagram) and all necessary hardware and connecting wiring.

1.3 The Power Transfer Relay and Manual Bypass Switch shall be mounted in the same cabinet (Service Cabinet or the External Battery Backup Cabinet) as the inverter/charger unit.

1.4 All provided wire for Relay contact wiring for each set of NO/NC relay contact closure terminals shall not be less than 2 meters (6'6") of # 18 AWG wire or longer if needed.

2 BC100HZG-LH BBS BASE-MOUNT OR SIDE-MOUNT CABINET

2.1 The BBS and Batteries shall be housed in the same NEMA 3R rated double-lipped cabinet. The cabinet shall be mountable on a concrete pad or attached to the side of existing traffic cabinet.

2.2 The cabinet shall be constructed of 0.125 aluminum.

2.3 The dimensions of the cabinet shall be 53.50" high by 22.00" wide by 15.25" deep.

2.4 Finishes shall be white, power coat.

2.5 The Inverter/Charger shall be mounted in the horizontal position only.

2.6 The Inverter/Charger, Power Transfer Relay and manually operated Bypass Switch shall be mounted inside the BBS Cabinet. Generator hookup shall be optional. If generator is required it shall be 30A (Hubble 2615, NEMA LS-30R configuration). There shall be a lockable, weatherproof cover.

2.7 There shall be two shelves for batteries. The bottom shelf shall be elevated to allow for pad mounting of cabinet.

2.8 The cabinet shall be capable of holding 33Ah to 105Ah batteries.

2.9 The cabinet shall be capable of holding up to four 105Ah batteries.

2.10 There shall be a minimum of 17.5" clearance between shelves. Each shelf shall be a minimum of 15.0 " Deep and 21" Wide.

2.11 Each shelf shall be capable of supporting a minimum of 68 kg (150 lbs).

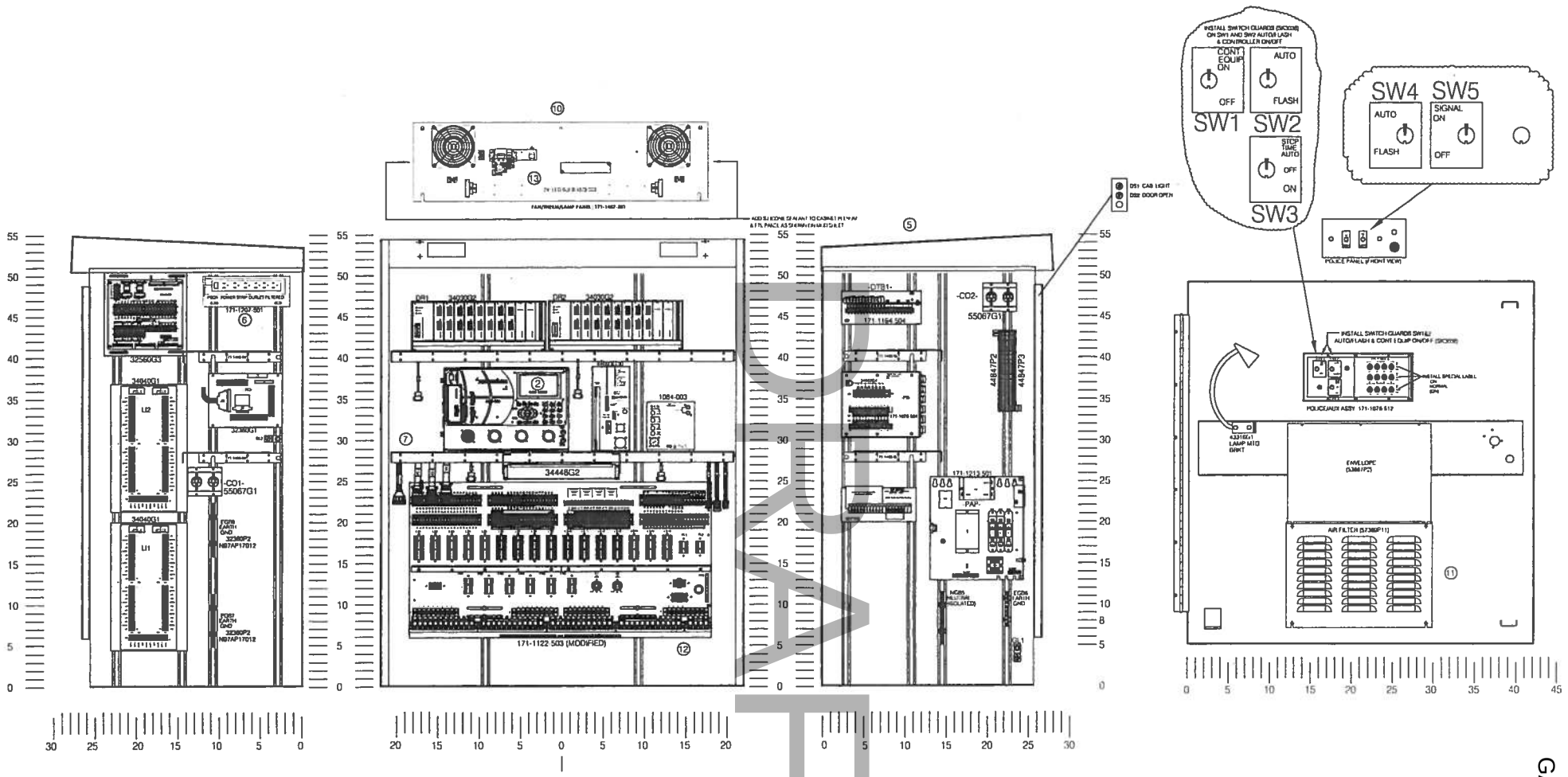
2.12 The BBS Cabinet shall be ventilated through the use of door louvered vent, filter, and one thermostatically controlled fan.

2.13 The BBS Cabinet shall have a door opening to the entire cabinet. The door shall be attached to the cabinet through the use of three (3) leaf stainless steel hinges.

2.14 The door shall use a three point, roller locking mechanism and Best Lock to lock the door. The door shall have a stainless steel handle.

2.15 The door shall have a doorstop and holder to securely hold the door in an open position.

2.16 The BBS Cabinet shall come with all bolts, conduits and bushings, gaskets, shelves, and hardware needed for mounting.



1. MOUNT POWER PANEL IN SECOND MOUNTING HOLES WITHOUT THE SPACERS.
2. REFERENCES ONLY, TO BE INSTALLED WHERE APPLICABLE.
3. INSTALL COMPUTER DRAWER PER MOD SHEET.
4. INSTALL NG85 WITH SPACERS(58066P3) AND STUDS(40238P1).
5. WHITE POWDER PAINT INSIDE & OUT WITH ANTIGRAFITTI COATING.
6. FILTERED ACCESSARY POWER STRIP.
7. WIRE HARNESSES AND CABLES SHALL BE FIXED TO BOTTOM BACK OF EACH SHELF.
8. ALL CONNECTORS SHALL BE SOLDERED AND TERMINATED.
9. CABINET SHALL BE UL LISTED.
10. VENTILATION FAN SHALL BE PLUG-N-PLAY, OVERSIZED(2 FANS) WITH 1/2 AMP FUSE, CABINET LIGHT SHALL BE LED.
11. CABINET FILTER SHALL BE SYNTHETIC FIBER TYPE AND UL RATED WITH VENTED PLATE.
12. SWING DOWN LOAD BAY.
13. CABINET LIGHT 24"(1079-023) INSIDE TOP OF CABINET EDGE.

NOTES: UNLESS OTHERWISE SPECIFIED

ECONOLITE CONTROL PRODUCTS INC

P-44 55" CABINET UL LISTED
TS2-2 PNG

CITY OF ORANGE, CALIFORNIA

ORANGE-LY

RFP 8-1910
PROJECT1
GARDEN GROVE BOULEVARD CORRIDOR
EXHIBIT A-1

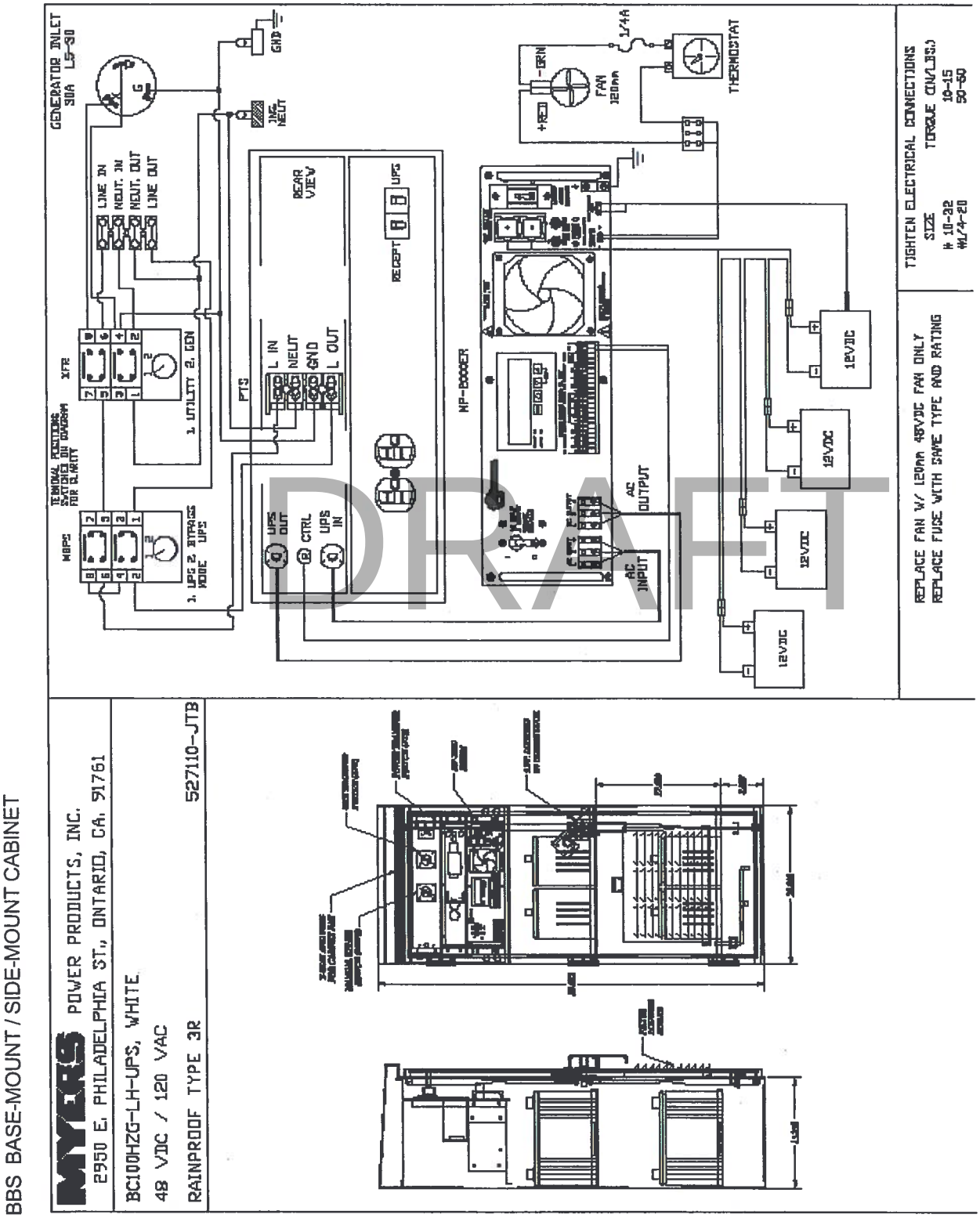


Figure 1: BC100HZG-LH-UPS

MYERS POWER PRODUCTS, INC.
2950 E. PHILADELPHIA ST., ONTARIO, CA. 91761

STATE INSPECTION REQUIRED ☐ YES ■ NO

U.L. LABEL ☐ INDUSTRIAL CONTROL ☐ CABINET & BOXES

CAT. NO. ME-IIBD-M100/M100 (MOD)

SEE DRAWING _____ FOR WIRING DIAGRAM

120/208 V | 1 Ø | 3 W | 100 AMPS | 10K AIC

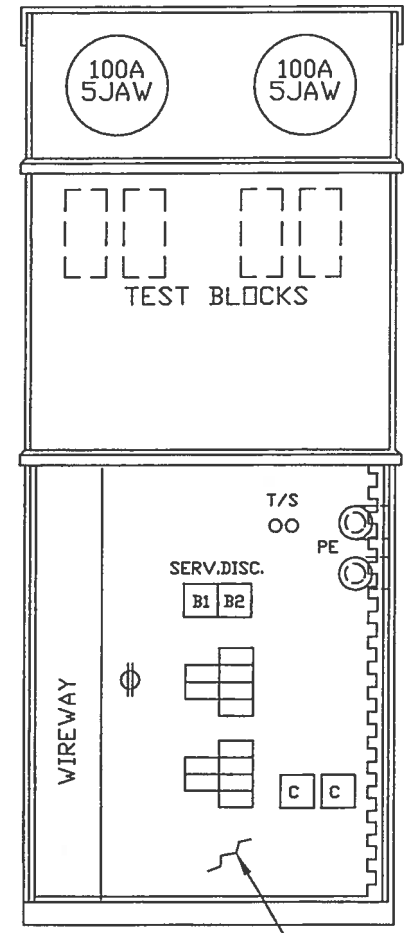
FINISH COLOR ☐ LT. GREEN ■ WHITE ☐ DK. GREEN ☐ OTHER _____

PHOTOCELL REQUIRED ☐ YES ☐ NO PHOTOCELL PROVISIONS ■ YES ☐ NO

NAMEPLATES ☐ BREAKER ID

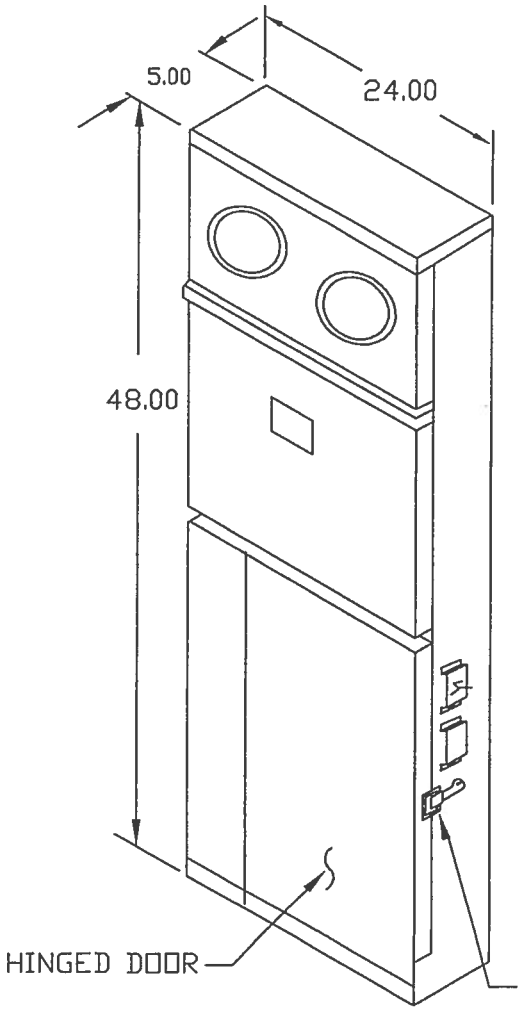
PHENOLIC ☐ ☐ CONTRACT NO. _____

DATE:	BY: JLT	S/O #	



INTERIOR VIEW LESS DOOR

HINGED DEADFRONT

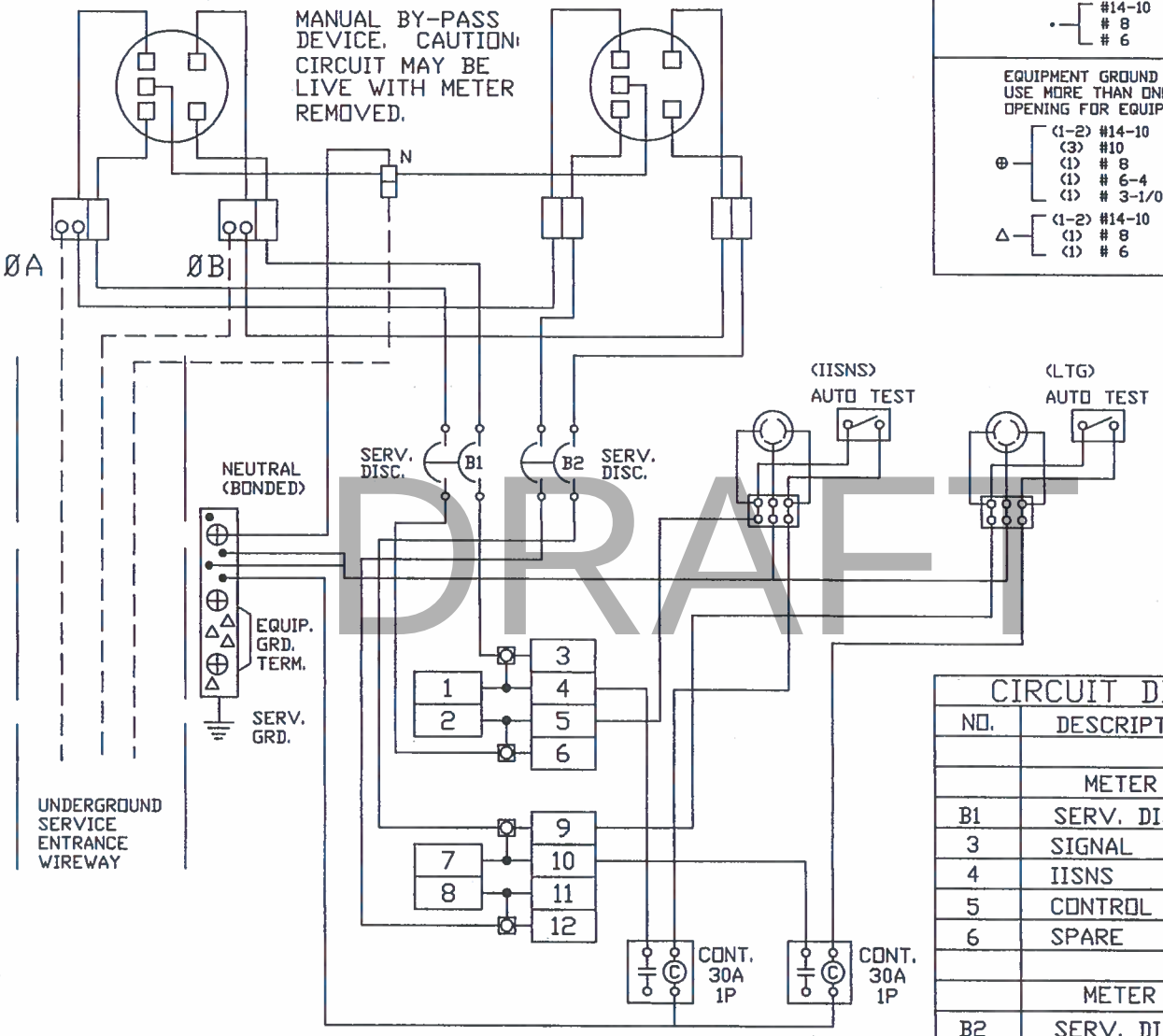


RFP 8-1910
PROJECT1
GARDEN GROVE BOULEVARD CORRIDOR
EXHIBIT A-1

MYERS POWER PRODUCTS, INC.
2950 E. PHILADELPHIA ST., ONTARIO, CA. 91761

ME-IIBD-M100/M100 (MOD)
120/208VAC 1 PHASE 3 WIRE 100 AMPS
RAINPROOF TYPE 3R. ENCLOSURE

METER SOCKET 100 AMPS CONTINUOUS



INTERMEDIATE HANDLE TRIP POSITION:
TO RESTORE POWER; TURN TO FULL OFF, THEN ON.

WIRE CONNECTORS EXCEPT CIRCUIT BREAKERS:

SYMBOL	AL RANGE	CU RANGE	TORQUE:
⊠	12-10	14-1/0	50 LB IN
⊛	6-250MCM	6-250MCM	200 LB IN

WIRE CONNECTORS: USE AL/CU CONDUCTORS

SYMBOL	RANGE	TORQUE: IN/LBS.
⊠ □ ▲	#6-250MCM	250
○	#14-10	32
	# 8	36
	# 6-4	41
	# 3-1/0	45
•	#14-10	18
	# 8	23
	# 6	32

EQUIPMENT GROUND TERMINATION:
USE MORE THAN ONE CONDUCTOR PER OPENING FOR EQUIPMENT GRD. ONLY.

⊕	(1-2)	#14-10	32
	(3)	#10	50
	(1)	# 8	36
	(1)	# 6-4	41
	(1)	# 3-1/0	45
△	(1-2)	#14-10	18
	(1)	# 8	23
	(1)	# 6	32

CIRCUIT DIRECTORY

NO.	DESCRIPTION	AMP	POLE
	METER 1		
B1	SERV. DISC.	100	2
3	SIGNAL	40	1
4	IISNS	20	1
5	CONTROL	15	1
6	SPARE	40	1
	METER 2		
B2	SERV. DISC.	100	2
9	CONTROL	15	1
10	LIGHTING	30	1

BONDED NEUTRAL, REMOVE BONDING MEANS FOR TEST PURPOSES ONLY.

518819

SERVICE DISCONNECT 100 AMPS OR LESS:CUTLER-HAMMER TYPE QC; GE TYPE THQC.
CIRCUIT BREAKERS 100 AMPS OR LESS: CUTLER-HAMMER BR,BRH,BQ,BD,GFCB,GFCBH,HQP,QPH,QP-GF:
CROUSE-HINDS MP,MH,MP-GF; G.E. THQL,THQL-GF.

SHORT CIRCUIT RATING: RMS SYMMETRICAL AMPS 10,000 AT 120/240 VAC. THE SHORT CIRCUIT RATING IS LIMITED TO THE LOWEST INTERRUPTING CAPACITY OF ANY DEVICE INSTALLED THEREIN REPLACEMENT BREAKERS MUST BE SAME TYPE AND RATING. FIELD INSTALLED CONDUCTORS SHOULD BE SIZED ON 60°C AMPACITY FOR 14-1 AWG. AND 75°C AMPACITY OVER 1 AWG PER TABLE 310-16 OF NEC.

RIPLEY LIGHTING CONTROLS

DIVISION OF SOUTHCONN TECHNOLOGIES INC

Twist-Lock Electronic Photocontrol

LongLife II

IDA APPROVED Dark-Sky Friendly Fixture

Exclusive Features

ZCS TECHNOLOGY Zero Cross Switching

Zero Cross Switching Technology: protects the device from inrush currents, commonly found in LED Luminaires.

Microprocessor Control

Intelligent Microprocessor: assures advanced Performance & Reliability

Self-Healing Relay

SELF-Healing Relay: allows unattended field restoration. Stuck relay contacts are a common failure point. Our Patent Pending technology actually works to un-stick the contacts, thus preventing wasted energy (day burners) and service calls. Tested at more than 325 years with a 1000 Watt Tungsten Lamp

3 Tier Power Supply Technology

3 Tier Power Supply Circuitry: 640 Joule 33 mm MOV rated @ 40,000 Amps for primary protection Dual Zener Diode for secondary protection. 3rd Layer of protection using a precision voltage regulator.

TRU Filter

Tru-Filter®: spectral sensitivity matches that of the Human Eye; while competitor's Silicon Photodetector comes nowhere close.

Phone: 803-939-4700
Fax: 803-939-4777
E-mail: Sales@RipleyLC.com
www.RipleyLC.com

Ripley's exclusive **LongLife II Photocontrol**

"NEW Generation of Technologies that change the Game "

Ripley Lighting Controls is pioneering new technologies raising the bar in the Street and Area Lighting Industry.

	6390LL-BK	6394LL	6395LL
Nominal Voltage 60 Hz	120/208/240/277	480	347
Voltage Range	105—305	432—528	312—382
Fail Mode	On		
Load Rating	1000 Watt Tungsten / 1800 VA Ballast		
Operating Temperature	-40C to +70C (-40F to +158F)		
Photocell	Infrared Filtering Silicon Phototransistor		
Dielectric Strength	5000 Volts between current carrying parts and metal surfaces		
Surge Protection	Primary: 640 Joule MOV rated at 40,000 amp surge current—protects not only the photocontrol, but also the LED fixture Secondary: 2 Zener diodes Third: Voltage Regulator		
Power Consumption	0.5 watts @ 120 V		
Time Delay Off (Instant On)	3 to 5 seconds		
Operating Light Levels (Standard Settings)	Turn On 1.5 FC ± .25 / Turn Off by 2.25 FC (Off:On Ratio = 1.5:1)		
ANSI Color Coded Cover: double-wall thickness, UV Stabilized Permanent Color LongLife polymer with extra UV inhibitor	Black	Yellow	Green
Options			
Fail Off	-FO (Green)	N/A	N/A
Freguency	60Hz		

Other Exclusive Features:

- Electrolytic Capacitors rated 105 °C, with minimum 20,000 hour life at maximum voltage, current, & temperature
- Completed circuit boards are conformal coated with silicone for Long Life
- Double-wall thickness for strength and longevity in constant outdoor environment, optimized black Long Life polymer with maximum UV inhibitor
- 1:1 Ratio Capable saves energy by reducing burn time. Allows for the light to turn off at the same light level as the turn on value.
- RoHS Compliant & packaged in Biodegradable Bags
- WARRANTY: 12 years from date of manufacture

Meets or exceeds rigid quality requirements of SouthConn Technologies Inc. and applicable ANSI C136.10, and C136.24 Standards

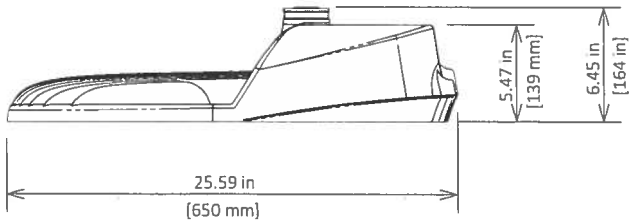
LEOTEK®
LITE-ON GROUP

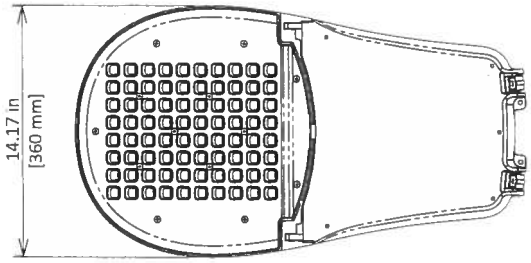
Project GARDEN GROVE BOULEVARD CORRIDOR
Type
Catalog No.

GreenCobra™ LED Street Light
GC1

Luminaire Data

Weight 21 lbs [9.5 kg]
EPA 0.9 ft^2





Ordering Information

Sample Catalog No. GC1 60F MV NW 2 GY 350 BSK RPB FDC

Product	No. & Type of LEDs	Voltage[6]	Color Temperature	Distribution	Finish[2]	Drive Current[1]	Options
GC1	20F	MV 120-277V	WW 3000K	2 Type 2	GY Gray	350 350mA	HSS[4] House Side Shield (Factory Installed)
	30F	HV 347-480V	NW 4000K	3 Type 3	DB Dark Bronze	530 530mA	
	40F		CW 5000K		BK Black	700 700mA	FDC[5] Fixed Drive Current
	60F					1A[3] 1A	LPCR Less Photocontrol Receptacle
	80F						PCR5 ANSI 5-wire Photocontrol Receptacle
							PCR7 ANSI 7-wire Photocontrol Receptacle
							PCR5-CR Control Ready 5-wire Photocontrol Receptacle
							PCR7-CR Control Ready 7-wire Photocontrol Receptacle
							SC PCR Shorting Cap
							WL Utility Wattage Label

Notes:

1 Factory set drive current, field adjustable standard. Refer to Performance Data Table Consult factory if wattage limits require a special drive current.
2 Gray, Black and Dark Bronze standard, consult factory for other finishes.
3 1A drive current only available with 40F.
4 Flush mounted house side shield factory installed. Shield cuts light off at 1/2 mounting height behind luminaire.
5 Non-field adjustable, fixed drive current.
6 MV is DLC qualified. HV is DLC qualified on request, consult factory.
7 Flush mounted house side shield. Shield cuts light off at 1/2 mounting height behind luminaire. Specify Model and Color.
8 Specify Color (GY, DB, BK)
9 Specify MV (120-277V) or HV (347V-480V)

Accessories*	
HSS[7]	House Side Shield
SPB[8]	Square Pole Horizontal Arm Bracket
RPB[8]	Round Pole Horizontal Arm Bracket
PTB[8]	Pole Top Tenon Horizontal Arm Bracket
WB[8]	Wall Horizontal Arm Bracket
BSK	Bird Deterrent Spider Kit
PC[9]	Twist Lock Photocontrol
LLPC[9]	Long-Life Twist Lock Photocontrol
SC	Twist Lock Shorting Cap

*Accessories are ordered separately and not to be included in the catalog number

LEOTEK®
LITE-ON GROUP

GreenCobra™ LED Street Light

GC1

Luminaire Specifications

Housing
Die cast aluminum housing with universal four-bolt slip fitter mounts to 1-1/4" to 2" (1-5/8" to 2-3/8" O.D.) diameter mast arm. Aluminum housing provides passive heat-sinking of the LEDs and has upper surfaces that shed precipitation. Mounting provisions meet 3G vibration per ANSI C136.31-2001 Normal Application, Bridge & Overpass. Mounting has leveling adjustment from + 10° to -5° in 2.5° steps and integral bubble level standard. Electrical components are accessed without tools and are mounted on removable power door with stainless steel latches. Standard rubber wildlife guard conforms to mast arm with no gaps.

Light Emitting Diodes
Hi-flux/Hi-power white LEDs produce a minimum of 90% of initial intensity at 100,000 hours of life based on IES TM-21. LEDs are tested in accordance with IES LM-80 testing procedures. LEDs have correlated color temperature of 3000K (WW), 4000K (NW), or 5000K (CW) and 70 CRI minimum. LEDs are 100% mercury and lead free.

Optical Systems
Micro-lens optical systems produce IESNA Type 2 or Type 3 distributions and are fully sealed to maintain an IP66 rating. Luminaire produces 0% total lumens above 90° (BUG Rating, U=0). Optional house side shield cuts light off at 1/2 mounting height behind luminaire.

Electrical
Rated life of electrical components is 100,000 hours. Uses isolated power supply that is 1-10V dimmable. Power supply is wired with quick-disconnect terminals. LED drive current can be changed in the field to adjust light output for local conditions (not available with PCR5-CR or PCR7-CR options). Power supply features a minimum power factor of .90 and <20% Total Harmonic Distortion (THD). EMC meets or exceeds FCC CFR Part 15. Terminal block accommodates 6 to 14 gauge wire and is aligned for strait wire entry. Surge protection complies with IEEE/ANSI C62.41 Category C High, 20kV/10kA.

Controls
3-Wire photocontrol receptacle is standard. ANSI C136.41 5-wire (PCR5) or 7-wire (PCR7) photocontrol receptacles are available. All photocontrol receptacles have tool-less rotatable bases. Wireless control module is provided by others.

Finish
Housing receives a fade and abrasion resistant polyester powder coat finish. Finish tested to withstand 3000 hours in salt spray exposure per ASTM B117. Finish tested 500 hours in UV exposure per ASTM G154 and meets ASTM D523 gloss retention.

Listings/Ratings/Labels
Luminaires are UL listed for use in wet locations in the United States and Canada. DesignLights Consortium™ qualified 120-277V 4000K product. International Dark Sky Association listed. Luminaire is qualified to operate at ambient temperatures of -40°C to 40°C. Assembled in the U.S.A

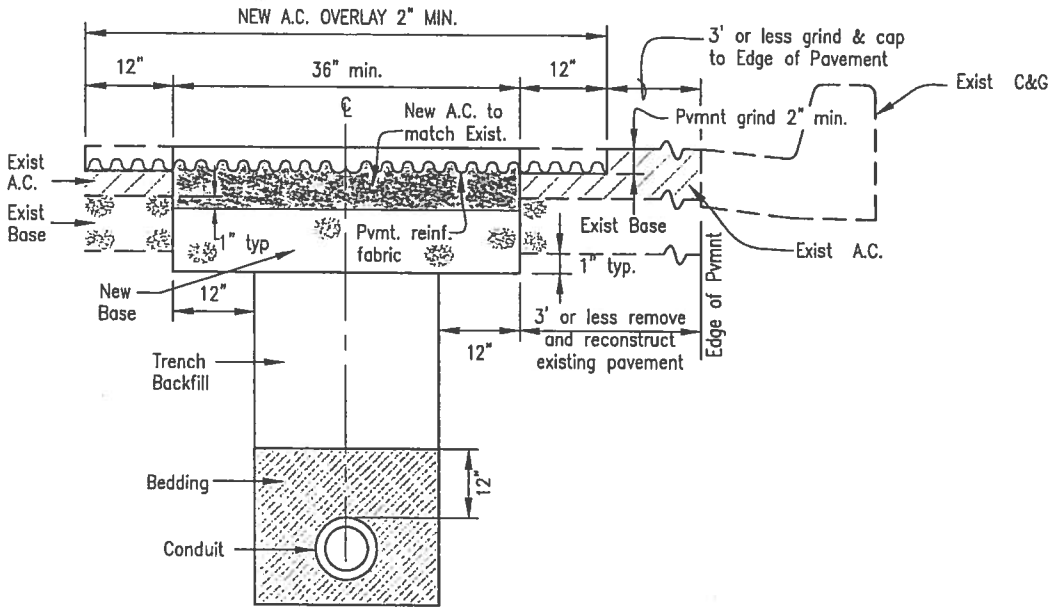
Photometry
Luminaires photometrics are tested by certified independent testing laboratories in accordance with IES LM-79 testing procedures. IES files for all CCTs are available at leotek.com.

Warranty
10-year limited warranty is standard on luminaire and components.

Performance Data
All data nominal. IES files for all CCTs are available at leotek.com.

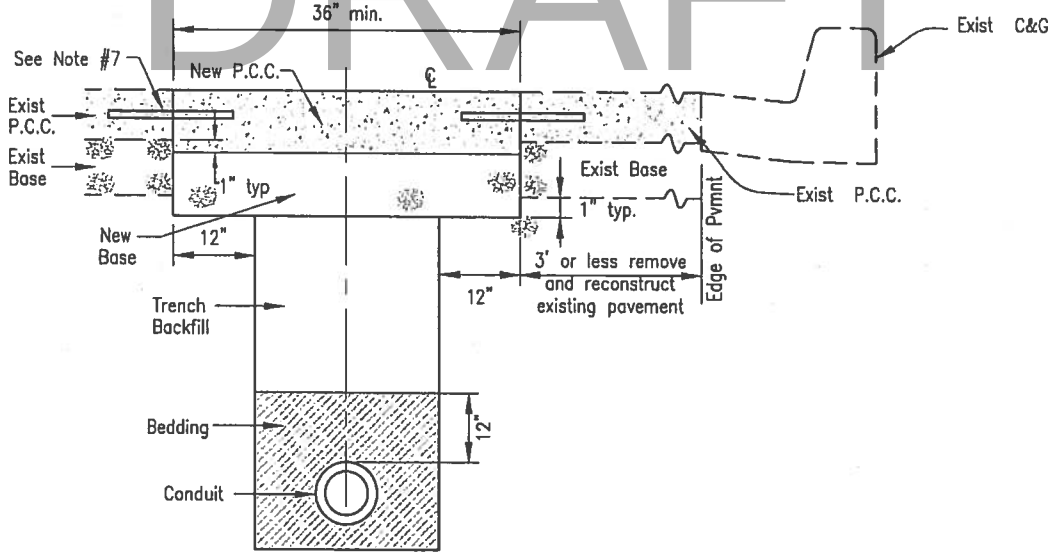
					Type 2	Type 3
No. of LEDs & Type	**Drive Current (mA)**	**System Wattage (W)**	**Delivered Lumens (Lm)[1]**	**Efficacy (Lm/W)**	**BUG Rating**	**BUG Rating**
20F	350	25	2700	108	B1 U0 G1	B1 U0 G1
	530	35	3650	104	B1 U0 G1	B1 U0 G1
	700	47	4800	102	B1 U0 G1	B1 U0 G1
30F	350	35	3800	109	B1 U0 G1	B1 U0 G1
	530	53	5400	102	B1 U0 G1	B2 U0 G1
	700	70	7000	100	B2 U0 G2	B2 U0 G2
40F	350	45	5050	112	B1 U0 G1	B2 U0 G1
	530	70	7200	103	B2 U0 G2	B2 U0 G2
	700	92	9300	101	B2 U0 G2	B2 U0 G2
	1000	132	12300	93	B3 U0 G3	B3 U0 G3
60F	350	70	7600	109	B2 U0 G2	B2 U0 G2
	530	101	10400	103	B2 U0 G2	B2 U0 G2
	700	133	13400	101	B3 U0 G3	B3 U0 G3
80F	350	85	9500	112	B2 U0 G2	B2 U0 G2
	530	133	14200	107	B3 U0 G3	B3 U0 G3
	700	180	17700	98	B3 U0 G3	B3 U0 G3

Notes:
1 All data nominal lumens for 4000K (NW) and 5000K (CW). For 3000K (WW) apply a LLF of 0.93. Normal tolerance ± 10% due to factors including distribution type, LED bin variance, and ambient temperatures.



A.C. SECTIONS
SYMMETRICAL @ CENTERLINE

CASE 1



CONVENTIONAL P.C.C. SECTIONS
SYMMETRICAL @ CENTERLINE

CASE 2

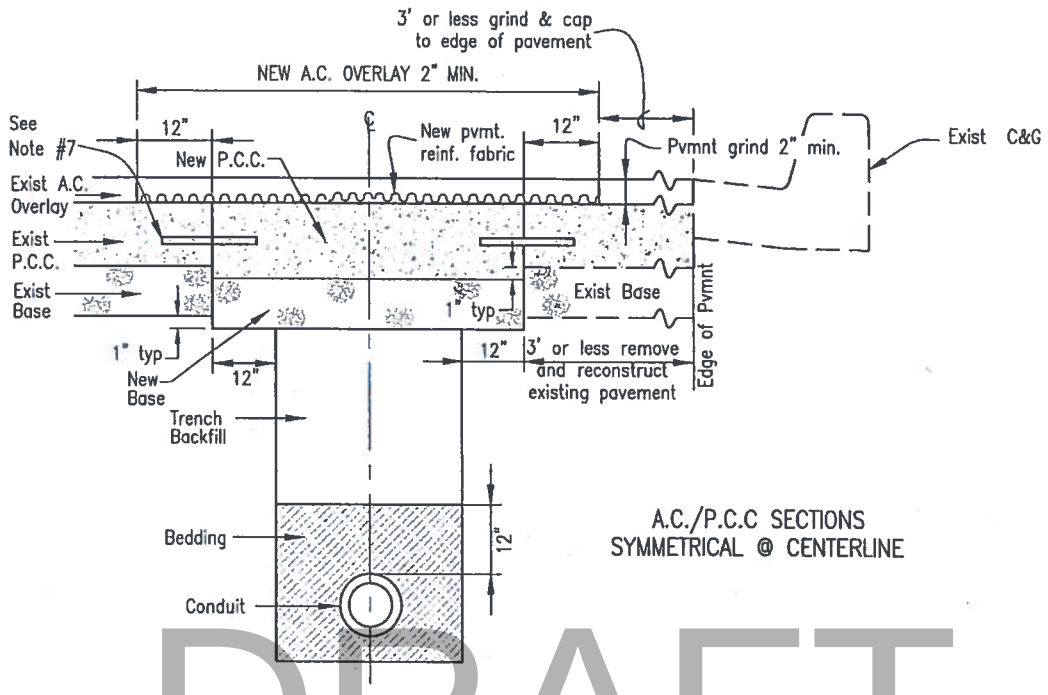
REGISTERED PROFESSIONAL ENGINEER
FRANK SUN
No. 52835
Exp. 12-31-14
CIVIL
STATE OF CALIFORNIA

4-15-13
DATE APPROVED
PUBLIC WORKS DIRECTOR
CITY ENGINEER

CITY OF ORANGE PUBLIC WORKS DEPARTMENT

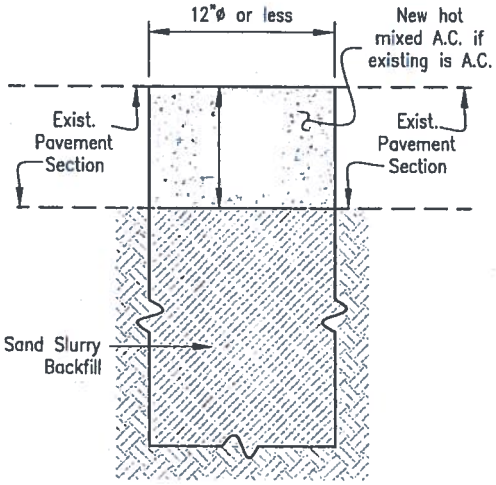
STREET REPAIR STANDARDS FOR UTILITY CUTS

STANDARD PLAN No. 125
SHEET 1 OF 3



A.C./P.C.C SECTIONS
SYMMETRICAL @ CENTERLINE

CASE 3



POTHOLE (CORE) REPAIR

REGISTERED PROFESSIONAL ENGINEER
FRANK SUN
No. 52835
Exp. 12-31-14
CIVIL
STATE OF CALIFORNIA

4-15-13
DATE APPROVED
PUBLIC WORKS DIRECTOR
CITY ENGINEER

CITY OF ORANGE PUBLIC WORKS DEPARTMENT

STREET REPAIR STANDARDS
FOR UTILITY CUTS

STANDARD PLAN No. 125
SHEET 2 OF 3

NOTES:

1. All street excavations require a permit from the City of Orange Public Works Department a minimum of three working days prior to excavation.
2. All proposed excavation surface joints shall be sawcut prior to final repair. Pavement grind shall extend 12" beyond sawcut per details herein. All damaged or deteriorated pavement adjacent to the trench shall be removed and replaced per structural section recommendations herein.
3. All pavement removals shall be made on straight line saw cuts a minimum of 1½ inches deep. If cut line is less than 3 feet from another cut line, expansion joint, or pavement edge, the existing pavement between the two shall be removed and replaced to the cut lines, expansion joints, or edges.
4. Transverse trenches shall be backfilled with 150-E-100 concrete slurry per the Standard Specifications for Public Works Construction, "Greenbook" (latest edition), Table 201-1.1.2(a), Trench Backfill Slurry, modified herein.
5. Thickness of new AC or PCC pavement shall be 1" thicker than the existing pavement but in no case shall the AC pavement be less than 4 inches thick and the PCC less than 6" thick. Thickness of aggregate base shall be 1" thicker than that of the existing aggregate base, but in no case shall the thickness be less than 8".
6. Backfill quality and placement shall conform to Section 306-1.3 of the Standard Specifications for Public Works Construction, "Greenbook" (latest edition). Backfill shall be compacted to a relative compaction of 95% in the upper 3 feet and 90% below 3 feet.
7. Dowel #4 deformed steel bars into existing concrete pavement edges 6" deep at 24" O.C. with 1½" minimum clearance from top of pavement surface. Dowels shall be epoxied into existing slab and cast into new slab.
8. Excavated material not suitable for backfill shall be removed from job site.
9. Soft, spongy, or unsuitable material encountered at the trench bottom shall be removed to a depth of 2 feet maximum and replaced with compacted sand or rock material as directed by the City Engineer. In all wet or unstable vertical trenches 5 feet and deeper shoring conforming to Cal OSHA and Division of Tunnels and Mines Standards shall be required. All shoring shall be designed by a Civil or Structural Engineer registered in the State of California.
10. Recessed traffic rated trench plates shall be installed flush with the existing finished surface.
11. All USA markings shall be removed upon completion of the work.
12. Rubberized asphalt concrete pavement shall be restored to match existing and shall be paved with paving machine.
13. For concrete pavement, high early strength concrete mix with minimum of 3,000 psi in 24 hours shall be used.
14. For construction within the Old Towne Area, the concrete and finish shall be regular concrete mix with an application of water-based top-surface retarder that is washed away using pressured water for a sand blast finish effect. The retarder shall be Grade 05 - Powder Blue Violet (color coded) per Grace Constrction Products (www.graceconstruction.com (877) 423-6491 or approved equal.
15. All damaged traffic loops due to the construction shall be repaired to the City Traffic Engineer's satisfaction.
16. Restore traffic striping in the construction area to match existing.
17. Work within a pavement moratorium area shall require a special approval by the City Engineer.

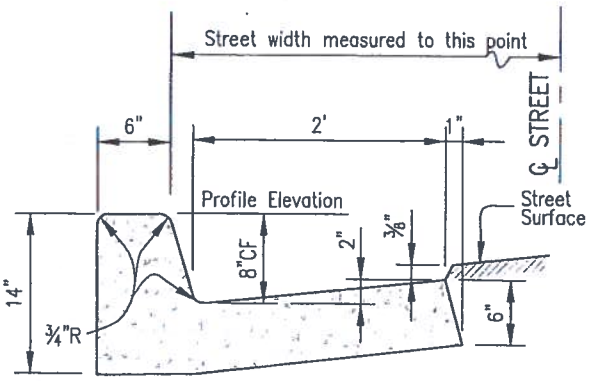
REGISTERED PROFESSIONAL ENGINEER
FRANK SUN
No. 52835
Exp. 12-31-14
CIVIL
STATE OF CALIFORNIA

4-15-13
DATE APPROVED
PUBLIC WORKS DIRECTOR
CITY ENGINEER

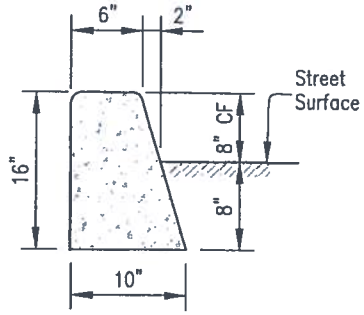
CITY OF ORANGE PUBLIC WORKS DEPARTMENT

STREET REPAIR STANDARDS FOR UTILITY CUTS

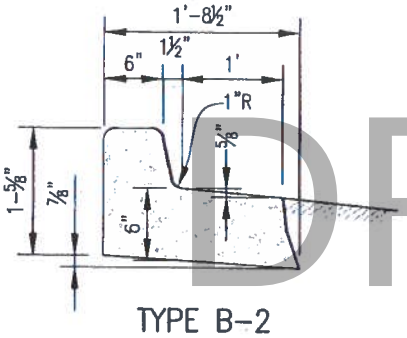
STANDARD PLAN No. 125



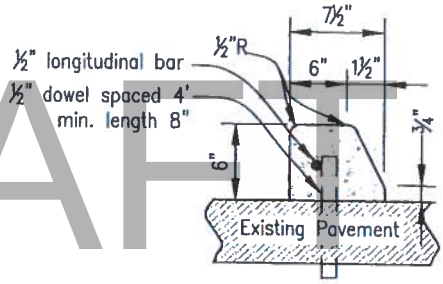
TYPE A
(normal)



TYPE B-1
(For use with cross gutters see Std. Plan 119)



TYPE B-2
(median strips)



TYPE B-3
(berm)

NOTES:

1. Concrete shall be class 520-C-2500.
2. Slope gutter in plane of pavement if cross slope of pavement is away from curb (when directed).
3. All gutter flowlines shall be water tested.
4. Weakened-plane joints shall be constructed at 12' intervals except through driveway and alley aprons.
5. Gutter thickness shall be 8" across commercial driveway apron depressions (see Std Plan 115).
6. Type B-3 curb shall not be joined to the existing pavement with epoxy compounds in lieu of dowels.
7. For construction within the Old Towne Area, the concrete color and finish shall be regular concrete mix with an application of water-based top-surface retarder that is washed away using pressured water for a sand blast finish effect. The retarder shall be Grade 05 – Powder Blue Violet (color coded) per Grace Construction Products (www.graceconstruction.com (877) 423-6491) or approved equal.

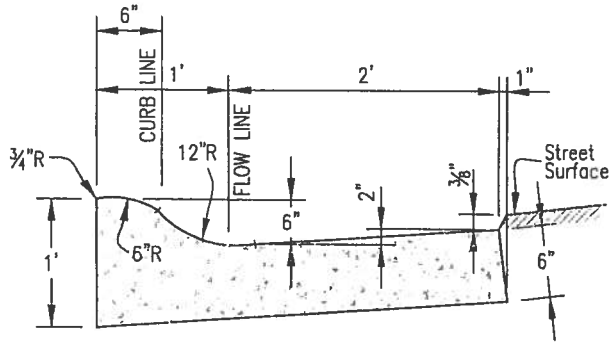
REGISTERED PROFESSIONAL ENGINEER
FRANK SUN
No. 52835
Exp. 12-31-16
CIVIL
STATE OF CALIFORNIA

4/13/15
DATE APPROVED
PUBLIC WORKS DIRECTOR
CITY ENGINEER

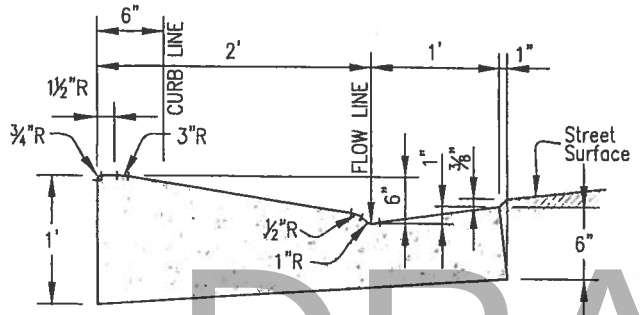
CITY OF ORANGE PUBLIC WORKS DEPARTMENT

CURB AND GUTTER

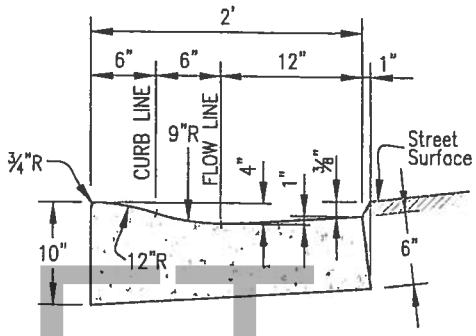
STANDARD PLAN No. 117
SHEET 1 OF 2



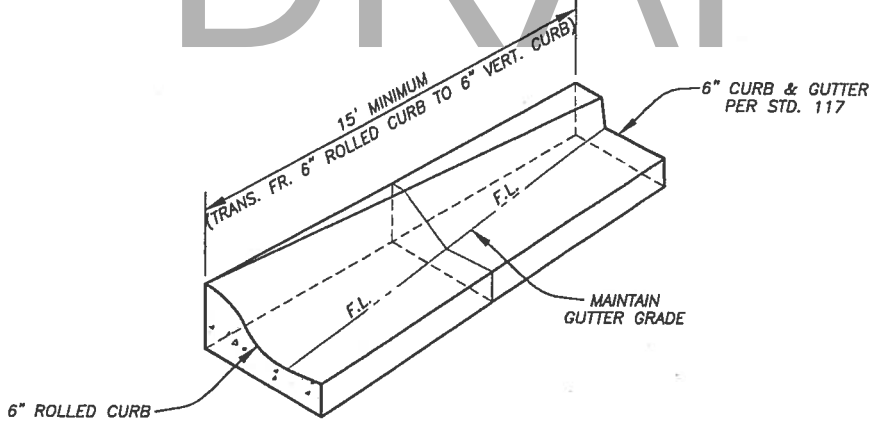
TYPE C-1



TYPE C-2



TYPE C-3



ROLLED CURB
(FOR PRIVATE STREET ONLY)

NOTES

1. Type C to be used only with special permission of the City Engineer when Type A and B of Standard Plan 117 are not feasible. Transition length from Type C to Type A shall not be less than 15 feet.
2. Type C-1 shall not be used for driveway approach.
3. Type C-2 & C-3 may be used for driveway approach with special approval of the City Engineer.

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4/13/15
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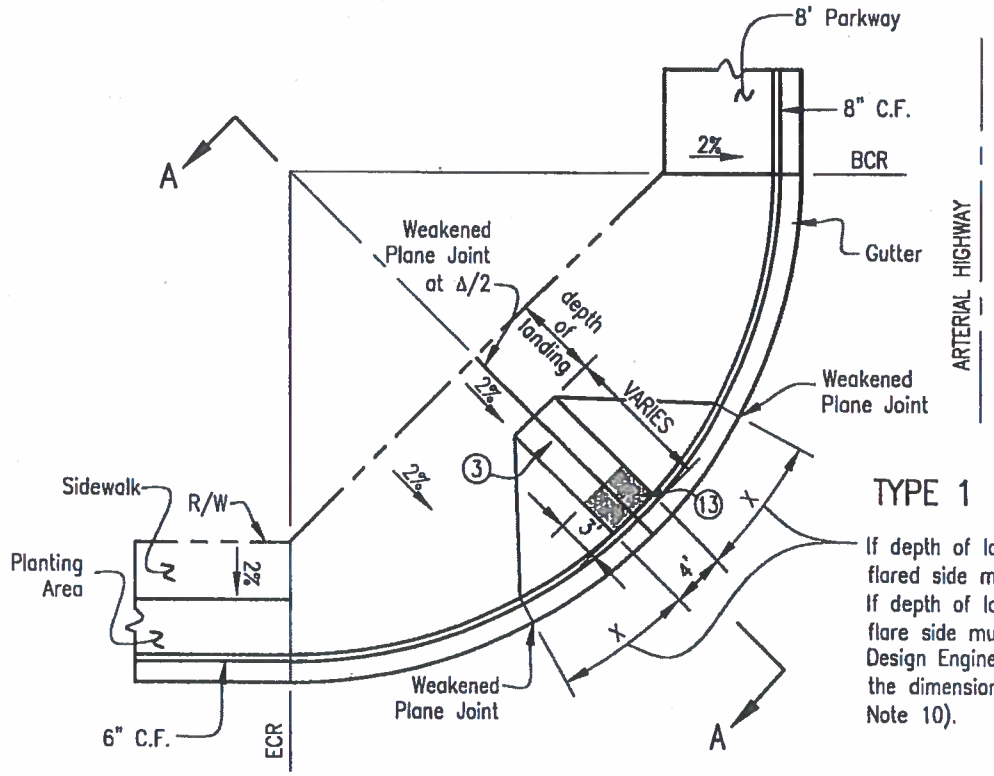
CITY ENGINEER

CITY OF ORANGE PUBLIC WORKS DEPARTMENT

CURB AND GUTTER

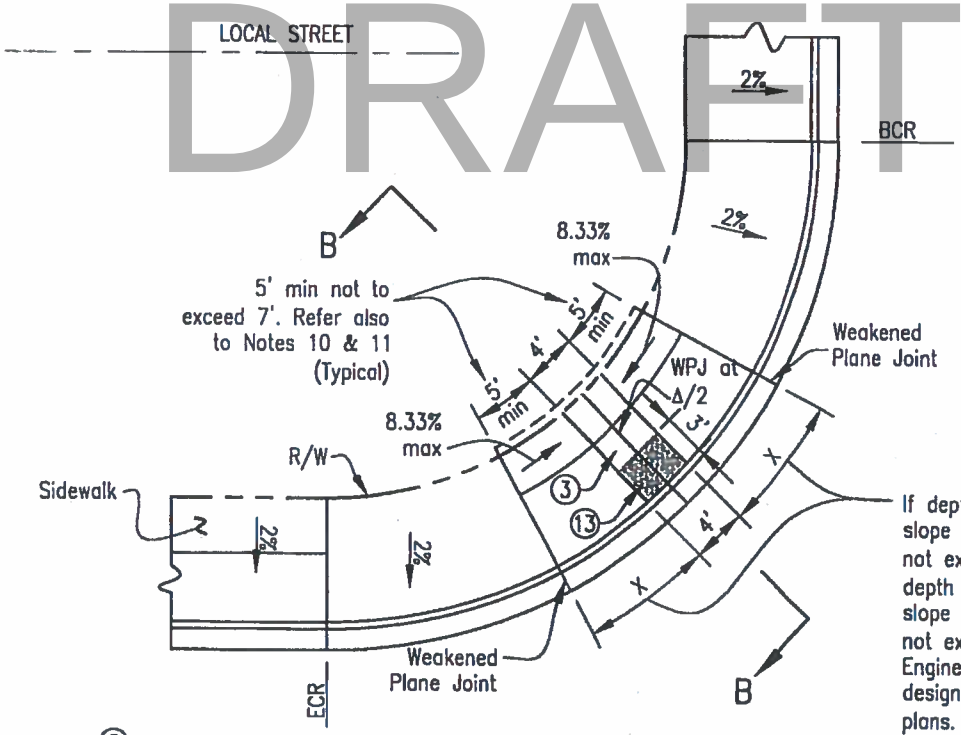
STANDARD PLAN No. 117
SHEET 2 OF 2



③ See Note 3
⑬ See Note 13

TYPE 1

If depth of landing is ≥3', the slope of the flared side must not exceed 8.33% (X≤10'). If depth of landing is ≥4', the slope of the flare side must not exceed 10% (X≤8'). Design Engineer shall determine and designate the dimensions on the plans. (Also refer to Note 10).



③ See Note 3
⑬ See Note 13

TYPE 2

If depth of landing is ≥3', the slope of the flared side must not exceed 8.33% (X≤10'). If depth of landing is ≥4', the slope of the flare side must not exceed 10% (X≤8'). Design Engineer shall determine and designate the dimensions on the plans. (Also refer to Note 10).

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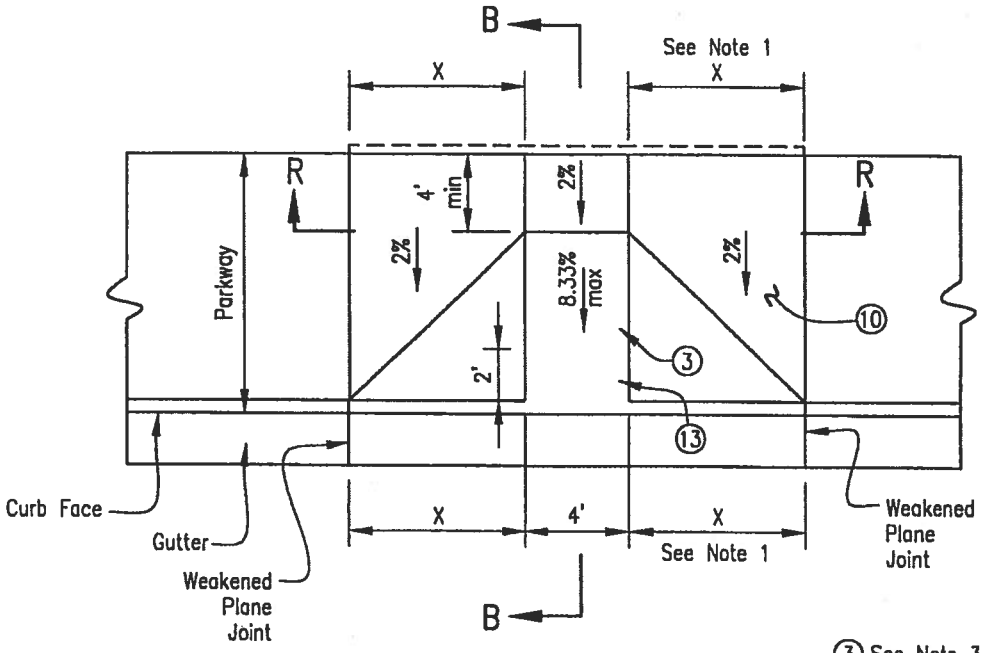
CITY OF ORANGE PUBLIC WORKS DEPARTMENT

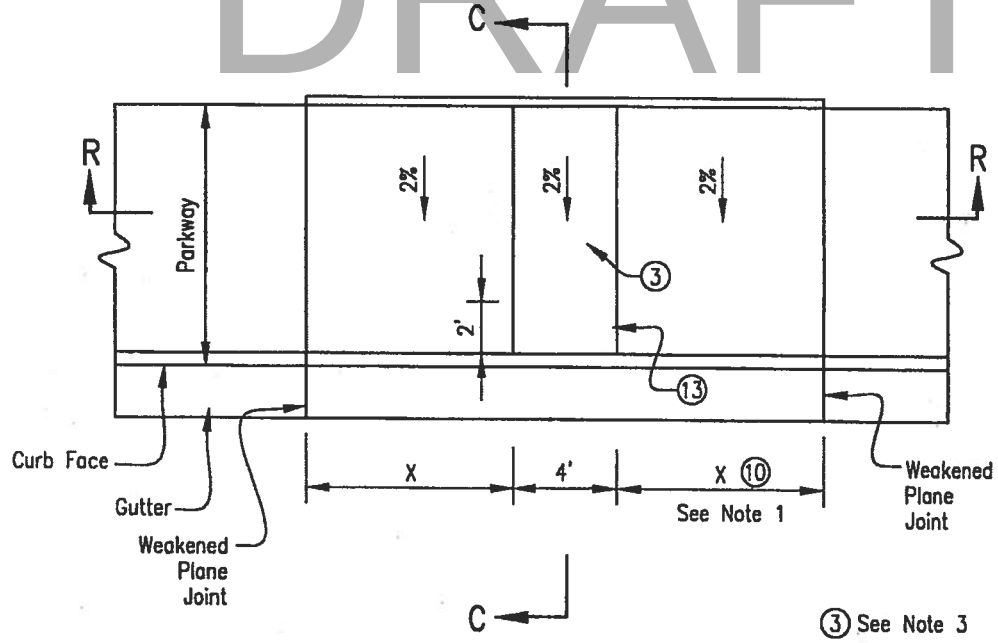
SIDEWALK ACCESS RAMP

STANDARD PLAN No. 121
SHEET 1 OF 7



③ See Note 3
⑩ See Note 10
⑬ See Note 13

TYPE 3



③ See Note 3
⑩ See Note 10
⑬ See Note 13

TYPE 4

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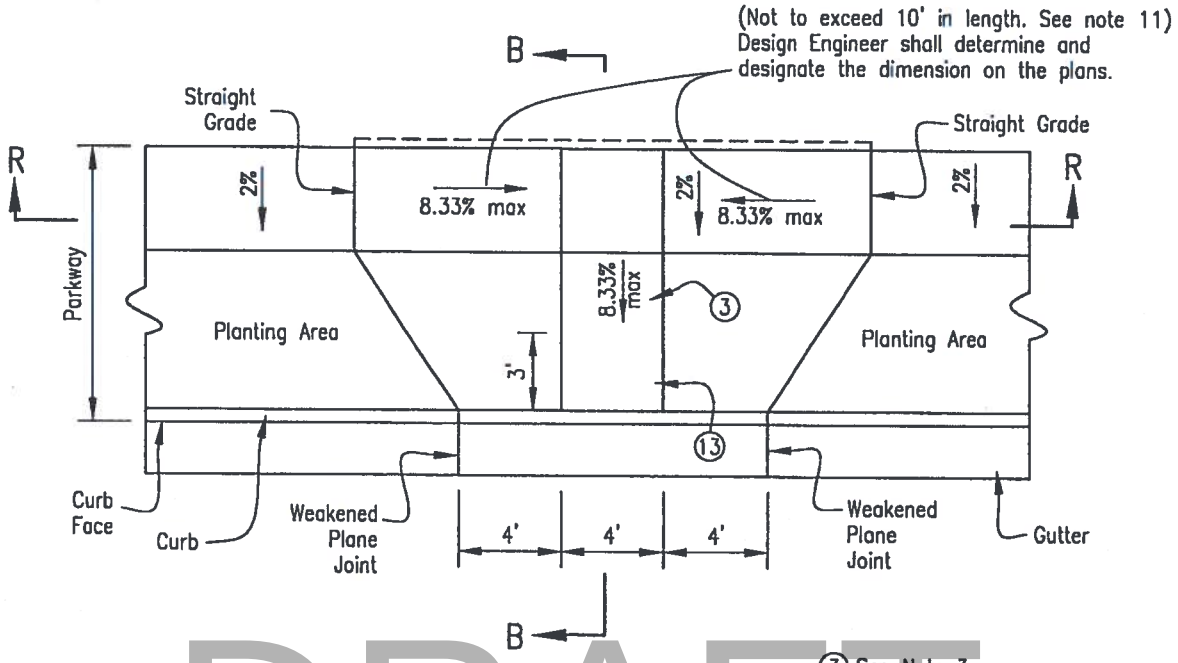
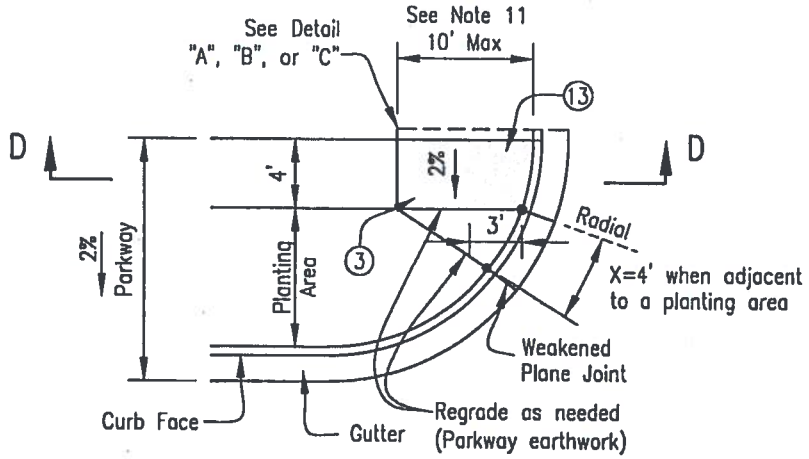
SIDEWALK ACCESS RAMP

STANDARD PLAN No. 121
SHEET 2 OF 7



TYPE 5

③ See Note 3
⑬ See Note 13



TYPE 6

③ See Note 3
⑬ See Note 13

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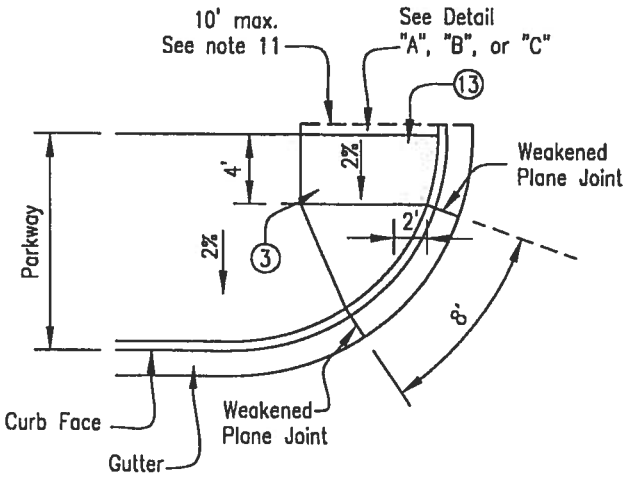
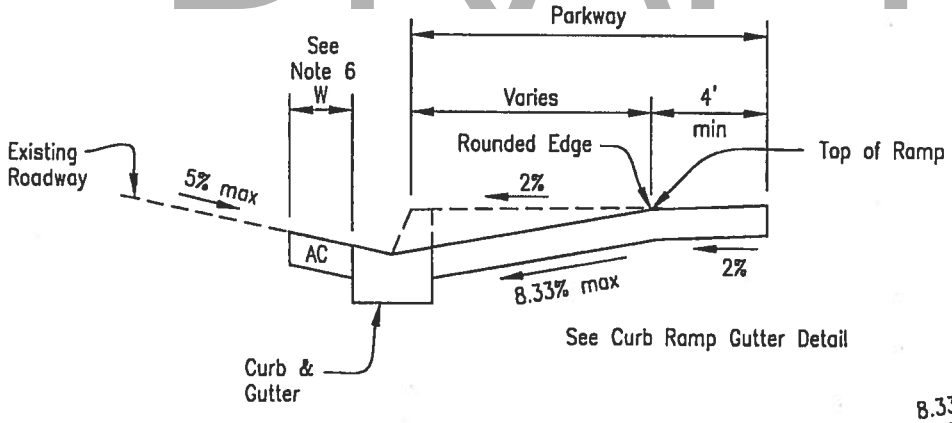
SIDEWALK ACCESS RAMP

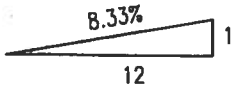
STANDARD PLAN No. 121
SHEET 3 OF 7



TYPE 7

3 See Note 3
13 See Note 13





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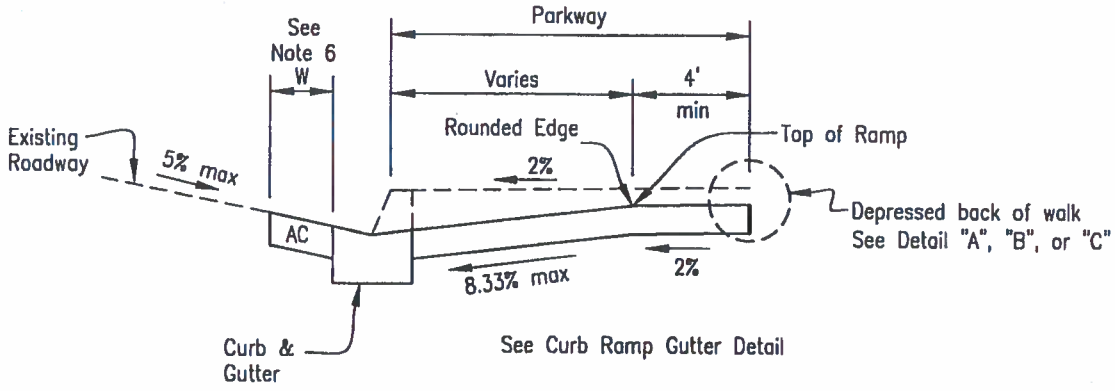
SIDEWALK ACCESS RAMP

STANDARD
PLAN No.
121
SHEET 4 OF 7



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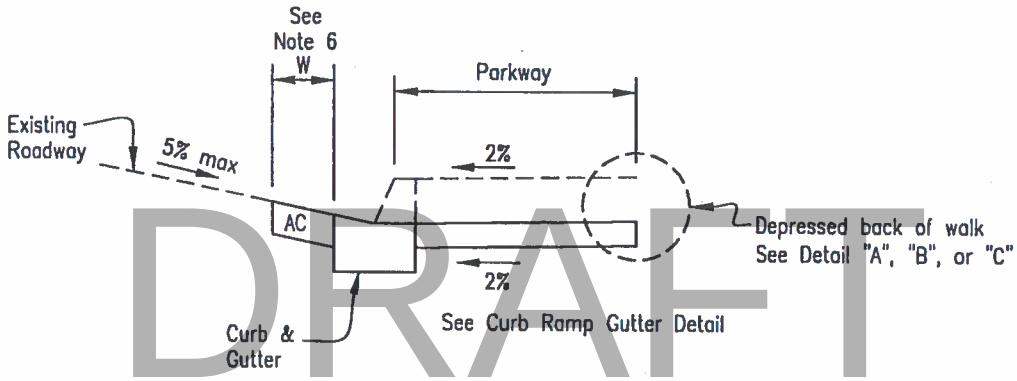

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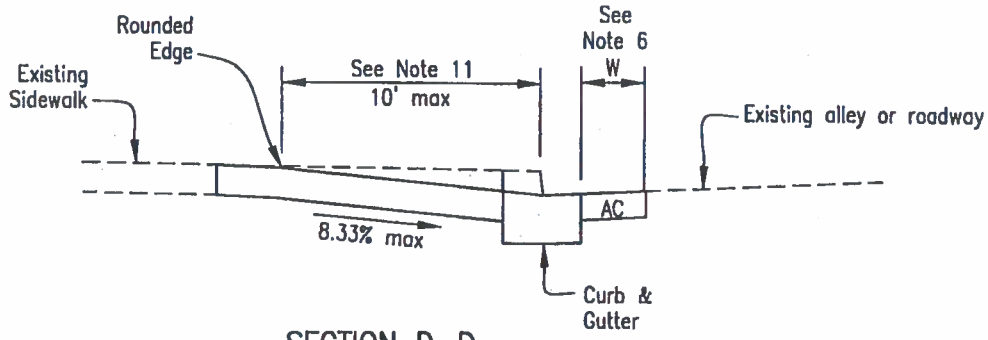
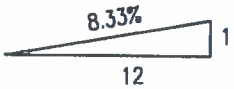


SECTION D–D



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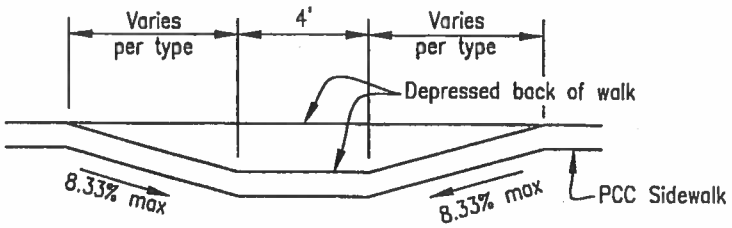
SIDEWALK ACCESS RAMP

STANDARD
PLAN No.
121
SHEET 5 OF 7



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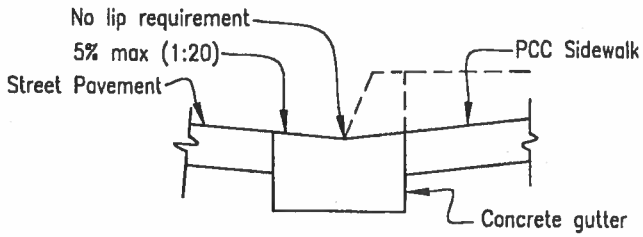
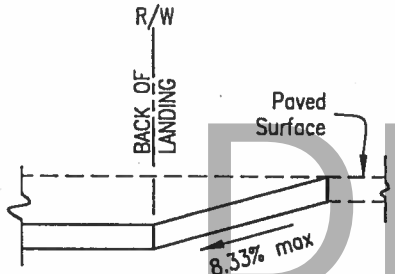
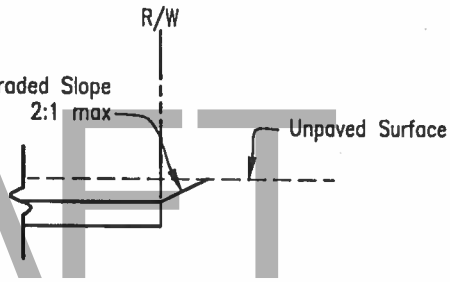


CURB RAMP GUTTER DETAIL

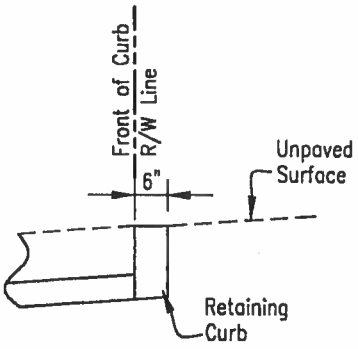


DETAIL "A"

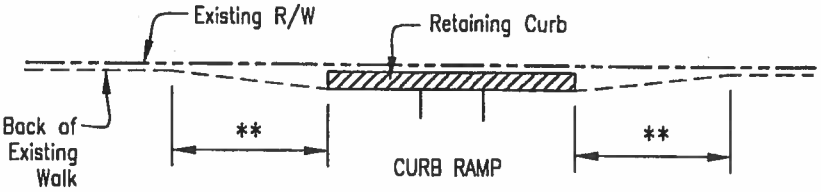


DETAIL "B"

* On retrofit construction or cases where the retaining curb must be constructed inside existing road R/W, a "Back of Sidewalk" transition is required (see diagram below) to direct pedestrian traffic around the retaining curb.



DETAIL "C"



PLAN VIEW

** 7.5' transition length for straight sidewalk alignment. At curb returns, transition length can terminate at BCR/ECR, provided it is not less than 5'; otherwise, the retaining curb must extend to the BCR/ECR and the 7.5' transition length be used.

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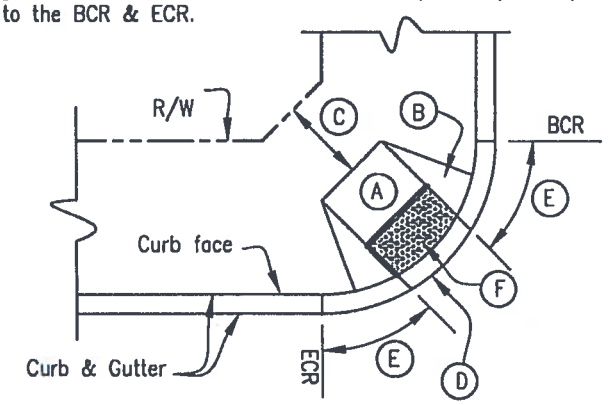
SIDEWALK ACCESS RAMP

STANDARD PLAN No. 121
SHEET 6 OF 7

NOTES:

1. X=8.0' on curb with 8.0" curb face height. X=6.0' on curb with 6.0" curb face height.
2. NOTE NOT USED.
3. The ramp surface shall have a transverse broomed surface texture.
4. Use Detail "A" if existing surface behind Right-of-Way is paved.
5. Use Detail "B" or "C" if existing surface behind Right-of-Way is unpaved.
6. W=3.0' to retrofit existing sidewalk. New construction shall maintain the standard street crossfall.
7. A 10-foot minimum Gutter Edge Transition is required between Type A gutter (8.33% max) and the Curb Ramp Gutter (5%max gradient, as shown on Sheet 6, Curb Ramp Gutter) to improve vehicular ridability. At curb return location, transition shall be to the BCR & ECR.



(A) Curb Ramp
(B) Flared Side Slopes
(C) Landing Area
(D) Curb Ramp Gutter Edge
(E) Gutter Edge Transition
(F) Detectable Warning Surface

8. For construction of curb ramp on an existing walkway area where space limitation prohibits the use of 8.33% (1:12) slope, a steeper slope can be used (Federal Register/Vol. 56, No. 144/Friday July 26, 1991, Section 4.1.6 (3)(a)).
   (i) A slope between 10.0% (1:10) and 8.33% (1:12) is allowed for a maximum rise of 6 inches.
   (ii) A slope between 12.5% (1:8) and 10% (1:10) is allowed for a maximum rise of 3 inches. A slope steeper than 12.5% (1:8) is not allowed.
9. Type 6 shall not be used at locations where marked crosswalk exists in both directions.
10. If depth of landing is ≥3', the maximum gradient at the flared side slope shall not exceed 8.33% (X≤10'). In no instance, however, shall the maximum flared side slope length (X) exceed 10' (see Note below). The Design Engineer shall determine and designate the dimensions on the plans.
    Note: In some cases where the street grade is steep, the 8.33% criteria would require a substantial transition length for the flared side slope (transition from 0-height curb to standard height curb). Limiting the transition length to 10' will minimize safety impact to the overall public.
    A standard height curb & gutter provides the following safety features:
    -Maintains roadway drainage at the flowline location.
    -Maintains vehicular traffic flow and safety at curb returns and parkway area.
    -Protects pedestrian from vehicular traffic.
    Subpart A, Section 36.302(a) "Modifications in Policies, Practices, or Procedures" of the "Americans with Disabilities Act" (ADA) and Section 4451(f) of the California Government Code allows modifications to the requirements in order to maintain overall public safety.
11. At hillside development, street grade can be as steep as 6% for arterial highways and 10% for local streets. To maintain an 8.33% ramp would require a substantial walkway transition length. In cases where the street grade is steeper than 8.33%, it would be impossible for the transition curb or transition walkway to join the normal height of curb or sidewalk. Furthermore, the depressed walkway would create safety issues such as water ponding behind the curb and a siltation problem on the sidewalk. Hence, modification to the ADA requirement is allowed per Subpart A, Section 36.302(a) of the "ADA" and Section 4451(f) of the California Government Code.
12. Dual ramps per American Public Works Association (APWA) Standard Plans, may be used on a curb return upon the approval of the City Engineer.
13. Detectable Warning Surface (Truncated Domes) shall comply with the Americans with Disabilities Act Accessibility Guidelines (ADAAG). Min. 3' deep by ramp width located so that edge nearest curb line is 6 inches min. and 8 inches max. from the curb line face. Dome size shall have a base dia. of 0.9 inch min. to 1.4 inches max., top dia. of 50 % of the base min. to 65% of the base dia. max., and a height of 0.2 inch. Dome spacing shall have a center-to-center spacing of 1.6 inches min. and 2.4 inches max., and a base-to-base spacing of 0.65" min., measured between the most adjacent domes on a square grid. Detectable warning surface shall have a min. 70% contrast visually with adjacent walking surfaces either light-on-dark, or dark-on-light. The truncated domes shall be manufactured by Safety Step Products (www.safetysteptd.com) or an approved equal.
14. Concrete shall be class 520-C-2500.
15. For construction within the Old Towne Area, the concrete color and finish shall be regular concrete mix with an application of water-based top-surface retarder that is washed away using pressured water for a sand blast finish effect. The retarder shall be Grade 05 – Powder Blue Violet (color coded) per Grace Construction Products (www.graceconstruction.com (877) 423-6491) or approved equal.

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CITY ENGINEER

CITY OF ORANGE PUBLIC WORKS DEPARTMENT

SIDEWALK ACCESS RAMP

STANDARD PLAN No. 121

City of Santa Ana Specifications

General Conditions and Special Provisions

CITY OF SANTA ANA
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CITY OF SANTA ANA
ADVERTISEMENT
PROJECT NO.: XX-XXXX
PROJECT TITLE

NOTICE INVITING BIDS

NOTICE IS HEREBY GIVEN that the City of Santa Ana will receive Bids on or before the hour of 2:00:59 pm, Month XX, 20XX by the Public Works Agency Receptionist, Third Floor (see attached map), located at City Hall - Ross Annex, 20 Civic Center Plaza, M-22, Santa Ana, California 92701 for:

PROJECT NO. XX-XXXX
PROJECT TITLE

Bids Proposals shall be enclosed in a sealed envelope clearly marked on the outside with the above identified project number and name, and also marked "SEALED BID – DO NOT OPEN WITH REGULAR MAIL"

Scope of Work includes ……

[Mandatory?] Job walk is scheduled for ……..(or state "There is no scheduled Job Walk)

It is the BIDDER'S responsibility to ensure delivery of the Proposal prior to the bid opening hour. Contractors will be required to comply with the City's new security policy and sign-in with the receptionist on the first floor. Contractors will sign-in under Bid opening for Project XX-XXXX to receive elevator access to the 3rd floor lobby. Contractors should allow themselves additional time to register in order to avoid missing the time-stamp deadline.

Each bid shall be accompanied by a Bid Proposal Guaranty in the form of a cashier's or certified check payable to the City of Santa Ana, or Bid Bond issued by a corporate surety, in an amount not less than ten percent (10%) of the bid aggregate, as a guarantee that the Bidder will enter into the proposed contract if the same is awarded. The signature of the bidder on the bid bond must be notarized.

The City of Santa Ana reserves the right to reject any and all bids and to waive any minor or non- substantive irregularities in the bid documents.

Prior to bid opening, Bidders must possess or obtain a valid California Class "X" Contractor's license.

Addenda issued during the time the bid is advertised will be posted on the City of Santa Ana website. BIDDERs are responsible to become self-informed as to whether or not addenda have been issued.

Complete electronic sets of the Plans and Specifications are available on Planet Bids or at the Public Works Agency counter (.pdf format on CD), First Floor, 20 Civic Center Plaza, Ross Annex, Santa Ana, California 92701. There is no charge for the Plans and Specifications on CD. PWA Counter Business Hours are 9:00am to 4:00pm, Monday thru Thursday and alternate Fridays. Call the PWA Projects Information Line at 714-647-5680 for instructions and availability of CDs. To request a CD by mail, the Contractor must submit an email request to sarmour@santa-ana.org and provide the following information: Company name, mailing address, phone number, FedEx account, and email Subject heading:

CITY OF SANTA ANA
ADVERTISEMENT
PROJECT NO.: XX-XXXX
PROJECT TITLE

CD Request for <project no.> <project name>

Contact [Project Manager] at 714-XXX-XXXX for questions related to this project.
Do not call Purchasing Division regarding Public Works Agency projects.

Following a 3-month transition period, all bids will be conducted online only after July 1, 2018. Further information related to this and other bid solicitations and how to register as a vendor in PlanetBids are available at:

http://www.santa-ana.org/finance/bidding_information.asp

COMMUNITY WORKFORCE AGREEMENT

For projects with bids greater than $250,000 for prime multi-trade construction contracts (including all subcontractors) or over $100,000 for specialty contracts (contracts either limited to a single trade or craft or limited to a singular scope of work), the CONTRACTOR shall adhere to the CITY'S Community Workforce Agreement (CWA). This project is considered a _____ contract. The CWA is a pre-hire collective bargaining agreement, which establishes the labor relations policies and procedures for CONTRACTOR to follow in the crafts persons employed to complete the WORK OF IMPROVEMENT as more fully described in the CWA. The CWA is incorporated by reference in the Construction Contract. A copy of the CWA may be found on the City's website at:

http://www.santa-ana.org/pwa/documents/CWA.pdf.

CALIFORNIA LABOR CODE

This project is subject to compliance monitoring and enforcement by the State of California Department of Industrial Relations, per Section 1771.4.a.1. BIDDERS are required to inform themselves fully of the conditions relating to construction and labor under which the work will be performed. Any contract entered into pursuant to this notice will incorporate the provisions of the California State Labor Code.

In accordance with the California State Labor Code, prevailing wage rates apply. Copies of the prevailing rate of per diem wages are on file with the Public Works Agency and shall be made available to any interested party on request.

A Contractor and any subcontractor must be registered with the Department of Industrial Relations prior to submitting a bid. "*A contractor and any subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the California Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the California Business and Professions Code or by Section 10164 or 20103.5 of the California Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.* Information about registration can be found on the Department of Industrial Relations website at http://www.dir.ca.gov/public-works/publicworks.html

A bid will not be considered nor any contract or subcontract entered into without proof of the contractor and subcontractor's current registration to perform public work.

FEDERAL REQUIREMENTS

As this project involves Federal funding assistance, Federal Labor Standards, including Davis-Bacon Act requirements, apply and will be enforced. If Federal and State wage rates differ, then the higher of the two will prevail.

The City of Santa Ana has established a Disadvantaged Business Enterprise (DBE) goal of X% for this contract. The Construction Contract DBE Commitment (Exhibit 15-G) and the DBE Information – Good Faith Efforts (Exhibit 15-H) may be submitted with the bid proposal. The form(s) must be received by the City no later than the time specified in the Special Instructions to Bidders for Federally Funded Projects included in the Contract Documents.

(FOR CDBG FUNDED PROJECTS): The work to be performed under this contract is also subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, the Copeland Anti-Kickback Act, and the Contract Work Hours and Safety Standards Act.

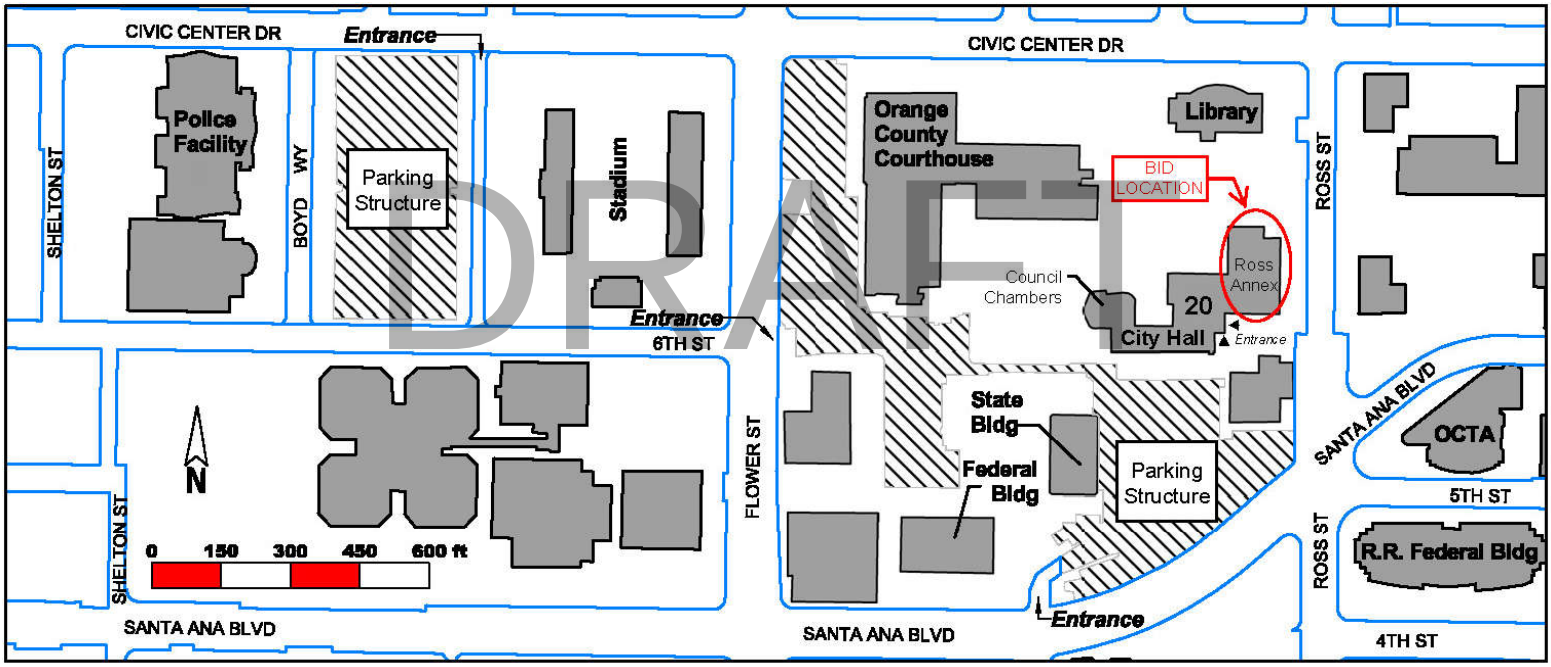
By:_____ Date:_____

Edwin "William" Galvez, P.E.
Acting Executive Director, Public Works Agency

MAP OF CITY HALL & DIRECTIONS TO BID OPENING

Civic Center Plaza

Public Works Agency
Ross Annex - 3rd Floor
20 Civic Center Plaza
Santa Ana, CA 92701



Directions

From 5 Fwy South
Exit Broadway, go South on Broadway, turn Right on Santa Ana Blvd.

From 5 Fwy North
Exit Grand Ave, turn Left on Grand Ave, turn Right on Santa Ana Blvd.

From 22 Fwy East
To I-5 South, exit Broadway go South on Broadway, turn Right on Santa Ana Blvd.

From 22 Fwy West
Exit Main St., turn Left on La Veta, turn Left on Main St., turn Right on Santa Ana Blvd.

INSTRUCTIONS TO BIDDERS FOR PROPOSAL SUBMISSION

INTENT OF PROPOSAL

The purpose of this Proposal is to identify a Prime Contractor to enter into a contract with the City of Santa Ana, referred to as AGENCY, to complete the Work shown on the Contract Documents.

PROPOSAL

The Proposal shall be submitted in accordance with the Notice Inviting Bids and shall be accompanied by the following documents:

1. *Bid Proposal*
2. *Bidder's Statement*
3. *Contractor's Licensing and Registration Statement*
4. *Prevailing Wage Compliance and Monitoring Statement*
5. *Ownership Affidavit*
6. *Bid Bond*
7. *List of Sub-Contractors*
8. *References*
9. *Additional References*
10. *Non-Collusion Affidavit*
11. *Non-Discrimination Certificate*
12. *Statement Regarding Apprenticeship Requirements*
13. *Statement Regarding "Anti-Kickback" Requirements*
14. *Public Contract Code Section 10162 Questionnaire*
15. *Federal Aid Certifications*

The Proposal may be considered non-responsive if any of these documents or forms is not included. The bid package shall be submitted as instructed in the Notice Inviting Bids. It is the BIDDER'S responsibility to ensure delivery of the Proposal to the location and prior to the bid opening hour stipulated in the Notice Inviting Bids. Late Proposals will not be considered.

CALIFORNIA STATE LABOR CODE

As outlined in the Notice Inviting Bids, this project is subject to compliance monitoring and enforcement by the State of California Department of Industrial Relations, per Section 1771.4.a.1. BIDDERS are required to inform themselves fully of the conditions relating to construction and labor under which the work will be performed. Any contract entered into pursuant to this notice will incorporate the provisions of the California State Labor Code. Per Section 171.4.a.2, Contractors are required to post job site notices, as prescribed by regulation.

EXAMINATION OF CONTRACT DOCUMENTS AND PROJECT SITE

BIDDERS shall satisfy themselves by personal examination of the work site, Contract Documents including the Plans and Specifications (and by any other means as they believe necessary) as to the actual physical conditions, requirements, and difficulties under which work must be performed.

DISCREPANCIES AND MISUNDERSTANDINGS

No BIDDER shall at any time after submission of a proposal make any claim or assertion that there was any misunderstanding or lack of information regarding the nature or amount of work necessary for the satisfactory completion of the job. Any errors, omissions, or discrepancies found in the Contract Documents including the Plans and Specifications shall be called to the attention of the AGENCY as a Request for Clarification and addressed prior to the submission of bid proposals.

REQUESTS FOR INTERPRETATION OF CONTRACT DOCUMENTS

Requests for interpretation must be received at least five (5) days prior to the bid opening date. The person submitting the request will be responsible for its prompt delivery. Any interpretation or correction of the documents will be made only by an Addendum.

ADDENDA

All addenda issued during open bid advertisement period will be posted on the City of Santa Ana website and shall become part of the Contract Documents. Before submitting a Proposal, each BIDDER is responsible to become self-informed as to whether or not addenda have been issued. It is the BIDDER's responsibility to notify the AGENCY regarding receipt of addenda.

WITHDRAWAL OF PROPOSAL

A Proposal may be withdrawn by submitting a written request signed by the BIDDER. Such requests must be delivered to the AGENCY'S Public Works Agency Executive Director prior to the bid-opening hour stipulated in the Notice Inviting Bids.

Proposals may not be withdrawn after said hour without forfeiture of the proposal guarantee which shall remain in effect for 60 days after opening bids. The withdrawal of the bid proposal will not prejudice the right of the BIDDER to submit a new bid proposal, providing there is time to do so, or to submit a new bid proposal if the is a rebidding of the same project.

BID PROTEST

Any bid protest must be submitted in writing to Executive Director of Public Works Agency, City of Santa Ana, 20 Civic Center Plaza M-21, Santa Ana, CA 92701 before 5:00 p.m. of the 5th business day following bid opening. Bid protests sent via mail or overnight carrier must be received by the AGENCY by 5:00 pm of the 5th business day following bid opening in order to be deemed timely. Hand delivered protests must be provided to the receptionist in the City Hall Annex/Public Works Counter on the first floor of the City Hall Annex.

a. The initial protest document shall contain a complete statement of the basis for the protest.

b. The protest shall refer to the specific portion of the Contract Document which forms the basis for the protest.

c. The protest shall include the name, address, and telephone number of the person representing the protesting party.

d. The party filing the protest shall concurrently transmit a copy of the initial protest document and any attached documentation to all other parties with a direct financial interest, which may be adversely affected by the outcome of the protest. Such parties

shall include all other BIDDERS or proposers who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest. If staff is aware a protest has been filed prior to the opening of bids, the AGENCY shall announce at bid opening who such parties shall be.

e. Should a written bid protest be filed in a timely fashion, a protest hearing shall be held before the Executive Director of Public Works or designee by the 10th business day from receipt of protest. All interested parties may appear and offer testimony at this bid protest hearing. Formal rules of evidence shall not apply at this hearing, nor shall testimony under oath be required. The burden of proof shall be on the party submitting the protest to demonstrate that the staff's determination of proposed low BIDDER is arbitrary and capricious, or unsupported by substantial evidence in the record.

f. All BIDDERS are advised that if you challenge the AGENCY's award of contract in court, you may be limited to raising only those issues you or someone else raised at the public hearing described above, or in written correspondence delivered to the Executive Director of Public Works at or prior to the public hearing.

g. The Executive Director of Public Works or designee will issue a written decision to the City Council on the protest, which shall also be promptly provided to all interested parties. If the Executive Director of Public Works or designee determines that a protest is frivolous, the party originating the protest may be determined to be irresponsible and that party may be determined to be ineligible for future contract awards.

h. The procedure and time limits set forth in this paragraph are mandatory and are the BIDDER's sole and exclusive remedy in the event of Bid protest, and failure to comply with these procedures shall constitute a waiver of any right to further pursue the bid protest, including filing a Government Code Claim or legal proceedings.

BID PROPOSAL

The definitions for Bid Items that are identified in the Bid Proposal form are provided in Appendix A.

The AGENCY will check each bid item unit price and amount for all the bids submitted. In case of a discrepancy between the correct product of the quantity multiplied by the unit price and the subtotal amount entered by the BIDDER, the correct unit price shall prevail and the product will be correctly accordingly.

In case of a discrepancy between the correct sum of the individual subtotal amounts and the total bid amount entered by the BIDDER, the correct sum shall prevail. If a unit price is not legible or is missing, the amount for that contract bid item shall be divided by the quantity to arrive at the unit price. The bid total shall be corrected and the results shall be considered as representing the bidder's intention. Proposals in which the prices are obviously unbalanced may be rejected.

If a Bid contains discrepancies that make it difficult or impossible to determine the bidder's intention, then such Bid may be considered unresponsive, in which case the bid may be rejected.

TIME FOR COMPLETION OF IMPROVEMENTS AND LIQUIDATED DAMAGES
The time for completion of this project, and the liquidated damages amount when/if the time for completion is exceeded, is included in the Bid Proposal Section of these Contract Documents.

BIDDERS STATEMENT
In accordance with Section 7028.15(e) of the Business and Professions Code, a licensed contractor shall not submit a bid to the public agency unless his or her contractor's license number appears clearly on the bid, the license expiration date is stated, and the bid contains a statement that representations made therein are made under penalty of perjury. Any bid not containing this information or a bid containing information, which is subsequently false, shall be considered non-responsive and shall be rejected by the public agency. Format for these statements are included in the Bid Proposal section of these Contract Documents.

In accordance with the Section 3300 of the California Public Contract Code, the Agency has determined that the BIDDER shall possess a license in the classification specified in the Notice Inviting Bids.

OWNERSHIP AFFIDAVIT
An Ownership Affidavit is required to be completed and submitted with the Bid Proposal. A form is provided in the Bid Proposal section of these Contract Documents.

PROPOSAL GUARANTY
Each bid shall be accompanied by a Proposal Guaranty as instructed in the Notice Inviting Bids. A sample Bid Bond is included in the Bid Proposal Section of these Contract Documents.

LIST OF SUB-CONTRACTORS
The State of California Public Contract Code requires listing of all subcontractors who intend to perform work which is ½ % of the bid or $10,000 (streets, highways and bridge projects), whichever is greater, or ½ % of the bid (buildings, parks, or other projects). A form for this information is provided in the Bid Proposal section of these Contract Documents.

REFERENCES/ADDITIONAL REFERENCES
BIDDER shall include a list of three public agencies for which BIDDER has performed similar work within past three (3) years, and three public agencies for which BIDDER and/or his Subcontractor has performed similar work within the past five (5) years. A form for this information is provided in the Bid Proposal section of these Contract Documents.

NON-COLLUSION AFFIDAVIT
In accordance with Title 23 United States Code Section 112 and Public Contract Code 7106, the AGENCY shall require all bidders to execute and submit a non-collusion affidavit with the Bid Proposal. A copy of the Non-Collusion Affidavit is provided in the Bid Proposal section of these Contract Documents.

NON-DISCRIMINATION CERTIFICATE
Attention is directed to Section 1735 of the California Labor Code, as added by Chapter 643, Statutes of 1939, which reads as follows:

"No discrimination shall be made in the employment of persons upon public works because of the race, religious creed, color, national origin, ancestry, physical handicap, medical condition, marital status, or sex of such persons except as provided in Section 1420, and every contractor for Public Works violating this Section is subject to all penalties imposed for a violation of the Chapter."

A copy of the Certification of Nondiscrimination by Contractors is provided in the Bid Proposal section of these Contract Documents.

STATEMENT REGARDING APPRENTICESHIP REQUIREMENTS

Bidders shall be familiar with the requirements of Section 1777.5 of the California State Labor Code regarding employment of apprentices and shall submit a Statement Regarding Apprenticeship Requirements with the Bid Proposal. A copy of the Statement is provided in the Bid Proposal section of these Contract Documents.

STATEMENT REGARDING "ANTI-KICK-BACK" REQUIREMENTS

Bidders shall be familiar with, and shall agree to comply with, the Copeland "Anti-Kickback" Act (18 USC 74) as supplemented in the Department of Labor regulations (29 CFR, Part 3), and shall submit a Statement Regarding "Anti-Kickback" Requirements with the Bid Proposal. A copy of the Statement is provided in the Bid Proposal section of these Contract Documents.

CONSTRUCTION CONTRACT AGREEMENT, BONDS & INSURANCE

The Construction Contract Agreement is included in the project Contract Documents as Appendix B, Sample Bonds are included as Appendix C, and Insurance Requirements are included as Appendix D.

Following authorization by City Council to award a Construction Contract, written notification will be given by the AGENCY to the successful BIDDER who will, within ten (10) business days, submit to the Agency the completed and signed Construction Contract Agreement, a Performance Bond, a Payment Bond, and evidence of Worker's Compensation Insurance.

Failure to execute a contract and submission of acceptable bonds and insurance as provided herein within the time limit above may be just cause for the annulment of contract award and the forfeiture of the bid proposal guarantee.

No contract shall be binding upon the AGENCY until it has been completely executed by the Contractor, approved by the City Attorney, and executed by the AGENCY.

After the AGENCY executes the Contract and approves the bonds and certificates of liability insurance, the AGENCY will send the successful BIDDER a copy of the fully executed Construction Contract Agreement.

RETURN OF PROPOSAL GUARANTIES

Within ten (10) days after the award of the contract, the AGENCY will return the proposal guaranties, other than Bid Bonds, except any guaranties that have been forfeited.

SPECIAL INSTRUCTIONS TO BIDDERS FOR FEDERALLY FUNDED PROJECTS

DAVIS-BACON ACT

Because this project is funded with XXXXXXXXXX money, the rate of wages for each craft or type of worker or mechanic employed under this contract shall be specified under the current determinations of the Department of Labor as required under the Davis-Bacon Act. The current wage determination can be obtained at the following location, upon entering Davis-Bacon Act Wage Decision (DBA WD) #CA35: www.wdol.gov/dba.aspx

Notwithstanding the conditions hereinabove, the California Labor Code stipulated that not less than the general prevailing rate of per diem wages for each craft or type of worker or mechanic needed to execute the contract in the locality in which the work is to be performed, and not less than the general prevailing rate of per diem wages for holiday and overtime work as determined by the Director of Industrial Relations of the State of California shall be paid to all workers employed. A copy of the prevailing rate of per diem wages is on file in the Public Works Agency, Construction Engineering Division, City of Santa Ana and is available on request to any interested party.

Where a discrepancy exists between federal and state prevailing wage rates, the policy of the California Department of Labor is to require that the higher of the two prevailing wage rates shall apply.

DESIGN ENGINEER MAY NOT BID ON CONSTRUCTION CONTRACT

No engineering or architectural firm which has provided design services for a project shall be eligible to bid on the contract to construct the project. The firms ineligible to bid include the Prime Contractor for design, Subcontractors of portions of the design, and affiliates of either. An affiliate is a firm which is subject to the control of the same persons, through joint ownership or otherwise.

DISADVANTAGED BUSINESS ENTERPRISES (DBE)

Under 49 CFR 26.13(b):

> The contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate.

Take necessary and reasonable steps to ensure that DBEs have opportunity to participate in the contract (49 CFR 26).

To ensure equal participation of DBEs provided in 49 CFR 26.5, the Agency shows a goal for DBEs.

Make work available to DBEs and select work parts consistent with available DBE subcontractors and suppliers.

Meet the DBE goal shown elsewhere in these special provisions or demonstrate that you made adequate good faith efforts to meet this goal.

It is your responsibility to verify that the DBE firm is certified as DBE at date of bid opening. For a list of DBEs certified by the California Unified Certification Program, go to:

http://www.dot.ca.gov/hq/bep/find_certified.htm

All DBE participation will count toward the California Department of Transportation's federally mandated statewide overall DBE goal.

Credit for materials or supplies you purchase from DBEs counts towards the goal in the following manner:

- 100 percent counts if the materials or supplies are obtained from a DBE manufacturer.
- 60 percent counts if the materials or supplies are obtained from a DBE regular dealer.
- Only fees, commissions, and charges for assistance in the procurement and delivery of materials or supplies count if obtained from a DBE that is neither a manufacturer nor regular dealer. 49 CFR 26.55 defines "manufacturer" and "regular dealer."

You receive credit towards the goal if you employ a DBE trucking company that performs a commercially useful function as defined in 49 CFR 26.55(d)(1) through (4) and (6).

a. *DBE Commitment Submittal*

Submit the Exhibit 15-G *Construction Contract DBE Commitment* form, included in the Bid book. If the form is not submitted with the bid, remove the form from the Bid book before submitting your bid.

If the DBE Commitment form is not submitted with the bid, the apparent low bidder, the 2nd low bidder, and the 3rd low bidder must complete and submit the DBE Commitment form to the Agency. DBE Commitment form must be received by the Agency no later than 4:00 p.m. on the 4th business day after bid opening.

Other bidders do not need to submit the DBE Commitment form unless the Agency requests it. If the Agency requests you to submit a DBE Commitment form, submit the completed form within 4 business days of the request.

Submit written confirmation from each DBE stating that it is participating in the contract. Include confirmation with the DBE Commitment form. A copy of a DBE's quote will serve as written confirmation that the DBE is participating in the contract.

If you do not submit the DBE Commitment form within the specified time, the Agency will find your bid nonresponsive.

b. ***Good Faith Efforts Submittal***

If you have not met the DBE goal, complete and submit the DBE Information - Good Faith Efforts, Exhibit 15-H, form with the bid showing that you made adequate good faith efforts to meet the goal. Only good faith efforts directed towards obtaining participation by DBEs will be considered. If good faith efforts documentation is not submitted with the bid, it must be received by the Agency no later than 4:00 p.m. on the 4th business day after bid opening.

If your DBE Commitment form shows that you have met the DBE goal or if you are required to submit the DBE Commitment form, you must also submit good faith efforts documentation within the specified time to protect your eligibility for award of the contract in the event the Agency finds that the DBE goal has not been met.

Good faith efforts documentation must include the following information and supporting documents, as necessary:

1. Items of work you have made available to DBE firms. Identify those items of work you might otherwise perform with your own forces and those items that have been broken down into economically feasible units to facilitate DBE participation. For each item listed, show the dollar value and percentage of the total contract. It is your responsibility to demonstrate that sufficient work to meet the goal was made available to DBE firms.

2. Names of certified DBEs and dates on which they were solicited to bid on the project. Include the items of work offered. Describe the methods used for following up initial solicitations to determine with certainty if the DBEs were interested, and the dates of the follow-up. Attach supporting documents such as copies of letters, memos, facsimiles sent, telephone logs, telephone billing statements, and other evidence of solicitation. You are reminded to solicit certified DBEs through all reasonable and available means and provide sufficient time to allow DBEs to respond.

3. Name of selected firm and its status as a DBE for each item of work made available. Include name, address, and telephone number of each DBE that provided a quote and their price quote. If the firm selected for the item is not a DBE, provide the reasons for the selection.

4. Name and date of each publication in which you requested DBE participation for the project. Attach copies of the published advertisements.

5. Names of agencies and dates on which they were contacted to provide assistance in contacting, recruiting, and using DBE firms. If the agencies were contacted in writing, provide copies of supporting documents.

6. List of efforts made to provide interested DBEs with adequate information about the plans, specifications, and requirements of the contract to assist them in responding to a solicitation. If you have provided information, identify the name of the DBE

assisted, the nature of the information provided, and date of contact. Provide copies of supporting documents, as appropriate.

7. List of efforts made to assist interested DBEs in obtaining bonding, lines of credit, insurance, necessary equipment, supplies, and materials, excluding supplies and equipment that the DBE subcontractor purchases or leases from the prime contractor or its affiliate. If such assistance is provided by you, identify the name of the DBE assisted, nature of the assistance offered, and date assistance was provided. Provide copies of supporting documents, as appropriate.

8. Any additional data to support demonstration of good faith efforts.

The Agency may consider DBE commitments of the 2nd and 3rd bidders when determining whether the low bidder made good faith efforts to meet the DBE goal.

c. ***Exhibit 15-G - Construction Contract DBE Information***

Complete and sign Exhibit 15-G *Construction Contract DBE Commitment* included in the contract documents regardless of whether DBE participation is reported.

Provide written confirmation from each DBE that the DBE is participating in the Contract. A copy of a DBE's quote serves as written confirmation. If a DBE is participating as a joint venture partner, the Agency encourages you to submit a copy of the joint venture agreement

d. ***Subcontractor and Disadvantaged Business Enterprise Records***

Use each DBE subcontractor as listed on Exhibit 12-B *Bidder's List of Subcontractors (DBE and Non-DBE)* and Exhibit 15-G *Construction Contract DBE Commitment* form unless you receive authorization for a substitution.

The Agency requests the Contractor to:

1. Notify the Engineer of any changes to its anticipated DBE participation

2. Provide this notification before starting the affected work

3. Maintain records including:

   - Name and business address of each 1st-tier subcontractor

   - Name and business address of each DBE subcontractor, DBE vendor, and DBE trucking company, regardless of tier

   - Date of payment and total amount paid to each business

If you are a DBE contractor, include the date of work performed by your own forces and the corresponding value of the work.

Before the 15th of each month, submit a Monthly DBE Trucking Verification form.

If a DBE is decertified before completing its work, the DBE must notify you in writing of the decertification date. If a business becomes a certified DBE before completing its work, the business must notify you in writing of the certification date. Submit the notifications. On work completion, complete a Disadvantaged Business Enterprises (DBE) Certification Status Change, Exhibit 17-O, form. Submit the form within 30 days of contract acceptance.

Upon work completion, complete Exhibit 17-F *Final Report – Utilization of Disadvantaged Business Enterprises (DBE), First-Tier Subcontractors*. Submit it within 90 days of contract acceptance. The Agency will withhold $10,000 until the form is submitted. The Agency releases the withhold upon submission of the completed form.

e. ***Performance of Disadvantaged Business Enterprises***

DBEs must perform work or supply materials as listed in the Exhibit 15-G *Construction Contract DBE Commitment* form, included in the Bid.

Do not terminate or substitute a listed DBE for convenience and perform the work with your own forces or obtain materials from other sources without authorization from the Agency.

The Agency authorizes a request to use other forces or sources of materials if it shows any of the following justifications:

1. Listed DBE fails or refuses to execute a written contract based on plans and specifications for the project.

2. You stipulated that a bond is a condition of executing the subcontract and the listed DBE fails to meet your bond requirements.

3. Work requires a contractor's license and listed DBE does not have a valid license under Contractors License Law.

4. Listed DBE fails or refuses to perform the work or furnish the listed materials.

5. Listed DBE's work is unsatisfactory and not in compliance with the contract.

6. Listed DBE is ineligible to work on the project because of suspension or debarment.

7. Listed DBE becomes bankrupt or insolvent.

8. Listed DBE voluntarily withdraws with written notice from the Contract.

9. Listed DBE is ineligible to receive credit for the type of work required.

10. Listed DBE owner dies or becomes disabled resulting in the inability to perform the work on the Contract.

11. Agency determines other documented good cause.

Notify the original DBE of your intent to use other forces or material sources and provide the reasons. Provide the DBE with 5 days to respond to your notice and advise you and the Agency of the reasons why the use of other forces or sources of materials should not occur. Your request to use other forces or material sources must include:

1. One or more of the reasons listed in the preceding paragraph

2. Notices from you to the DBE regarding the request

3. Notices from the DBEs to you regarding the request

If a listed DBE is terminated or substituted, you must make good faith efforts to find another DBE to substitute for the original DBE. The substitute DBE must perform at least the same amount of work as the original DBE under the contract to the extent needed to meet the DBE goal.

The substitute DBE must be certified as a DBE at the time of request for substitution.

Unless the Agency authorizes (1) a request to use other forces or sources of materials or (2) a good faith effort for a substitution of a terminated DBE, the Agency does not pay for work listed on the Exhibit 15-G *Construction Contract DBE Commitment* form unless it is performed or supplied by the listed DBE or an authorized substitute.

BID OPENING

The Agency publicly opens and reads bids at the time and place shown on the Notice Inviting Bids.

BID RIGGING

The U.S. Department of Transportation (DOT) provides a toll-free hotline to report bid rigging activities. Use the hotline to report bid rigging, bidder collusion, and other fraudulent activities. The hotline number is (800) 424-9071. The service is available 24 hours 7 days a week and is confidential and anonymous.. The hotline is part of the DOT's effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General.

CONTRACT AWARD

If the Agency awards the contract, the award is made to the lowest responsible and responsive BIDDER.

CONTRACTOR LICENSE

The Contractor must be properly licensed as a contractor from contract award through Contract acceptance (Public Contract Code § 10164).

CHANGED CONDITIONS

a. ***Differing Site Conditions***

1. During the progress of the work, if subsurface or latent physical conditions are encountered at the site differing materially from those indicated in the contract or if unknown physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract, are encountered at the site, the party discovering such conditions shall promptly notify the other party in writing of the specific differing conditions before the site is disturbed and before the affected work is performed.

2. Upon written notification, the engineer will investigate the conditions, and if it is determined that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any work under the contract, an adjustment, excluding anticipated profits, will be made and the contract modified in writing accordingly. The engineer will notify the contractor of the determination whether or not an adjustment of the contract is warranted.

3. No contract adjustment which results in a benefit to the contractor will be allowed unless the contractor has provided the required written notice.

4. No contract adjustment will be allowed under this clause for any effects caused on unchanged work. (This provision may be omitted by the Local Agency, at their option.)

b. Suspensions of Work Ordered by the Engineer

1. If the performance of all or any portion of the work is suspended or delayed by the engineer in writing for an unreasonable period of time (not originally anticipated, customary, or inherent to the construction industry) and the contractor believes that additional compensation and/or contract time is due as a result of such suspension or delay, the contractor shall submit to the engineer in writing a request for adjustment within 7 calendar days of receipt of the notice to resume work. The request shall set forth the reasons and support for such adjustment.

2. Upon receipt, the engineer will evaluate the contractor's request. If the engineer agrees that the cost and/or time required for the performance of the contract has increased as a result of such suspension and the suspension was caused by conditions beyond the control of and not the fault of the contractor, its suppliers, or subcontractors at any approved tier, and not caused by weather, the engineer will make an adjustment (excluding profit) and modify the contract in writing accordingly. The contractor will be notified of the engineer's determination whether or not an adjustment of the contract is warranted.

3. No contract adjustment will be allowed unless the contractor has submitted the request for adjustment within the time prescribed.

4. No contract adjustment will be allowed under this clause to the extent that performance would have been suspended or delayed by any other cause, or for which an adjustment is provided or excluded under any other term or condition of this contract.

c. Significant Changes in the Character of Work

1. The engineer reserves the right to make, in writing, at any time during the work, such changes in quantities and such alterations in the work as are necessary to satisfactorily complete the project. Such changes in quantities and alterations shall not invalidate the contract nor release the surety, and the contractor agrees to perform the work as altered.

2. If the alterations or changes in quantities significantly change the character of the work under the contract, whether such alterations or changes are in themselves significant changes to the character of the work or by affecting other work cause such other work to become significantly different in character, an adjustment, excluding anticipated profit, will be made to the contract. The basis for the adjustment shall be agreed upon prior to the performance of the work. If a basis cannot be agreed upon, then an adjustment will be made either for or against the contractor in such amount as the engineer may determine to be fair and equitable.

3. If the alterations or changes in quantities do not significantly change the character of the work to be performed under the contract, the altered work will be paid for as provided elsewhere in the contract.

4. The term "significant change" shall be construed to apply only to the following circumstances:

   - When the character of the work as altered differs materially in kind or nature from that involved or included in the original proposed construction; or

   - When a major item of work, as defined elsewhere in the contract, is increased in excess of 125 percent or decreased below 75 percent of the original contract quantity. Any allowance for an increase in quantity shall apply only to that portion in excess of 125 percent of original contract item quantity, or in case of a decrease below 75 percent, to the actual amount of work performed.

<u>BUY AMERICA REQUIREMENTS</u>

Furnish steel and iron materials to be incorporated into the work with certificates of compliance. Steel and iron materials must be produced in the U.S. except:

1. Foreign pig iron and processed, pelletized, and reduced iron ore may be used in the domestic production of the steel and iron materials [60 Fed Reg 15478 (03/24/1995)];

2. If the total combined cost of the materials does not exceed the greater of 0.1 percent of the total bid or $2,500, materials produced outside the U.S. may be used.

Production includes:

1. Processing steel and iron materials, including smelting or other processes that alter the physical form or shape (such as rolling, extruding, machining, bending, grinding, and drilling) or chemical composition

2. Coating application, including epoxy coating, galvanizing, and painting, that protects or enhances the value of steel and iron materials.

QUALITY ASSURANCE

The Agency uses a Quality Assurance Program (QAP) to ensure a material is produced to comply with the Contract.

You may examine the records and reports of tests the Agency performs if they are available at the job site.

Schedule work to allow time for QAP.

PROMPT PAYMENT OF FUNDS WITHHELD TO SUBCONTRACTORS

The agency shall hold retainage from the prime contractor and shall make prompt and regular incremental acceptances of portions, as determined by the agency, of the contract work, and pay retainage to the prime contractor based on these acceptances. The prime contractor, or subcontractor, shall return all monies withheld in retention from a subcontractor within 30 days after receiving payment for work satisfactorily completed and accepted including incremental acceptances of portions of the contract work by the agency. Federal law (49CFR26.29) requires that any delay or postponement of payment over 30 days may take place only for good cause and with the agency's prior written approval. Any violation of this provision shall subject the violating prime contractor or subcontractor to the penalties, sanctions and other remedies specified in Section 7108.5 of the Business and Professions Code. These requirements shall not be construed to limit or impair any contractual, administrative, or judicial remedies otherwise available to the prime contractor or subcontractor in the event of a dispute involving late payment or nonpayment by the prime contractor, deficient subcontract performance, or noncompliance by a subcontractor.

FORM FHWA-1273 REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONTRACTS

Form FHWA-1273 is included in Appendix X of the Contract Documents.

FEMALE AND MINORITY GOALS

To comply with Section II, "Nondiscrimination," of "Required Contract Provisions Federal-Aid Construction Contracts," the following are goals for female and minority utilization for Federal-aid construction contracts and subcontracts that exceed $10,000:

The nationwide goal for female utilization is 6.9 percent.

The goal for minority utilization is 11.9 percent.

TITLE VI ASSURANCES

During the performance of this Agreement, the contractor, for itself, its assignees and successors in interest (hereinafter collectively referred to as Contractor) agrees as follows:

(1) Compliance with Regulations: CONTRACTOR shall comply with the regulations relative to nondiscrimination in federally assisted programs of the Department of Transportation, Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the REGULATIONS), which are herein incorporated by reference and made a part of this agreement.

(2) Nondiscrimination: CONTRACTOR, with regard to the work performed by it during the AGREEMENT, shall not discriminate on the grounds of race, color, sex, national origin, religion, age, or disability in the selection and retention of sub-applicants, including procurements of materials and leases of equipment. CONTRACTOR shall not participate either directly or indirectly in the discrimination prohibited by Section 21.5 of the Regulations, including employment practices when the agreement covers a program set forth in Appendix B of the Regulations.

(3) Solicitations for Sub-agreements, Including Procurements of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by CONTRACTOR for work to be performed under a Sub-agreement, including procurements of materials or leases of equipment, each potential sub-applicant or supplier shall be notified by CONTRACTOR of the CONTRACTOR'S obligations under this Agreement and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.

(4) Information and Reports: CONTRACTOR shall provide all information and reports required by the Regulations, or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the California Department of Transportation or FHWA to be pertinent to ascertain compliance with such Regulations or directives. Where any information required of CONTRACTOR is in the exclusive possession of another who fails or refuses to furnish this information, CONTRACTOR shall so certify to the California Department of Transportation or the FHWA as appropriate, and shall set forth what efforts CONTRACTOR has made to obtain the information.

(5) Sanctions for Noncompliance: In the event of CONTRACTOR's noncompliance with the nondiscrimination provisions of this agreement, the California Department of Transportation shall impose such agreement sanctions as it or the FHWA may determine to be appropriate, including, but not limited to:

(a) withholding of payments to CONTRACTOR under the Agreement within a reasonable period of time, not to exceed 90 days; and/or

(b) cancellation, termination or suspension of the Agreement, in whole or in part.

(6) Incorporation of Provisions: CONTRACTOR shall include the provisions of paragraphs (1) through (6) in every sub-agreement, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto.

CONTRACTOR shall take such action with respect to any sub-agreement or procurement as the California Department of Transportation or FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance, provided, however, that, in the event CONTRACTOR becomes involved in, or is threatened with, litigation with a sub-applicant or supplier as a result of such direction, CONTRACTOR may request the California Department of Transportation enter into such litigation to protect the interests of the State, and, in addition, CONTRACTOR may request the United States to enter into such litigation to protect the interests of the United States

USE OF UNITED STATES-FLAG VESSELS
The CONTRACTOR agrees-

1. To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carries, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.

2. To Furnish within 20 days following the date of loading for shipments originating within the United State or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated "on-board" commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.

3. To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract.

CERTIFICATIONS, STATEMENTS, FORMS AND QUESTIONNAIRES
The City of Santa Ana, as AGENCY, will require, prior to the award of any non-exempt Federally assisted construction contract or subcontract, that each prospective contractor and subcontractor submit the Certifications, Statements, Forms and Questionnaires which are included in Appendix X of the Contract Documents.

CITY OF SANTA ANA

PROPOSAL

PROJECT NO.: XX-XXXX

PROJECT TITLE

BID PROPOSAL

TO: CITY COUNCIL OF THE CITY OF SANTA ANA

FROM: _____

REQUIREMENT:

The undersigned bidder declares that they have carefully examined the location of the proposed work, that they have examined the Contract Documents in its entirety and hereby proposes to furnish all material and do all the work required to complete the said work in accordance with said plans (if any) and the specifications for the unit price(s) or lump sum(s) set forth in the following schedule:

Item	Description	Qty	Unit	Unit Price	Amount
1				$	$
2				$	$
3				$	$
4				$	$
5				$	$
6				$	$
7				$	$
8				$	$
9				$	$
10				$	$
11				$	$
12				$	$
13				$	$
14				$	$

CITY OF SANTA ANA
PROPOSAL
PROJECT NO.: XX-XXXX
PROJECT TITLE

Item	Description	Qty	Unit	Unit Price	Amount
15				$	$
16				$	$
17				$	$
18	Labor Agreement Oversight	1	LS	$ Enter $$	$ Match Unit Price

TOTAL BASE BID	$

The lowest responsible bidder shall be selected based on the total base bid. The City reserves the right to award the Base Bid, and any, all, or none of the add-alternate bid items (if any).

* The quantity for this bid item is shown for bid comparison only. This bid item shall not be subject to the "25%" limit as stated in Section 3-2 of the Standard Specifications. The actual amount for this item will be dictated by the actual quantity used, and the Agency reserves the right to increase or decrease the quantity of this item accordingly.

† This bid item is considered a Specialty Item per Section 2-3.2 of the Standard Specifications.

TIME FOR COMPLETION OF IMPROVEMENTS AND LIQUIDATED DAMAGES

The undersigned bidder hereby proposes to complete the Work for the total base bid amount shown above, within number (XXX) working days after the commencement date stated in the Notice to Proceed.

The liquidated damages amount, in lieu of the amount specified in Subsection 6-9 of the Standard Specifications, shall be $X,XXX per calendar day.

Name of Firm _____

Signature of BIDDER _____

Title _____
(If an individual, so state. If a firm or co-partnership, state the firm name and give the names of all individual co-partners composing the firm. If a corporation, state legal name of corporation, and names of President, Secretary, Treasurer and Manager, thereof.)

CITY OF SANTA ANA
PROPOSAL
PROJECT NO.: XX-XXXX
PROJECT TITLE

BIDDER'S STATEMENT

BIDDER understands and agrees that this Bid Proposal, Contract Documents and subsequent Construction Contract Agreement shall constitute the entire agreement between BIDDER and the AGENCY only after it has been accepted by the City Council, endorsed by the Clerk of the Council with her signature and official seal noting hereon the action of approval of the Council, signed by the Public Works Agency Executive Director or his/her duly authorized agent, and signed by the City Attorney, denoting his approval of the form of this document, and its execution, and when it or an exact copy of it has been either delivered to BIDDER or deposited with the United States Postal Service properly addressed to the BIDDER with the correct postage affixed thereto.

BIDDER further agrees that upon delivery (as defined above) of the accepted agreement he/she will furnish AGENCY all required bonds and certificate of liability insurance within ten (10) business days or the funds, check, draft, or BIDDERS bond substituted in lieu thereof accompanying this proposal shall become the property of the AGENCY and shall be considered as payment of damages due to the delay and other causes suffered by AGENCY because of the failure to furnish the necessary bonds and because it is distinctly agreed that the proof of damages actually suffered is difficult to ascertain; otherwise said funds, check, drafts, or BIDDER'S bond substituted in lieu thereof shall be returned to the undersigned.

BIDDER understands that a bid is required for the entire work, the estimated quantities set forth in the bid schedule are solely for the purpose of comparing bids, and that final compensation under the contract will be based upon the actual quantities of work satisfactorily completed. The BIDDER also certifies that the bid is a balanced bid.

In accordance with Section 7028.15 of the California Business and Professions Code, the undersigned certifies under penalty of perjury that the foregoing is true and correct.

Name of Firm _____

Signature of BIDDER _____

Title _____
(If an individual, so state. If a firm or co-partnership, state the firm name and give the names of all individual co-partners composing the firm. If a corporation, state legal name of corporation, and names of President, Secretary, Treasurer and Manager, thereof.)

CITY OF SANTA ANA
PROPOSAL
PROJECT NO.: XX-XXXX
PROJECT TITLE

CONTRACTOR'S LICENSING AND REGISTRATION STATEMENT

The undersigned contractor, or corporate officer, declares under penalty of perjury that he/she and all his/her subcontractors are registered with the State of California Department of Industrial Relations (DIR), and that the following is true and correct.

Contractor's Name: _____

Business Address: _____

Business E-Mail Address: _____

Telephone: _____

State Contractor's License No. and Class: _____

License Expiration Date: _____

State Dept. of Industrial Relations (DIR) Registration No.: _____

State Dept. of Industrial Relations (DIR) Registration Expiration Date: _____

Signed: _____

Title: _____

PREVAILING WAGE COMPLIANCE AND MONITORING STATEMENT

Contractor is aware of the requirements of California Labor Code Section 1720, et seq., as well as California Code of Regulations, Title 8, Section 16,000, et seq., ("Prevailing Wage Laws"), which require the payment of prevailing wage rates and the performance of other requirements on "public works" and "maintenance" projects. Since the services are being performed as part of an applicable "public works" or "maintenance" project, as defined by the Prevailing Wage Laws, and since the total compensation is $1,000 or more, Contractor agrees to fully comply with such Prevailing Wage Laws.

City shall provide Contractor with a copy of the prevailing rates of per diem wages in effect at the commencement of this Agreement. Contractor shall make copies of the prevailing rates of per diem wages for each craft, classification or type of worker needed to execute the services available to interested parties upon request, and shall post copies at the Contractor's principal place of business and at the project site.

Contractor shall defend, indemnify and hold the City, its elected officials, officers, employees and agents free and harmless from any claim or liability arising out of any failure or alleged failure to comply with the Prevailing Wage Laws.

The undersigned certifies that the foregoing is true and correct.

Name of Firm _____

Signature of BIDDER _____

Title _____
(if an individual, so state)

CITY OF SANTA ANA
PROPOSAL
PROJECT NO.: XX-XXXX
PROJECT TITLE

OWNERSHIP AFFIDAVIT

STATE OF CALIFORNIA)
COUNTY OF ORANGE) SS:
CITY OF SANTA ANA)

_____ , being duly sworn, deposes and says:

☐ INDIVIDUAL — That he/she is the party making the foregoing proposal:

☐ PARTNERSHIP — That he/she is a member of the co-partnership firm designated as:

_____

_____

and who has been and is duly vested with the authority to make and execute instruments for the co-partnership by:

_____

_____

who constitute the other members of the co-partnership.

☐ CORPORATION — That he is of:

_____

_____

a corporation which is making the foregoing proposal:

☐ JOINT VENTURE — That he is of:

_____

_____

one of the parties making the foregoing proposal as a joint venture, and the he/she has been and is duly vested with the authority to execute instruments for an on behalf of the parties making said bid who are:

_____

_____

that such a bid is genuine and not collusive or sham, and has not in any manner sought by collusion to secure any advantage against the City of Santa Ana or any person interested in the proposed contract, for himself or any other person.

_____
Signature of Bidder

Subscribed and sworn to before me this _____ day of _____ 20 ___

_____
Signature of officer Administering Oath (Notary Public)

CITY OF SANTA ANA
PROPOSAL
PROJECT NO.: XX-XXXX
PROJECT TITLE

BID BOND

KNOW ALL PRESENT that,
_____ , as BIDDER, and
_____ , as SURETY,
are held and firmly bound unto the CITY OF SANTA ANA, as AGENCY, in the penal sum of __ _____ Dollars ($_____), which is ten percent (10%) of the total amount bid by BIDDER to AGENCY for the above-stated project, for the payment of which sum, BIDDER and SURETY agree to be bound, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION ARE SUCH that, whereas BIDDER is about to submit a bid to AGENCY for the above-stated project, if said bid is rejected, or if said bid is accepted and a contract is awarded and entered into by BIDDER in the manner and time specified, then this obligation shall be null and void, otherwise it shall remain in full force and effect in favor of AGENCY.

IN WITNESS WHEREOF the parties hereto have set their names, titles, hands, and seal this _____ day of _____ , 20___.

BIDDER*

_____

_____

SURETY*

_____

_____

Subscribed and sworn to before me _____ this _____ day of _____ , 20___.

Signature: _____

Notary Public in and for the County of _____ , State of _____

* Provide BIDDER/ SURETY name, address, and telephone number and the name, title, address, and telephone number of authorized representative.

CITY OF SANTA ANA

PROPOSAL

PROJECT NO.: XX-XXXX

PROJECT TITLE

LIST OF SUB-CONTRACTORS

Section 4100 et. seq. of the Public Contract Code requires listing of all subcontractors with the bid for all subcontract work exceeding the following amount:

- Streets, highways including bridge projects: ½% of the bid or $10,000, whichever is greater
- Buildings, parks, or other projects: ½% of the bid

Section 1725.5 of the Public Contract Code requires all Subcontractors be registered with the State Department of Industrial Relations (DIR).

BIDDER proposes to subcontract certain portions of the work to the firms listed below:

Name _____
License #/Exp. _____
DIR Reg. #/Exp. _____
Location _____
Phone _____
Type Of Work _____
Amount $ _____

Name _____
License #/Exp. _____
DIR Reg. #/Exp. _____
Location _____
Phone _____
Type Of Work _____
Amount $ _____

Name _____
License #/Exp. _____
DIR Reg. #/Exp. _____
License # _____
Location _____
Phone _____
Type Of Work _____
Amount $ _____

Name _____
License #/Exp. _____
DIR Reg. #/Exp. _____
License # _____
Location _____
Phone _____
Type Of Work _____
Amount $ _____

Name _____
License #/Exp. _____
DIR Reg. #/Exp. _____
License # _____
Location _____
Phone _____
Type Of Work _____
Amount $ _____

Name _____
License #/Exp. _____
DIR Reg. #/Exp. _____
License # _____
Location _____
Phone _____
Type Of Work _____
Amount $ _____

_____
Signature of Bidder

CITY OF SANTA ANA
PROPOSAL
PROJECT NO.: XX-XXXX
PROJECT TITLE

REFERENCES

The following are the names, addresses, and telephone numbers for **THREE** public agencies for which the BIDDER has performed similar work within the past three years.

1. _____
Name and Address of Owner.

_____
Name and Telephone Number of person familiar with project.

_____ _____ _____
Contract Amount Type of Work Date Completed

2. _____
Name and Address of owner.

_____
Name and Telephone Number of person familiar with project.

_____ _____ _____
Contract Amount Type of Work Date Completed

3. _____
Name and Address of owner.

_____
Name and Telephone Number of person familiar with project.

_____ _____ _____
Contract Amount Type of Work Date Completed

The following are the names, addresses, and telephone numbers of all brokers and sureties from whom BIDDER intends to procure insurance and bonds.

_____

_____

_____

_____

ADDITIONAL REFERENCES

The following are the names, addresses, and telephone numbers for **THREE** public agencies for which the BIDDER or Subcontractor has performed similar work in the past five years.

1. _____
Name and Address of Owner.

_____
Name and Telephone Number of person familiar with project.

_____ _____ _____
Contract Amount Type of Work Date Completed

2. _____
Name and Address of owner.

_____
Name and Telephone Number of person familiar with project.

_____ _____ _____
Contract Amount Type of Work Date Completed

3. _____
Name and Address of owner.

_____
Name and Telephone Number of person familiar with project.

_____ _____ _____
Contract Amount Type of Work Date Completed

The following are the names, addresses, and telephone numbers of all brokers and sureties from whom BIDDER intends to procure insurance and bonds.

_____

_____

_____

_____

CITY OF SANTA ANA
PROPOSAL
PROJECT NO.: XX-XXXX
PROJECT TITLE

NON-COLLUSION AFFIDAVIT

(Title 23 United States Code Section 112 and Public Contract Code Section 7106)

In conformance with Title 23 United States Code Section 112 and Public Contract Code 7106 the BIDDER declares that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the BIDDER has not directly or indirectly induced or solicited any other BIDDER to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any BIDDER or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the BIDDER has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the BIDDER or any other BIDDER, or to fix any overhead, profit, or cost element of the bid price, or of that of any other BIDDER, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the BIDDER has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

Note: The above Non-collusion Affidavit is part of the Proposal. BIDDERS are cautioned that making a false certification may subject the certifier to criminal prosecution.

Signed _____

State of California
County of _____

Subscribed and sworn to (or affirmed) before me on this _____ day of _____, 20__, by _____, proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me

_____
Notary Public Signature

Notary Public Seal

NON-DISCRIMINATION CERTIFICATE

The undersigned contractor or corporate officer, during the performance of this contract, certifies as follows:

1. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without, regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

2. The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

3. The Contractor shall send to each labor union or representative of workers with which he/she has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. The Contractor shall comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

5. The Contractor shall furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his/her books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation, to ascertain compliance with such rules, regulations, and orders.

6. In the event of the Contractor's non-compliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, the contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Execution Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulations, or order of the Secretary of Labor, or as otherwise provided by law.

7. The Contractor shall include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontract or purchase order as the administering agency may direct as means of enforcing such provisions, including sanctions for noncompliance; provided, however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the Contractor may request that the United States enter into such litigation to protect the interests of the United States.

8. Pursuant to California Labor Code Section 1735, as added by Chapter 643 Stats. 1939, and as amended, no discrimination shall be made in the employment of persons upon public works because of race, religious creed, color, national origin, ancestry, physical handicaps, mental condition, marital status, or sex of such persons, except as provided in Section 1420, and any contractor of public works violating this Section is subject to all the penalties imposed for a violation of the Chapter.

Signed: _____

Title: _____

Firm: _____

Date: _____

CITY OF SANTA ANA
PROPOSAL
PROJECT NO.: XX-XXXX
PROJECT TITLE

STATEMENT REGARDING APPRENTICESHIP REQUIREMENTS

The undersigned BIDDER is familiar with the requirements of Section 1777.5 of the State Labor Code regarding employment of apprentices, and understands that contractors on contracts exceeding $30,000 or 20 working days shall:

1. Apply to the joint apprenticeship committee administering the apprenticeship standards of the craft or trade in the area of the site of the public work for a certificate approving the contractor under the apprenticeship standards for the employment and training of apprentices in the area or industry affected.

2. Employ the number of apprentices or the ratio of apprentices to journeymen stipulated in the apprenticeship standards.

3. Contribute to the fund or funds in each craft or trade in which he/she employs journeymen or apprentices on the public work, in the same amount or upon the same basis and in the same manner as the other contractors, except contractors not signatory to the trust agreement shall pay a like amount to the California Apprenticeship Council.

Signed: _____

Title: _____

Firm: _____

Date: _____

STATEMENT REGARDING "ANTI-KICKBACK" REQUIREMENTS

The undersigned is submitting this proposal for performing by contract the work required by these bid documents, agrees to comply with the Copeland "Anti-Kickback" Act (18 USC 74) as supplemented in the Department of Labor regulations (29 CFR, Part 3). This act provides that each contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction or repair of public work, to give up any part of the compensation to which he/she is otherwise entitled.

Signed: _____

Title: _____

Firm: _____

Date: _____

PUBLIC CONTRACT CODE SECTION 10162 QUESTIONNAIRE

In conformance with Public Contract Code Section 10162, the BIDDER shall complete, under penalty of perjury, the following questionnaire:

Has the BIDDER, any officer of the BIDDER, or any employee of the BIDDER who has a proprietary interest in the BIDDER, ever been disqualified, removed, or otherwise prevented from bidding on, or completing a federal, state, or local government project because of a violation of law or a safety regulation?

Yes _____ No _____

If the answer is yes, explain the circumstances in the following space.

FORWARD

The Standard Specifications is the 2012 edition, including all supplements, at time of bid of the Standard Specifications for Public Works Construction, including supplements and accompanying Standard Plans, written and promulgated by Public Works Standards, Inc. These Standard Specifications shall control the general provisions, construction materials, and construction methods for this contract, except as amended by the Contract Documents.

The following General Provisions are supplementary and in addition to the provisions of the Standard Specifications, unless otherwise noted. The section and subsection numbering system used in these General Provisions corresponds to that used in the Standard Specifications.

The State of California Department of Transportation Standard Specifications, Standard Plans, and Manual on Uniform Traffic Control Devices, latest edition at time of bid of each, are incorporated herein by reference and are hereby accepted as Reference Specifications. These Reference Specifications are intended to govern certain construction materials, methods, and details except as modified herein or are inconsistent with the provisions herein.

PART 1
GENERAL PROVISIONS

SECTION 1 - TERMS, DEFINITIONS, ABBREVIATIONS, UNITS OF MEASURE AND SYMBOLS

1-2 TERMS & DEFINITIONS

Add the following to this subsection:

Acceptance – The formal written acceptance by the Agency of the completed project.

Agency – City of Santa Ana

Approved Equal –material or product that has been reviewed and approved by the Engineer as similar and equal in all respects and acceptable for use in lieu of that specified.

Approved, Required, Directed – or words of similar import, refer to and indicate that the work or materials shall be "approved," "required," or "directed" by the City of Santa Ana or its duly authorized representative.

Board – City Council of the City of Santa Ana

Bid Proposal – see Bid

City – City of Santa Ana

City Council – The body constituting the awarding authority of the City, namely the City Council of the City of Santa Ana.

Contract Documents – In addition to items specified in the Standard Specifications, Contract Documents shall also include all Appendices as referenced and/or included.

Contractor – The person or persons, co-partnership or corporation, private or municipal, who have entered into contract for this work as parties or party of the second part of his or her legal representatives.

Department – City of Santa Ana Public Works Agency.

Due Notice – A written notification, given in due time, of a proposed action where such notification is required by the contract to be given a specified interval of time (usually 48 hours or two working days) prior to the commencement of the contemplated action. Notification may be from City to Contractor or from Contractor to City.

Engineer – The Executive Director of the Public Works Agency of the City of Santa Ana or his/her authorized representative

Laboratory – Any laboratory of a public agency or a recognized commercial testing laboratory.

Owner – City of Santa Ana

Prompt – The briefest interval of time required for a considered reply, including time required for approval by a governing body.

1-3 ABBREVIATIONS
1-3.2 Common Usage
Add the following to this subsection:

Abbreviation	Word or Words
CA MUTCD	California Manual on Uniform Traffic Control Devices
CCPR	Cold Central Plant Recycling
CIR	Cold In-Place Recycling
CIREAM	Cold In-Place Recycling Expanded Asphalt Mix
DCP	Dynamic Cone Penetrometer
EAS	Emulsion-Aggregate Slurry
HDB	Hydrostatic Design Basis
JITT	Just-In-Time Training
NPDES	National Pollutant Discharge Elimination System
PACP	Pipe Assessment & Certification Program
REAP	Rain Event Action Plan
REAS	Rubberized Emulsion Aggregate Slurry
SSPWC	Standard Specifications for Public Works Construction
TEES	Transportation Electrical Equipment Specifications

1-3.3 Institutions
Add the following to this subsection:

Abbreviation	Word or Words
AGC	Associated General Contractors of America
APWA	American Public Works Association
ASA	American Standards Association
CALTRANS	California Department of Transportation
FHWA	Federal Highway Administration
FRA	Federal Rail Administration
FTA	Federal Transit Authority
NASSCO	National Association of Sewer Service Companies
OCSD	Orange County Sanitation District
OCTA	Orange County Transportation Authority
SCG	Southern California Gas Company
SCE	Southern California Edison Company

SECTION 2 - SCOPE AND CONTROL OF WORK

2-1 AWARD AND EXECUTION OF CONTRACT
Add the following to this subsection:

The award of the contract, if it is awarded, will be to the lowest responsive, responsible BIDDER whose proposal complies with all requirements described. The award, if made, will be made within 60 working days after the opening of the bids.

No proposal shall be considered binding upon the AGENCY until the execution of the contract by the AGENCY.

The date of the contract shall be the date the contract is executed by the AGENCY.

The AGENCY reserves the right to waive minor irregularities in their consideration of the award of the bid. The award, if made, shall be by mutual consent in writing of the parties signatory to the contract. Alterations or deviations, increases or decreases, additions or omissions, in the plans and specifications may be made and the same shall in no way affect or make void the contract.

2-3 SUBCONTRACTS
2-3.1 General
Add the following to this subsection:

The Prime Contractor agrees to pay each Subcontractor under this prime contract for satisfactory performance of its contract no later than 10 days from the receipt of each payment the Prime Contractor receives from AGENCY.

The Prime Contractor agrees further to release retainer payments to each Subcontractor within 30 days after the subcontractor's work is satisfactorily completed.

2-4 CONTRACT BONDS
Add the following to this subsection:

The bonds shall be executed by the successful BIDDER and returned within ten (10) business days after the successful BIDDER has received notice that the contract has been awarded. Each bond shall incorporate, by reference, the contract and shall be signed by both the BIDDER and Surety. The signatures of the BIDDER and the authorized agent of the Surety shall be notarized.

Failure to file acceptable bonds as provided herein within ten (10) business days, after the successful BIDDER has received notice that the contract has been awarded, shall be just cause for the annulment of the award and the forfeiture of the proposal guaranty.

2-5. PLANS AND SPECIFICATIONS
2-5.1 General
Add the following to this subsection:

The Contractor shall maintain a control set of plans and specifications on the project site at all times throughout the construction period. As approved by the Engineer, all final locations determined in the field and any deviations from the plans and specifications shall be marked in red on this control set to show the As-Built conditions. Upon completion of all work, the Contractor shall submit the control set As-Built Plans and report to the Engineer. Additionally, the Contractor shall provide the following:

Street Improvements: Any deviations from the contract plans such as: alignments, and appurtenance locations shall be noted (drawing sketch) on the control plan and a copy submitted to the Engineer no later than (5) working days from the occurrence.

Storm Drain Improvements: Any deviations from the contract plans such as: alignments, elevations, modifications to pipe/structures sizing/material.

Sewer Improvements: Any deviations from the contract plans such as: alignments, elevations, modifications to pipe/structures sizing/material. Contractor shall also provide CCTV inspection recordings/videos in format required by Engineer.

Water Improvements: Any deviations from the contract plans such as: alignments and appurtenance locations shall be noted (drawing sketch) on the control plan and a copy submitted to the Engineer no later than (5) working days from the occurrence.

Traffic Improvements: Any deviations from the contract plans such as: location of poles, pull boxes and runs, depth of conduits, number of conductors, and other appurtenant work, for future reference.

Within (15) days of completion of all work, the Contractor shall submit the control set of as-built plans to the Engineer. **Final payment will not be made until this requirement is met.**

2-6 WORK TO BE DONE
Add the following to this subsection:

Where the manufacturer of any material or equipment provides written recommendations or instructions for its use or method or installation (including labels, tags, manuals or trade literature), such recommendations or instructions shall be compiled and delivered to the City prior to project acceptance.

2-8 RIGHT-OF-WAY
Add the following to this subsection:

When the contractor arranges for temporary use of private property for additional work areas and facilities required for the Contractor's convenience, to meet requirements, or other reason(s), the Contractor shall provide the City with written agreement authorizing use of said property.

2-9 SURVEYING
2-9.2 Survey Service
The following supersedes the provisions of this subsection:

The Contractor shall be responsible for directly obtaining the services of a California Licensed Land Surveyor to be in responsible charge of all survey work performed under this contract.

The Contractor shall be responsible for the scheduling of all survey requests.

The Contractor's Surveyor shall provide construction staking for project improvements. A copy of the cut sheets shall be provided to the AGENCY for verification. Also a copy of all updated control set by the Contractor's Surveyor; showing coordinates, elevation, and description shall be submitted, for quality management (as-built checks by Agency).

The AGENCY will provide construction plans and specifications for the project. Construction stakes shall be set per the provided plans and specifications. The Contractor's Surveyor shall notify the AGENCY immediately of any discrepancy or design errors discovered on the plans during staking or when verifying join points.

The Contractor's Surveyor shall research existing County and City records for centerline survey monuments within the project area. Prior to construction, all monuments shall be tied-out and a Corner Record shall be recorded with the County Surveyor per Section 8771 of the Business and Professions Code of the State of California. After completion of construction, any monument disturbed or lost during construction shall be reset, in conformance with Section 8771. Each centerline intersection shall be drawn on a single Corner Record. A copy of all Corner Records shall be submitted to the AGENCY prior to a Notice of Completion being filed.

The Contractor is responsible for maintaining a safe and orderly job site per Occupational Safety and Health Administration (OSHA) standards.

The Contractor shall furnish traffic control as needed to provide a work area free of public and construction traffic for construction staking. Traffic control shall conform to the requirements of

the "Watch Area Traffic Control Handbook" (WATCH). Payment for said work shall be included in other items of work and no additional compensation will be allowed.

2-11 INSPECTION
Add the following to this subsection:

City inspection occurs during construction working hours. Inspection work requested by the contractor outside of the prescribed working hours shall be paid by the contractor at the City's overtime rate.

2-12 SPECIAL NOTICES
Add the following to this subsection:

Per Section 1771.4(a)(2) of the California Labor Code, Contractors are required to post job site notices, as prescribed by regulation.

SECTION 3 - CHANGES IN WORK

3-3 EXTRA WORK
3-3.1 General
Add the following to this subsection:

The contractor shall proceed with extra work only upon written order from the Engineer.

3-3.2 Payment
3-3.2.1 General
Add the following to this subsection:

For such extra work the contractor shall receive payment as agreed upon in writing, or shall be paid on force account. Work involving contract unit prices, the contractor shall not exceed any of the quantities in the proposal unless prior authorization from the engineer is obtained in writing.

3-3.2.3 Markup
Revise sub-section 3-3.2.3 (a) to read as follows:

(a) **Work by Contractor.** The following percentages shall be added to the Contractor's costs and shall constitute the markup for all overhead and profits:

1) Labor 20%
2) Materials 15%
3) Equipment Rental..... 15%
4) Other Items and Expenditures..... 15%

To the sum of the costs and markups provided for in this subsection, 1 percent shall be added as compensation for bonding.

(b) **Work by Subcontractor.** When all or any part of the extra work is performed by a Subcontractor, the markup established in 3-3.2.2(a) shall be applied to the Subcontractor's actual cost of such work. A markup of 10 percent on the first $5,000 of the subcontracted portion of the extra work and a markup of 5 percent on work added in excess of $5,000 of the subcontracted portion of the extra work may be added by the Contractor.

3-5 DISPUTED WORK

Delete the first paragraph and replace it with the following:

If the Contractor considers any work demanded of him to be outside the requirements of the contract, or if he considers any instruction, ruling or decision of the Engineer to be unfair, he shall within ten days after any such demand is made or instruction, ruling or decision is given, file a written protest with the Engineer, stating clearly and in detail his objections and reasons therefore. Except for such protests and objections as are made of record, in the manner and within the time above stated, the Contractor shall be deemed to have waived and does hereby waive all claims for extra work, damages, and extensions, rulings and decisions of the Engineer.

Upon receipt of any such protest from the Contractor, the Engineer shall review the demand, instruction, ruling or decision objected to and shall promptly advise the Contractor, in writing, of his final decision, which shall be binding on all parties, unless within the ten working days thereafter the Contractor shall file with the Executive Director of the Public Works Agency of the City of Santa Ana a formal protest against said decision of the Engineer. The Executive Director of the Public Works Agency of the City of Santa Ana shall consider and render a final decision on any such protest within 30 days of receipt of same.

SECTION 4 - CONTROL OF MATERIALS

4-1 MATERIALS AND WORKMANSHIP

4-1.1 General

Should the Contractor fail to correct deficiencies or public nuisances that have been created because of his/her operation, then these will be considered to be of an emergency nature, and will call for the AGENCY to move in on the project to take corrective action. Such work will be done on a force account basis with an additional callout charge. There is a minimum two-hour charge for labor on any callout plus an additional callout charge of $300.

4-1.4 Test of Materials

Add the following to this subsection:

Material testing will be performed by the Orange County EMA Materials Laboratory or a private laboratory engaged by the AGENCY for the construction of this project.

The AGENCY will bear the cost of testing material which meets the requirements indicated in these General Provisions. The cost of retesting of material that fails to pass the first test shall be borne by the Contractor.

SECTION 5 - UTILITIES

5-1 LOCATION
Add the following to this subsection:

The contractor is responsible to determine the exact location and depth of utilities and its service connections during construction. The contractor shall notify the City of the exact location of any utility or service connection which is not shown or is incorrectly shown on the plans.

In addition to calling Dig Alert, the contractor shall be expected to maintain liaison with the affected utility company representatives, and shall notify them prior to beginning of the job and each time the particular utility is or could possibly be affected at least 24 hours in advance.

All existing utility access frames and covers, both private and public, shall be located and marked with paint on the pavement surface by the Contractor.

Upon completion of the project, the Contractor shall remove all painted utility markings done by him/her or the respective utility owners from the surfaces of sidewalks, driveway approaches, curbs and gutters using the removal method acceptable to the Engineer. Any damage to sidewalks, driveway approaches, curbs and gutters due to the Contractor's removal operation shall be repaired at the Contractor's expense and to the satisfaction of the Engineer. Payment for removing utility markings shall be included in other items of work, and no additional compensation shall be allowed therefore.

If utility construction work within the area is required during the construction of this project, the Contractor is directed to cooperate with the utility company(s) and their workers to assure proper installation of the utilities with a minimum of conflict.

The last paragraph of Subsection 5-1 shall be revised to read as follows:

> "The Contractor shall determine the location and depth of all utilities including service connections, which may affect or be affected by its operation."

SECTION 6 - PROSECUTION, PROGRESS AND ACCEPTANCE OF THE WORK

6-1 CONSTRUCTION SCHEDULE AND COMMENTMENT OF THE WORK
6-1.1 Construction Schedule
Add the following to this subsection:

A working day shall be defined as outlined below, and the Contractor's activities shall be confined accordingly:

1. From 7:00 a.m. to 5:00 p.m., Monday through Friday, within work areas having either no lane closures or having continuous lane closures, i.e. 24-hour closures lasting more than one day.

2. From 9:00 a.m. to 3:00 p.m., Monday through Friday, for work requiring temporary lane closures, i.e. those having less than a 24-hour duration, and for work at major intersections. As an alternative, construction at major intersections may be permitted on Fridays, at night or on weekends, at the discretion of the Engineer.

Deviation from these hours/days shall not be permitted without the prior consent of the Engineer, except in emergencies involving immediate hazard to persons or property, or as specified otherwise.

Holidays as herein referred to shall be deemed to be:

- New Year's Day
- Martin Luther King Day
- President's Day
- Memorial Day
- Independence Day
- Labor Day
- Veteran's Day
- Thanksgiving Day and day after
- Christmas Eve
- Christmas Day

6-3 SUSPENSION OF THE WORK
Add the following to this subsection:

6-3.1 General

Should suspension of work be ordered by reason of the failure of the contractor to carry out orders or to perform any provisions of the contract; or by reason of weather conditions being unsuitable for performing any item or items of work; the contractor, at its expense, shall do all the work necessary to provide a safe, smooth, and unobstructed passageway through construction for use by public traffic during the period of such suspension. In the event that the contractor fails to perform the work above specified, the City will perform such work and the cost thereof will be deducted from payment due or to become due to the contractor.

If a suspension of work is ordered by the Engineer, due to the failure on the part of the contractor to carry out orders given or to perform any provision of the contract, the days on which the suspension order is in effect shall be considered working days.

SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

7-1 CONTRACTOR'S EQUIPMENT AND FACILITIES
Add the following to this subsection:

Pursuant to the authority contained in Section 591 of the Vehicle Code, the Department has determined that, such areas as are within the limits of the project and are open to public traffic, the Contractor shall comply with all the requirements set forth in Divisions 11, 12, 13, 14 and 15 of the Vehicle Code. Attention is directed to the statement in Section 591 that this Section shall not relieve him or any person from the duty of exercising due care. The Contractor shall take all necessary precautions for safe operation of his/her equipment and the protection of the public from injury and damage from such equipment.

7-2 LABOR
7-2.2 Prevailing Wages
Add the following to this subsection:

Certified Payroll Records shall be submitted to the Engineer every two weeks beginning with the actual start day of construction, and shall be consecutively numbered until the completion of the work. Progress payments will be withheld pending receipt of any outstanding reports.

The Contractor shall assure that a qualified supervisor is present at all times when work is being performed.

7.3 LIABILITY INSURANCE
The provisions of this subsection apply except as herein modified:

The Contractor shall provide insurance coverage limits as detailed in the Certificate of Liability Insurance. The Certificate of Liability Insurance is included in Appendix D of the Contract Documents.

Professional Liability Insurance (errors and omissions) will only be required if Contractor employs a licensed professional such as an architect or engineer for a component of the work. When occurs, Professional liability insurance, with a combined single limit of not less than $1,000,000 per claim with $2,000,000 in the aggregate.

The Certificate of Liability insurance shall be provided by the successful BIDDER within ten (10) business days, after the successful BIDDER has received notice that the contract has been awarded. Failure to provide shall be just cause for the annulment of the award and the forfeiture of the proposal guaranty.

7-4 WORKER'S COMPENSATION INSURANCE
Add the following to this subsection:

The Contractor shall furnish the Agency with satisfactory proof of Worker's Compensation Insurance. The insurance shall be taken out with a responsible insurance carrier authorized under the laws of the State of California and satisfactory to the Agency. For work that is sublet, the contract shall require the subcontractor similarly provide Worker's Compensation Insurance for the subcontractor's employees.

7-5 PERMITS
Add the following to this subsection:

The contractor shall comply with all Federal, State or local laws, ordinances, or rules and regulations related to the performance of the work, which include but are not limited to the following:

a. Business License. Each Prime Contractor and Subcontractor shall obtain and pay for a Santa Ana Business License. Detailed information concerning business license may be obtained from the Finance and Management Services Agency, (714) 647-5447, City Hall.

b. Construction Water Permit. Each Prime Contractor or Subcontractor which desires to obtain water from AGENCY-owned fire hydrants for construction or any other purpose shall first obtain and pay for a permit from the Corporate Yard of the City of Santa Ana, at 220 South Daisy Avenue. Information concerning costs and conditions may be obtained from the AGENCY by calling (714) 647-3320. Use of private water from a hose bib is not allowed.

   For safety reasons, the AGENCY will not allow Contractor to stretch construction water hoses across open traffic lanes. Where required, Contractor shall use water truck.

c. Disposal Permit. In accordance with the procedures of the Orange County General Services Administration (GSA), the cost for the disposal of all materials at County landfill sites shall be borne by the Contractor.

d. Building and Electrical Permits. For projects involving building, structural construction, traffic signal or irrigation controller installation, the Prime Contractor shall obtain the necessary building and electrical permits from the Planning & Building Agency. There will be no fees for these permits.

e. State Division of Industrial Safety Permits. In accordance with Section 6500 of the State Labor Code, permits are required for all excavations, which are five feet or deeper, or for all structures being built or demolished, which are more than three stories high.

All permits and fees required by all other Agencies having jurisdiction over any part of the work shall be obtained and paid for by the Contractor, unless otherwise noted on the Plans or in the General Provisions.

7-8 WORK SITE MAINTENANCE

7-8.1 General

Add the following to this subsection:

The contractor shall keep the work site clean and free from rubbish and debris at the end of every working day. In addition, the Contractor shall be fully responsible for removing any graffiti placed on new improvements or Contractor's equipment daily immediately at the start of the work day.

The City of Santa Ana has adopted an ordinance to assist the City in complying with the State of California's Assembly Bill 939 law which requires that all cities and counties in the State reduce the amount of trash disposed of in landfills by 50%. Failure to comply with State law could result in a fine to the City of $10,000 per day.

Santa Ana Municipal Code Section 16-30 (f) will ensure that construction and demolition waste generated within the City can be accounted for and recycled. The ordinance states the following, *"Any person with whom the City has an agreement for the collection, transportation and disposal of construction and demolition solid waste which has accumulated and/or been generated at a temporary construction site may haul such waste during the term of such agreement."*

The only companies approved by the City Council to haul temporary construction and demolition material in the City of Santa Ana are:

Ware Disposal Company, Inc.
1018 N. Lincoln Avenue
Santa Ana, CA 92701
Phone Number: (714) 834-0234

Waste Management
1800 South Grand
Santa Ana, Ca 92705
Phone Number: (714) 558-7761

Contractors shall contact one of the above companies to arrange for the collection and recycling of construction debris.

Persons who generate solid waste on the premises may personally collect, transport, and dispose of their own solid waste providing that they do so in accordance with all governing laws and regulations and dispose of such solid waste at a site permitted by the California Integrated Waste Management Board.

7-8.2 Air Pollution Control
Add the following to this subsection:

All organic solvents used must comply with the rules, regulations and orders of the South Coast Air Quality Management District (SCAQMD) relating to organic solvents.

7-8.3 Noise Control

The Contractor shall comply with all local sound control and noise level rules, regulations and ordinances which apply to any work performed pursuant to the contract. Each internal combustion engine, used for any purpose on the job or related to the job, shall be equipped with a muffler of a type recommended by the Manufacturer. The noise level from the Contractor's operations shall not exceed 95 dba at a distance of 50 feet. This requirement in no way relieves the Contractor from responsibility for complying with local ordinances regulating noise level.

The said noise level requirements shall apply to all equipment on the job or related to the job, including but not limited to trucks, transit mixers, or transient equipment that may or may not be owned the Contractor. The use of loud signals shall be avoided in favor of light warnings, except those required by safety laws for the protection of personnel.

7-8.4.2 Storage in Public Streets
Add the following to this subsection:

Storage of equipment and materials on City residential streets or in the public right of way during non-working hours shall not be permitted, and may only be placed in the public right of way for purposes of use that day.

Overnight stockpiling of construction debris or excavated materials is not allowed. Contractor must obtain written approval from the Engineer prior to storage of construction materials and equipment on the street where improvements are planned, but at minimum, adequate flashing barricades shall be provided.

No area is available within the contract limits for the exclusive use of the Contractor. However, temporary storage of equipment and materials on City of Santa Ana property may be arranged with the Engineer, subject to the prior demands of the City of Santa Ana. Use of the

Contractor's work areas and other City of Santa Ana-owned property shall be at the Contractor's own risk, and the City of Santa Ana shall not be held liable for damage to or loss of materials or equipment located within such areas.

The Contractor shall remove equipment, materials, and rubbish from the work areas and other City of Santa Ana – owned property that the Contractor occupies at the conclusion of each working day.

7-8.6.2 Best Management Practices (BMPs)
Add the following to this subsection:

If project has LESS than one-acre of disturbed soil, the following shall apply:

Contractor shall prepare erosion and sediment control plan immediately after award of the contract for the approval of the Engineer. The plan shall be prepared per the applicable guidelines described in the California Storm Water Best Management Practices Handbook. The Contractor shall submit the plans for review and shall make the necessary revisions to the plans as directed by the Engineer. The plans shall be prepared by a licensed Civil Engineer. The AGENCY may waive the requirement of licensed Civil Engineer if the Contractor can satisfactorily prove to the Engineer that the person preparing the erosion control plan is qualified in the field of erosion control.

The Contractor shall keep a copy of the erosion control plan on-site for the duration of the contract and shall provide all necessary control devices to implement all necessary measures as shown on the plan. The erosion control plan shall remain in effect until approval to remove is granted by the Engineer.

All erosion control materials shall be available on-site and stockpiled at a convenient location to facilitate rapid construction of temporary devices when rain is eminent.

7-8.6.3 Storm Water Pollution Prevention Plan (SWPPP)
Add the following to this subsection:

If a project has MORE than one-acre of disturbed soil, the following shall apply:

This project has been identified as a Risk Level # Project and shall comply with all requirements outlined in the current State Construction General Permit.

Prior to Contractor commencing work, a completed Storm Water Pollution Prevention Plan (SWPPP) shall be on file at the construction site that complies with the most current National Pollution Discharge Elimination System(NPDES) General Permit for Stormwater Discharges Associated with Construction Activity (General Permit), hereinafter referred to as State Construction General Permit.

As part of the permitting process, the Contractor shall administer a Storm Water Pollution Plan (SWPPP). Any additional work required for compliance with the requirements of the SWPPP shall be performed by the Contractor and full compensation for conforming to these Special Provisions

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

The SWPPP document shall include, at a minimum, all items as required by the State General Construction Permit. The SWPPP monitoring program and reporting requirements shall also comply with the requirements as set forth in the State Construction General Permit. The website address for the State Regional Water Quality Control Board can be found here:

http://www.swrcb.ca.gov/water_issues/programs/stormwater/constpermits.shtml

The Contractor shall submit SWPPP for review by the Engineer. The final accepted version of the SWPPP shall be submitted in both hard copy and in Adobe Acrobat PDF file format, with an original signed owner approval and certification page. The Contractor shall not commence activity until the SWPPP has been accepted by the State Regional Water Quality Board, and a Notice of Intent has been filed.

The Contractor is notified that the SWPPP must be amended from time to time during construction to reflect actual construction staging and practices.

The SWPPP document shall not be construed to be a waiver of the Contractor's obligation to review and understand the State Construction Activity Storm Water Permit before submitting a bid. By submitting a bid, the Contractor acknowledges satisfaction as to the requirements of the State Construction General Storm Water Permit.

The Contractor is hereby notified that specific construction practices in the Standard Specifications, Section 7, "Responsibilities of the Contractor" are considered to be Best Management Practices. Applicable construction practices in the Standard Specifications shall be incorporated into the SWPPP.

The Contractor shall prepare a Storm Water Annual Report for the reporting period from July 1st to June 30th. For the previous reporting period, the Contractor must submit the report no later than July 15th. If construction ends before June 30th, the Contractor must submit the report within 15 days. Notice of Completion will not be granted until Storm Water Annual Report is submitted and approved.

Storm Water Annual Report should be certified by a Qualified SWPPP Practitioner (QSP) and shall be submitted in Adobe Acrobat PDF file format. The report shall include all requirements detailed in the Construction General Permit and per Appendix X of these specifications.

The Contractor shall be liable for all violation fines levied against the City by Federal, State or Local Agencies with regulatory authority related to Contractor construction activities.

Payment for Storm Water Pollution Prevention Plan (SWPPP) shall be paid for at the contract unit price listed in the Bid Proposal and shall include full compensation for preparing and administering the SWPPP to conform to Contractor's actual construction practices, ensuring construction activities conform to the current Construction General Permit, and preparing and submitting the Storm Water Annual Report and no additional payment will be made therefore.

7-10 PUBLIC CONVENIENCE AND SAFETY

7-10.1 Access

Add the following to this subsection:

Intersections shall be kept open until work takes place within the intersection. Local vehicular and pedestrian access, including access to driveways and businesses, shall be maintained at all times. Pedestrian access across both streets in an intersection must be maintained at all times with a minimum 4-foot width.

7-10.1.1 General

Add the following to this subsection:

Notifications:

Prior to the start of construction operations, the Contractor shall notify the Police and Fire Departments of the AGENCY, giving the approximate starting date, completion date, and the name and telephone number of responsible persons who may be contacted at any hour in the event of a critical condition requiring immediate correction. At least two weeks prior to starting work, the Contractor shall notify the Orange County Transportation Authority (OCTA) bus service of the approximate starting date and completion date.

Construction Notices:

At least two weeks prior to starting work, the Contractor shall deliver notices supplied by the AGENCY to the residents and businesses in the area affected by the construction. At least 48 hours before working on a street, the contractor shall contact the residents and businesses of that street by written notice to provide information as to the type of work, closure, type of inconvenience and the expected duration. The written notice shall be a tag shape similar to the sample shown in Appendix X of the Contract Documents and be hung on door knobs and all parked vehicles on the street. In the event of a delay after the notice has been delivered, the contractor shall provide an updated notice to the residents and businesses. After construction completion on the street, the contractor shall collect any notices that are not picked up by the resident or business.

Temporary Construction Signs:

Contractor shall furnish, install and maintain temporary construction signs as detailed in Appendix X of the Contract Documents. The signs shall be mounted on Type II barricades and secured with sandbags to prevent overturning. The contractor shall install the temporary construction signs during construction at locations approved by the Engineer. The maintenance includes, but is not limited to the relocation for the different construction phases, replacement (if damaged due to the operations of the Contractor) and graffiti removal.

Payment for temporary construction signs shall be paid at the contract unit price bid per each and shall include all labor and materials necessary to manufacture, install and maintain the signs and barricades and no additional compensation will be allowed therefore.

Temporary Parking Removal Signs:

The signs for temporary parking removal during construction shall be a minimum of 12" x 18" as shown in Appendix X of the Contract Documents. The signs shall be posted 48 hours prior to the temporary parking removal. A sign shall be posted at the beginning of the parking removal area, the beginning of every block, and every 100 -150 feet thereafter.

7-10.2 Work Area Traffic Control
7-10.2.1 General
Add the following to this subsection:

All signs used for traffic control shall be illuminated or reflectorized when they are used during hours of darkness. All cones, pylons, barricades, or posts used in the diversion of traffic shall be reflectorized. All shall be maintained in a like new condition at all times. All signing, barricading and diversion of traffic shall be subject to the approval of the Engineer. The Contractor shall provide a telephone number at which the Contractor's representatives can be reached in case an emergency which requires replacement or relocation of the required traffic control devices should occur.

7-10.5.3 Steel Plate Covers
Add the following to this subsection:

When backfilling operation of an excavation in the travel way, whether transverse or longitudinal cannot be properly completed within a work day, steel plate bridging with a non-skid surface and shoring may be required to preserve unobstructed traffic flow. In such cases, the following shall apply:

1. Steel plate installation shall be recessed by milling existing pavement to set flush with finish grade.

2. Steel plate shall fit snug and installed to operate with minimum noise. Bridging shall be secured against displacement.

3. Steel plate used for bridging must extend a minimum of twelve (12") inches beyond the edge of the trench.

4. The pavement shall be cold planned a depth equal to the thickness of the plate and to a width and length equal to the dimensions of the plate.

Multiple steel plates shall be butted and tack welded as needed to secure plates 6" minimum. The trench shall be adequate to support the bridging and the traffic load. Contractor shall be responsible for determining whether shoring is necessary. The Contractor shall be responsible for the appropriate selection and maintenance of the steel plates, and shoring.

Unless specified, steel plate bridging at any given location shall not exceed four (4) consecutive working days in any given week. Backfilling of excavation shall be covered with a minimum of three (3) inches of temporary layer of cold asphalt concrete.

The following table shows the required minimal thickness of steel plate bridging for a given trench width:

Trench Width	Minimum Plate Thickness
1 foot-11 inches	¾ inch
2 feet-7 inches	7/8 inch
3 feet-5 inches	1 inch
5 feet-3 inches	1 ¾ inch

For spans greater than five (5) feet-three (3) inches, a structural design for the steel plate bridging shall be prepared by a California registered civil engineer and approved by the Engineer. Steel plate bridging shall be designed for HS20-44 truck loading per Caltrans Bridge Design Specifications Manual. The Contractor shall maintain steel plates with a non-skid surface having a minimum coefficient of friction equivalent to 0.35 as determined by California Test Method 342. The contractor may use standard steel plate with known coefficient of friction equal or exceeding 0.35.

A Rough Road sign (W8-8) with black lettering on an orange background shall be used in advanced of steel plate bridging. This is to be used along with any other required construction signing.

Payment for steel plate bridging shall be included in the other items of work involved and no additional payment shall be allowed therefore.

7-12 ADVERTISING
Add the following to this subsection:

Contractor shall furnish, install and maintain a project sign as detailed in Appendix X of the Contract Documents. The Contractor shall install the project sign during construction in the location approved by the Engineer. The maintenance includes replacement (if damaged due to the operations of the Contractor) and graffiti removal.

Payment for project signs shall be included in other items of work involved and no additional payment shall be allowed therefore.

SECTION 8 - FACILITIES FOR CITY PERSONNEL .....Not Used

SECTION 9 - MEASUREMENT AND PAYMENT

9-2 LUMP SUM WORK
Add the following to this subsection:

Contractor shall submit for approval a schedule of values for all lump sum work. Failure to submit may delay payment for said work.

9-3 PAYMENT

9-3.1 General

Add the following to this subsection:

Payment for any items of work required by the plans, specifications or other contract documents, which are not covered by a contract bid item, shall be considered as included in other items and no additional compensation shall be paid therefore.

9-3.4 Mobilization

Add the following to this subsection:

Mobilization shall consist of preparatory work and operations including, but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to the project site. Mobilization shall additionally include the establishment of any temporary facilities and the installation of project signs.

A minimum of one week before the start of construction, the Contractor shall video all areas where construction is to take place. The video shall be supplied to the Engineer before constructions begins. Videos will serve as a record of the existing conditions for disputes that may arise from restoration and should therefore be taken along the line of construction and site access and staging areas at sufficient detail as necessary to clearly depict details of existing conditions. Videos shall be a DVD or digital, in color, indexed and catalogued in such a manner that each photographed area is readily identifiable and shall also indicate the date and time (hours, minutes and seconds) when it was made. The Contractor shall also video any unusual conditions encountered during construction that are not already a matter of photographic record. In any areas where existing conditions cannot be determined by means of videos, the areas shall be restored as approved by the Engineer at the Contractor's expense. All videos shall become the property of the City.

SECTION 10 - CLAIMS RESOLUTION PROCEDURES

10-1 PUBLIC CONTRACT CODE SECTIONS 10240 AND 20104

Public Contract Code Section 10240 and Public Contract Code Section 20104 are hereby recognized and accepted as Reference General Provisions of these Specifications.

For purposes of the new law, "claim" means a separate demand by a contractor, sent by registered or certified mail with return receipt requested, for one or more of the following:

- a time extension, including a claim for relief from damages or penalties for delay assessed by a public entity.

- payment by the public entity of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public works project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled.

- payment of an amount that is disputed by the public entity.

Upon receipt of a claim, the following steps apply:

- the public entity must conduct a reasonable review of the claim and provide a written statement to the contractor within 45 days identifying what portion of the claim is disputed and what portion is undisputed; this time period may be extended by mutual agreement of the parties

- the claimant must furnish reasonable documentation to support the claim

- any payment due on an undisputed portion of the claim must be processed and made within 60 days after the public entity issues its written statement (amounts not timely paid bear interest at 7% annually)

- public entity's failure to timely issue a written statement on the claim results in the claim being deemed rejected in its entirety

- if claimant disputes the public entity's written response, or if the public entity fails to respond to a claim within the time prescribed, the claimant may demand in writing an informal conference to meet and confer

- upon receipt of such a demand, the public entity must schedule a meet and confer conference within 30 days

- within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of it remains in dispute, the public entity must provide a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed

- any payment due on the undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement

- any disputed portion of the claim, as identified by the contractor in writing, shall be submitted to nonbinding mediation, with the public entity and the claimant sharing the associated costs equally

- if mediation is not successful, the parts of the claim remaining in dispute become subject to applicable procedures outside of the statute (for example, litigation or arbitration)

10-2 PUBLIC CONTRACT CODE SECTION 9204

Any claims made by contractor relating to this project will be governed by Public Contract Code Section 9204, as appearing in full below:

(a) The Legislature finds and declares that it is in the best interests of the state and its citizens to ensure that all construction business performed on a public works project in the state that is complete and not in dispute is paid in full and in a timely manner.

(b) Notwithstanding any other law, including, but not limited to, Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2, Chapter 10 (commencing with Section 19100) of Part 2, and Article 1.5 (commencing with Section 20104) of Chapter 1 of Part 3, this section shall apply to any claim by a contractor in connection with a public works project.

(c) For purposes of this section:

(1) "Claim" means a separate demand by a contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:

(A) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by a public entity under a contract for a public works project.

(B) Payment by the public entity of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public works project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled.

(C) Payment of an amount that is disputed by the public entity.

(2) "Contractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who has entered into a direct contract with a public entity for a public works project.

(3) (A) "Public entity" means, without limitation, except as provided in subparagraph (B), a state agency, department, office, division, bureau, board, or commission, the California State University, the University of California, a city, including a charter city, county, including a charter county, city and county, including a charter city and county, district, special district, public authority, political subdivision, public corporation, or nonprofit transit corporation wholly owned by a public agency and formed to carry out the purposes of the public agency.

(B) "Public entity" shall not include the following:

(i) The Department of Water Resources as to any project under the jurisdiction of that department.

(ii) The Department of Transportation as to any project under the jurisdiction of that department.

(iii) The Department of Parks and Recreation as to any project under the jurisdiction of that department.

(iv) The Department of Corrections and Rehabilitation with respect to any project under its jurisdiction pursuant to Chapter 11 (commencing with Section 7000) of Title 7 of Part 3 of the Penal Code.

(v) The Military Department as to any project under the jurisdiction of that department.

(vi) The Department of General Services as to all other projects.

(vii) The High-Speed Rail Authority.

(4) "Public works project" means the erection, construction, alteration, repair, or improvement of any public structure, building, road, or other public improvement of any kind.

(5) "Subcontractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who either is in direct contract with a contractor or is a lower tier subcontractor.

(d) (1) (A) Upon receipt of a claim pursuant to this section, the public entity to which the claim applies shall conduct a reasonable review of the claim and, within a period not to exceed 45 days, shall provide the claimant a written statement identifying what portion of the claim is disputed and what portion is undisputed. Upon receipt of a claim, a public entity and a contractor may, by mutual agreement, extend the time period provided in this subdivision.

(B) The claimant shall furnish reasonable documentation to support the claim.

(C) If the public entity needs approval from its governing body to provide the claimant a written statement identifying the disputed portion and the undisputed portion of the claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a claim sent by registered mail or certified mail, return receipt requested, the public entity shall have up to three days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension, expires to provide the claimant a written statement identifying the disputed portion and the undisputed portion.

(D) Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. If the public entity fails to issue a written statement, paragraph (3) shall apply.

(2) (A) If the claimant disputes the public entity's written response, or if the public entity fails to respond to a claim issued pursuant to this section within the time prescribed, the claimant may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by

registered mail or certified mail, return receipt requested, the public entity shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(B) Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the public entity shall provide the claimant a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. Any disputed portion of the claim, as identified by the contractor in writing, shall be submitted to nonbinding mediation, with the public entity and the claimant sharing the associated costs equally. The public entity and claimant shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. The public entity and claimant shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside this section.

(C) For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.

(D) Unless otherwise agreed to by the public entity and the contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.

(E) This section does not preclude a public entity from requiring arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program, if mediation under this section does not resolve the parties' dispute.

(3) Failure by the public entity to respond to a claim from a contractor within the time periods described in this subdivision or to otherwise meet the time requirements of this section shall result in the claim being deemed rejected in its entirety. A claim that is denied by reason of the public entity's failure to have responded to a claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of the claimant.

(4) Amounts not paid in a timely manner as required by this section shall bear interest at 7 percent per annum.

(5) If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a public entity because privity of contract does not exist, the contractor may present to the public entity a claim on behalf of a subcontractor or lower tier

subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that the contractor present a claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the claim be presented to the public entity shall furnish reasonable documentation to support the claim. Within 45 days of receipt of this written request, the contractor shall notify the subcontractor in writing as to whether the contractor presented the claim to the public entity and, if the original contractor did not present the claim, provide the subcontractor with a statement of the reasons for not having done so.

(e) The text of this section or a summary of it shall be set forth in the plans or specifications for any public works project that may give rise to a claim under this section.

(f) A waiver of the rights granted by this section is void and contrary to public policy, provided, however, that (1) upon receipt of a claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable; and (2) a public entity may prescribe reasonable change order, claim, and dispute resolution procedures and requirements in addition to the provisions of this section, so long as the contractual provisions do not conflict with or otherwise impair the timeframes and procedures set forth in this section.

(g) This section applies to contracts entered into on or after January 1, 2017.

(h) Nothing in this section shall impose liability upon a public entity that makes loans or grants available through a competitive application process, for the failure of an awardee to meet its contractual obligations.

(i) This section shall remain in effect only until January 1, 2020, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2020, deletes or extends that date.

1.00 SPECIAL PROVISIONS - CONSTRUCTION

1.01 ROCK PRODUCTS

Alternate rock products, asphalt concrete, Portland cement concrete (PCC), and untreated base material shall be alternate rock material – Type S per Section 400 of the Standard Specifications.

1.02 RELATIVE COMPACTION TESTS

The following test methods shall be used for determining relative compaction:

California Test 216	(Sand Cone Method)
California Test 231	(Nuclear Gauge Method)

The Contractor will be provided with compaction test at locations deemed necessary by the Engineer. If compaction fails to meet the contract specifications, then the Contractor shall make the necessary adjustments and is responsible for the cost of additional compaction tests until compaction per the specifications is met.

1.03 CLEARING AND GRUBBING

Clearing and Grubbing shall be performed in conformance with the provisions of Section 300-1 of the Standard Specifications and these Special Provisions.

The following is added to Section 300-1.2 Preservation of Property:

> Modify and/or repair existing sprinklers in project area that are damaged due to the Contractor's operation within 24 hours.

1.04 UNCLASSIFIED EXCAVATION

This section shall conform to Subsection 300-2 and 300-4 of the Standard Specifications and these Special Provisions.

Unclassified excavation shall consist of all excavation including sawcutting and removal of roadways, bituminous pavement, concrete pavement and the removal of curbs, sidewalks, driveways, alleys, cross-gutters, etc. as shown on the plans.

Any cores provided are included in Appendix X for reference purposes only and are not part of the contract documents. The AGENCY will not be held responsible for existing conditions that differ from any core logs that may be provided. It is the Contractor's option to take his/her own core samples to verify the existing conditions.

1.05 SUBGRADE PREPARATION

Subgrade preparation shall conform to Section 301-1 of the Standard Specification and these Special Provisions.

Section 301-1.3 is modified to require only 90% relative compaction on all subgrade material.

On areas where unsuitable subgrade materials are encountered, such materials shall be overexcavated and replaced with either asphalt concrete or aggregate base, all as determined and directed by the Engineer.

Placement of asphalt concrete or aggregate base in overexcavated areas shall be done with minimum disturbance to the subgrade. Compacting shall be done with light rolling a steel wheel roller with compaction requirement waived. asphalt concrete shall be placed in lifts not exceeding 6 inches in compacted thickness and shall be allowed to cool for 24 hours before placing the next lift.

1.06 COLD MILLING

This section shall conform to Section 302-1 of the Standard Specifications.

1.07 SLURRY SEAL SURFACING

Emulsion-Aggregate Slurry (Type I-CSS-1h-EAS)

1. Materials - Shall conform to the requirements of Sub-Section "302-4 SLURRY SEAL SURFACING" and "203.5.4 Emulsion-Aggregate Slurry (EAS)" of the Standard Specifications except Sub-Section "203-5.4.2-.2 Emulsified Asphalt" shall be amended so that the asphaltic emulsion shall conform to the requirements for cationic emulsion grade CSS-1h (slow setting) or approved equal. The type of emulsion to be used shall be as indicated in these special provisions unless determined otherwise by the Engineer prior to slurry applications.

2. Sub-Section "302-4.5 Scheduling, Public Convenience and Traffic Control" shall be the same except for the following additions: Spreading - The application of slurry shall be scheduled to commence after 8:00 a.m., and no slurry operations shall be done after 2:00 p.m. unless otherwise approved by the Engineer. Slurry shall be sufficiently cured for vehicle traffic without tracking or damage to the surface by 3:00 p.m. on the same day. In case of damage done by vehicles and/or pedestrians upon slurry that has not been sufficiently cured by 3:00 p.m., the Contractor shall replace all of the damaged work at the Contractor's expense and no additional compensation shall be made by the City. Final stripping shall be installed no more than ten (10) working days after placement of slurry.

3. Sub-Section "302-4.6.4 Aggregate Application Rate" and "Table 302-4.6.4.1(A)" shall be replaced with the following: Slurry Seal (Type I) shall be applied at a rate of 2,000 square feet per extra long ton (ELT).

Emulsion-Aggregate Slurry (Type II-CSS-1h-EAS)

1. Materials - Shall conform to the requirements of Sub-Section "302-4 SLURRY SEAL SURFACING" and "203.5.4 Emulsion-Aggregate Slurry (EAS)" of the

Standard Specifications except Sub-Section "203-5.4.2-.2 Emulsified Asphalt" shall be amended so that the asphaltic emulsion shall conform to the requirements for cationic emulsion grade CSS-1h (slow setting) or approved equal. The type of emulsion to be used shall be as indicated in these special provisions unless determined otherwise by the Engineer prior to slurry applications.

2. Sub-Section "302-4.5 Scheduling, Public Convenience and Traffic Control" shall be the same except for the following additions: Spreading - The application of slurry shall be scheduled to commence after 8:00 a.m., and no slurry operations shall be done after 2:00 p.m. unless otherwise approved by the Engineer. Slurry shall be sufficiently cured for vehicle traffic without tracking or damage to the surface by 3:00 p.m. on the same day. In case of damage done by vehicles and/or pedestrians upon slurry that has not been sufficiently cured by 3:00 p.m., the Contractor shall replace all of the damaged work at the Contractor's expense and no additional compensation shall be made by the City. Final stripping shall be installed no more than ten (10) working days after placement of slurry.

3. Sub-Section "302-4.6.4 Aggregate Application Rate" and "Table 302-4.6.4.1(A)" shall be replaced with the following: Slurry Seal (Type II) shall be applied over asphalt rubber chip seal at a rate of 1,000 square feet per extra long ton (ELT).

Type II slurry shall be applied between 48 hours and 7 days after the cover aggregate is placed.

Slurry seal (Type II) shall be applied on the arterials at a rate of 1,350 square feet per extra long ton (ELT).

Rubberized Emulsion Aggregate Slurry (REAS), Type II

This section shall conform to Sections 203-5 and 302-4 of the Standard Specifications and these Special Provisions.

Section 302-4.7 entitled "Rubberized Emulsion Aggregate Slurry (REAS)" of the Standard Specifications shall be modified to delete the text in Section 302-4.7.2 and replace with the following:

REAS shall be mixed at a central plant conforming to 203-5.5.3.

Section 302-4.8 entitled "Spreading and Application" of the Standard Specifications shall be modified to add the following:

The Contractor shall remove all raised pavement markers and all striping in the Work area per Section 2.02, Striping (Traffic Stripes and Pavement Markings), of these Special Provisions. Cracks shall be sealed per Section 1.11, Crack Repair and Patching, of these Special Provisions. The pavement surface shall be cleaned with a power broom to remove all loose material, silt, grass, and dirt.

The application of slurry shall be scheduled to commence after 8:00 a.m., and no slurry operations shall be done after 2:00 p.m. unless otherwise approved by the Engineer. Slurry shall be sufficiently cured for vehicle traffic without tracking or damage to the surface by 3:00 p.m. on the same day. In case of damage done by vehicles and/or pedestrians upon slurry that has not been sufficiently, the Contractor shall replace all of the damaged work at the Contractor's expense and no additional compensation shall be made by the AGENCY. Final striping shall be installed per Section 2.02, Striping (Traffic Stripes and Pavement Markings), of these Special Provisions.

Section 302-4.9 entitled "Field Sampling and Testing" of the Standard Specifications shall be modified to add the following:

Upon the Engineer's direction, the Contractor shall slurry seal test sections within the construction limits for each batch of slurry mix. No slurry shall be applied until the test slurry sections have been approved by the Engineer. The costs of these slurry tests shall be included in the unit price for slurry seal surfacing and no additional compensation will be allowed therefore.

Section 302-4.10 entitled "Measurement" of the Standard Specifications shall be modified to add the following:

Licensed weighmaster's certificates showing gross, tare, and net weight of each truck load of slurry mix shall be submitted to the Engineer by the Contractor for each working day of slurry operation.

1.08 ASPHALT CONCRETE

Asphalt concrete construction shall conform to Section 200, 203, 302 and 400 of the Standard Specifications, Section 92 of the Caltrans Standard Specifications and these Special Provisions.

Coarse aggregate shall consist of material which at least 75% by weight shall be crushed particles in lieu of the requirements of Section 400-4.2.3.

Tack coat is required and the cost thereof shall be included in the price paid per ton for asphalt concrete.

The required asphalt concrete mix designs shall be as follows:

Base Course	III-B3-AR-4000 or PG 64-10
Leveling Course/Surface Course	III-C3-AR-4000 or PG 64-10
Crack Filler	III-F-AR-4000 or PG 64-10

The top layer of asphalt concrete pavement shall be a leveling course that shall not exceed 0.10' in compacted thickness. The leveling course shall be applied over both cold mill and reconstruction areas concurrently.

Section 302-5.5 entitled "Distribution and Spreading" of the Standard Specifications shall be modified as follows:

> Successive courses shall not be laid upon previously laid courses until 24 hours after the previous course was laid.

Section 302-5.6.2 entitled "Density and Smoothness" of the Standard Specifications shall be modified as follows:

> When a 10 foot straightedge is laid on the finished surface both parallel and perpendicular to the centerline of the roadway, the surface shall not vary from the edge of the straightedge more than 1/8 inch, except at intersections or at changes of grade.

The Contractor shall construct temporary asphalt concrete ramping with a slope of 1:1 at the edge of open excavation if all of the following occur:

1. Clearance between travel lane and open excavation is less than five (5) feet,
2. Excavation depth is six (6) inches or deeper, and
3. If open excavation will last for more than 48 hours.

Payment for construction and removal of temporary asphalt concrete shall be included in other items of work, and no additional compensation shall be allowed therefore.

Work determined by the Engineer to conform to the requirements specified below shall be adjusted based upon the relative compaction result from each lot tested in accordance with the following table:

Relative Compaction (Percent)	Reduced Compensa-tion Factor	Relative Compaction (Percent)	Reduced Compensa-tion Factor
95.0	1.000	93.4	0.938
94.9	0.998	93.3	0.932
94.8	0.996	93.2	0.925
94.7	0.994	93.1	0.918
94.6	0.991	93.0	0.910
94.5	0.988	92.9	0.902
94.4	0.985	92.8	0.892
94.3	0.982	92.7	0.882

Relative Compaction (Percent)	Reduced Compensa-tion Factor	Relative Compaction (Percent)	Reduced Compensa-tion Factor
94.2	0.978	92.6	0.871
94.1	0.974	92.5	0.858
94.0	0.970	92.4	0.843
93.9	0.966	92.3	0.825
93.8	0.961	92.2	0.804
93.7	0.956	92.1	0.775
93.6	0.950	92.0	0.700
93.5	0.944		

Lot sizes are as described in California Test Method 375. If asphalt in a lot is accepted on the basis of a reduced relative compaction, the payment shall be adjusted by multiplying the above factors if the lots are within the range of the above table and as described elsewhere in these special provisions. Should the lot test indicate a relative compaction value of 91.9% or less, the lot shall be removed and replaced at Contractor's sole expense.

A lot will generally be considered the area of asphalt concrete placement performed in one continuous operation in a given day unless otherwise approved by the Engineer. A lot shall consist of approved paving material from only one asphalt concrete production plant. Should asphalt concrete from more than one source (or plant) be used in any single paving operation, the highest reference maximum density shall be used for determination of Relative Compaction. More than one paving operation (one for each source of material) may be performed if equipped as a separate operation and is approved by the Engineer.

1.09 PAVEMENT FABRIC

This section shall conform to Section 213 and 302-7 of the Standard Specifications and these Special Provisions. Pavement fabric shall overlap street reconstruction areas by a minimum of six (6) inches.

1.10 ASPHALT RUBBER HOT MIX (ARHM)

This section shall conform to Section 302-9 of the Standard Specifications and these Special Provisions.

The required ARHM mix design shall be as follows:

Surface Course Only Asphalt-rubber hot-mix shall be gapGap graded Class C (ARHM-GG-D).

Provisions in Section 1.08, Asphalt Concrete, of these Special Provisions related to relative compaction requirements and various adjustments shall apply to this section as well.

1.11 CRACK REPAIR AND PATCHING

After removing all loose materials from the street surface and street surface preparation, Contractor shall crack seal all transverse, longitudinal, reflective, and block cracks that are ¼" or larger with hot rubberized sealant material Polyflex Type 3 or approved equal. Sealant shall be prepared and applied to the pavement cracks in conformance with all manufacturers' instructions.

All cracks to be sealed shall be completely clean, dry, and free of loose material, vegetation, and any other foreign substance, which may cause the sealant not to adhere to the crack wall. Hot compressed air or other means, approved by the Engineer, shall be used to clean and dry the crack immediately prior to application of sealant. Sealant shall be applied only after the cracks and adjacent asphalt concrete surfacing have been cleaned and dried.

Sealant shall be applied with a nozzle from the bottom of the crack up to the surface in a manner, which does not result in sealant bridging or entrapping air pockets. The sealant shall be applied to a slightly overfilled condition and then leveled with a squeegee. The overband shall not exceed 1½ inches on either side of the crack.

1.12 PORTLAND CEMENT CONCRETE (PCC)

PCC shall conform to Sections 200, 303 and 400 of the Standard Specifications and these Special Provisions.

The Cleanness Value requirement of Section 200-1.4 shall be replaced with the following:

Tests	Test Method	Requirements
Cleanness Value	Calif. 227	
Individual Test		70 min.*
Moving Average		75 min.*

The Sand Equivalent requirement of Section 200-1.5.3 shall be replaced with the following:

Tests	Test Method	Requirements
Sand Equivalent	Calif. 217	
Individual Test		70 min.*
Moving Average		75 min.*

* For 2500 or less class concrete, except concrete pavement, a minimum 65 Individual Test Result and a minimum 70 Moving Average will be acceptable if 2500 psi 28-day strength criteria of Section 201-1.1.4 are met, at a six (6) inch slump or greater.

Evaluation of Sand Equivalent and Cleanness Value results shall conform to the provisions of Subsections 200-1.4 and 200-1.5.

All cement to be used or furnished on this Project shall be Type II low alkaline Portland cement conforming to ASTM C150.

1.13 CONCRETE CURBS, GUTTERS, WALKS, RAMPS, DRIVEWAY APPROACHES, ALLEY APRONS, AND CROSS GUTTERS

This Section shall conform to Sections 201, 303 and 400 of the Standard Specifications and these Special Provisions.

Curbs and/or gutters to be constructed shall match existing in all dimensions and shall conform to City of Santa Ana Standard Plan No. 1101. Reconstructed curb and gutters shall be constructed so the top of curb matches the sidewalk surface elevation. When the plans do not show replacement limit stations, the Engineer shall approve replacement limits. Prior to acceptance of the curb and gutter construction by the Engineer, a flow test shall be conducted by the Contractor in the presence of the Engineer.

Curb depressions for driveway approaches and sidewalk thickness across driveway shall be in accordance with City of Santa Ana Standard Plan No. 1112 in lieu of dimensions indicated in Section 303-5.1.3 of the Standard Specifications.

Alley and alley apron shall conform to City of Santa Ana Standard Plan No. 1111.

All culvert openings encountered when replacing curb and gutter shall be reconstructed per City of Santa Ana Standard Plan No. 318 or 319.

During construction of driveway approaches, the Contractor shall maintain access to each business at all times. In some cases, construction of one-half of a driveway approach at a time may be required.

Sidewalks in the parkway designated for replacement shall be replaced at the same width as existing unless otherwise specified and shall conform to City of Santa Ana Standard Plan No. 1104. Sidewalk replacement shall include removing all existing materials below existing sidewalk to make necessary to construct new sidewalk.

Curb ramps shall conform to City of Santa Ana Standard Plan No. 1122 unless otherwise specified.

All new concrete shall be placed within five (5) working days after removal of existing concrete.

All concrete work shall be finished in texture, scoring, banding in generally the same manner as the adjacent existing improvements, unless specified.

1.14 PORTLAND CEMENT CONCRETE (PCC) GRINDING

Grinding existing PCC curb and sidewalk shall be done as shown on the Plans. Grinding shall be done with a power-driven machine that will leave a finished surface comparable to the adjacent sidewalk surface. Excessively smooth surfaces which will become slippery when wet are not acceptable.

Unless shown otherwise on the plans, the grinding width shall be assumed to be one-foot wide.

Limits of PCC Grinding shall be measured along the uplifted edge.

1.15 PORTLAND CEMENT CONCRETE (PCC) PAVEMENT CONSTRUCTION

PCC Pavement and bus pads shall conform to Section 302-6 of the Standard Specifications and these Special Provisions.

PCC used for street pavement and bus pad construction shall be minimum class 560-A-3250. In addition to these minimum requirements, the concrete shall possess the following characteristics:

- Flexural strength at 28 days: 550 p.s.i. min.
- Flexural strength at 7 days: 430 p.s.i. min.
- Compressive strength at 7 days: 2500 p.s.i. min.

All cement to be used or furnished on this Project shall be Type II low alkaline Portland Cement conforming to ASTM C150.

Prior to the start of construction, the Contractor shall furnish to the Engineer laboratory test data for the particular mix design he will use. The data will include the following:

A. A detailed concrete mix design including the type and amount of cement used; complete gradation and source of the aggregate used; the amount of water used; and any proposed admixtures.

B. Flexural strength test data for the same batch of concrete used in A above showing the compressive strength of the concrete at 3, 7, and 28 days.

Section 302-6.4.2 entitled "Tamping" of the Standard Specifications shall be modified by adding the following:

> The outer edge of the gutter shall not be used as a side form for the mechanical tamper except where existing gutter is to remain as shown on the construction Plans.

Concrete pavement for bus pads shall be installed monolithic with the PCC curb and gutter.

Section 302-6.4.4 entitled "Final Finishing" of the Standard Specifications shall be modified as follows:

> Delete all reference to wetted burlap. Final finish of the pavement surface shall be textured by stiff brooming that will produce scoring perpendicular to the centerline of the street, performed at a time and in a manner to produce a hardened surface have a coefficient of friction of not less than 0.38 as determined by California Test 342. Curing to be applied immediately following brooming.

Joints in the concrete pavement shall be constructed as shown on the Jointing Plan (if provided) and described in Section 302-6.5 of the Standard Specifications except as modified herein. Sawing of the joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, usually 4 to 24 hours per engineer's directions. If necessary, the sawing operations shall be carried on both day and night, regardless of weather conditions.

For construction of PCC alleys, transverse weakened plane joints shall be constructed at 15 foot intervals and at power poles, manholes, meter boxes, and utility vaults. One longitudinal weakened plane joint shall be placed offset the centerline. Weakened plane joints shall be saw cut to a depth of ¼ of the pavement thickness and ¼" wide.

All joints shall be sawed before uncontrolled shrinkage cracking occurs. A standby saw shall be available in the event of breakdown. All weakened plane joints shall be sawcut to a depth equal to one fourth of the pavement thickness. Longitudinal joint spacing shall be at ten (10) feet minimum and fifteen (15) feet maximum on either side of centerline joint. Transverse joint spacing shall be at ten (10) feet minimum and fifteen (15) feet maximum for pavement, curb and gutter. Longitudinal joints shall be aligned such that they will cross manholes and water valves at centerline if possible. Transverse construction joints within 1' shall cross all manholes and water valves. Provide a weakened plane joint around the perimeter of all utility vaults.

1.16 LANDSCAPING AND IRRIGATION REPAIR

This section shall conform to Sections 212 and 308 of the Standard Specifications.

All lawn and landscaped areas disturbed by the Contractor as part of or as a result of the work shall be prepared/brought to adjacent grade and restored to match existing landscaping. If there are any existing sprinkler heads and irrigation lines in the

construction areas, whether on public or private property, they shall be replaced or relocated by the Contractor.

1.17 ROOT SHAVING

Root shaving shall be done in accordance with City of Santa Ana Standard Plan No. 1124A at locations designated on Plans or as directed by the Engineer. Prior to shaving any tree root, the Contractor shall coordinate with the City's Tree Maintenance Supervisor.

1.18 ADJUSTMENT OF SURFACE UTILITIES TO GRADE

General

AGENCY-owned utility frames and covers for survey monuments, water meter, water valves, traffic signal and street light pull boxes, and manholes within the area to be paved or graded, shall be set to finished grade by Contractor after construction of new asphalt concrete pavement as shown on the plans, per these Special Provisions and the Standard Specifications in 301-1.6 "Adjustment of Manhole Frame and Cover Sets to Grade". In Portland cement concrete pavement and sidewalk areas, AGENCY' utility frames and covers shall be adjusted to grade prior to placement of concrete.

All other utility frames and covers shall be set to finished grade by the respective utility company. Manholes and other structures in asphalt concrete pavement shall be set to finished grade in accordance with the provisions of subsection 302-5.8 of the Standard Specifications.

Contractor shall tie out all utility locations prior to paving.

Pull Boxes

When lowering pull boxes to new grade, box frame and lid shall have a minimum 4" clearance from any cabling. If necessary, Contractor shall lower conduit by redirecting conduit or removing Subgrade in box area. Cost shall be included in the price bid for adjusting to grade, and no additional allowance shall be made therefore.

Water Meters

When adjusting water meter boxes to grade, Contractor shall replace any old concrete style boxes located within the proposed improvement areas with new polymer meter boxes per City of Santa Ana Standard Plan Nos. 1401 or 1402. **AGENCY shall furnish one new meter box per service to replace concrete style boxes.** If new meter box is damaged or broken for any reason, the Contractor shall be responsible for replacing same. Any existing polymer meter boxes that are damaged during construction shall also be replaced at the Contractor's expense.

Water Valve Box Frames and Covers

Existing AGENCY-owned water valve box frames and covers and manhole frames and covers designated for adjustment to grade shall be set to finished grade by the Contractor per City of Santa Ana Standard Plan Nos. 1410, 1410A, or 1201 as applicable, but with the following excepts as noted in these special provisions.

Prior to paving, an "ID Locator" shall be attached to each valve box or manhole frame and cover. An "ID Locator" is a rubberized marker approximately 4" high that adheres to the utility cover and pops-up after paving for easy identification and location of the respective valve box or manhole.

All valve box frame and covers shall require PCC collars and shall be adjusted to finished grade following paving operations.

PCC pavement for gate collars shall conform to Sections 400, 200, 201, and 302 of the Standard Specifications and these Special Provisions.

PCC used for gate collars construction shall be minimum class 560-A-3250. In addition to these minimum requirements, the concrete shall possess the following characteristics:

- Flexural strength at 28 days: 550 p.s.i. min.
- Flexural strength at 7 days: 430 p.s.i. min.
- Compressive strength at 7 days: 2500 p.s.i. min.

All cement to be used or furnished on this Project shall be Type II low alkaline Portland Cement conforming to ASTM C150.

City of Santa Ana Standard Plan No. 1410A shall no longer use of rapid set concrete mix. City of Santa Ana Standard Plan No. 1410A is to be used for adjusting water valve box frames and covers on arterial and collector streets with the exception of the type of concrete mix which shall conform to the above.

City of Santa Ana Standard Plan No. 1410, which calls for a conventional concrete mix as noted above, is to be used for adjusting valve box frames and covers on residential and local streets.

At any locations where the existing riser sleeve between the valve box and the valve-operating nut is a 6" diameter pipe or smaller, the Contractor shall excavate and replace it with an 8" diameter SCH. 40 PVC pipe. Backfill around riser pipe shall be compacted to 90 percent relative compaction. The riser sleeve shall be kept clean and free of dirt or debris to provide clear access to the valve-operating nut.

AGENCY Manholes

AGENCY utility manhole frames and covers shall be adjusted to grade with PCC collar in accordance with the respective Standard Plans.

The Contractor shall cooperate with the owners of any frames and covers and shall cover and completely protect said frames and covers with heavy plastic or other suitable material.

1.19 PULVERIZE & CEMENT-TREAT EXISTING ASPHALT CONCRETE, BASE, AND SUBGRADE

General

This work shall conform to the Standard Specifications Section 301-3 "PORTLAND CEMENT TREATED MIXTURES" and consist of pulverizing existing asphalt concrete surfacing & underlying base materials, mixing with Portland cement & water, spreading & compacting, and grading & curing the mixture to conform to the requirements specified.

Materials

Existing asphalt concrete surfacing shall be ripped and pulverized with underlying base materials and subgrade soil to the specified depths and widths in conformance to the Project Plans and Special Provisions.

The asphalt concrete surfacing and underlying base materials shall be pulverized such that 100 percent of the material will pass a two-inch sieve and a minimum of 90-percent will pass a one and one-half-inch sieve. All materials other than rock and pulverized asphalt concrete shall be broken up such that these materials will pass a one inch sieve.

The pulverized material shall be shaped and rolled to the specified cross sections. The Engineer shall check and verify the conformance of the material to the lines, grade, and elevation as shown on the plans, prior to beginning cement treatment.

Trimming and disposal of excess material, if required, will be performed on the intimate mixture of pulverized asphalt concrete, base materials and subgrade soil prior to cement treatment.

Portland cement shall be Type II Modified, conforming to the requirements of Section 201-1.2.1 "Portland Cement," of the Standard Specifications. Pozzolanic material shall not be substituted for Portland Cement.

Water shall conform to the provisions in Section 201-1.2.3, "Water," of the Standard Specifications.

Cement Application

Cement shall be uniformly spread by mechanical equipment at a spread rate necessary to meet the cement content specified on the plans for the various areas to be treated.

The cement content shall be 5% (five-percent) based on the dry unit weight of the pulverized material. The dry unit weight of the pulverized material shall be determined

by California Test 312 (Design and Testing of Classes A and B Cement Treated bases). The Engineer may order an increase or decrease in the specified cement content when conditions warrant such action. For cost estimate purposes, use 130 pounds/cubic feet for the dry unit weight of pulverized material.

The quantity of Portland cement added to the pulverized material for cement treatment shall meet the following requirements when evaluated in conformance with the provisions in Section 400-1.4, Statistical Testing, of the Standard Specifications.

1. The average of the test results for the cement content from each sampling station shall vary no more than 0.6-percent under not more than 1.0-percent over the specified cement content.

2. The moving average of the test results shall be at least the specified cement content.

Cement shall not be spread upon the prepared material more than one hour prior to the mixing operation. No traffic other than the mixing equipment shall be allowed to pass over the spread cement until the mixing operation is completed.

Mixing In Place

This work consists of mixing in place the pulverized asphalt concrete, underlying base material, and subgrade soil with Portland Cement and water; then spreading, compacting, trimming, and curing the mixture to the lines, grade, and elevation as established by the Project Plans and Special Provisions.

The cement treated mixture shall be constructed utilizing a machine or a combination of machines that will produce results meeting all the requirements herein. The mixing machine(s) shall be equipped with controlled water distributing equipment and water shall be applied under pressure. Leakage of water shall not be permitted. Care shall be exercised to avoid the addition of any excess water. Such equipment shall be approved by the Engineer prior to use.

The treated mixture shall be uniform throughout and at least one pass of the mixing equipment shall be made before mixing water is added to the material.

The engineer shall be the sole judge as to the number of passes required by the mixing equipment prior to the addition of the mixing water.

The percentage of moisture to be added to the pulverized material during the mixing operation shall be the amount necessary to assure a uniform and intimate mixture of the materials. It shall not exceed by more than one percent the optimum moisture content as determined by California Test 312.

Subsequent to the addition of water, sufficient passes shall be made by the mixing equipment to produce a uniformly treated material. Uniformity will be determined

initially by sampling and testing at variable depths and locations within the treated material.

The number of required passes may be adjusted from time to time by the Engineer based upon subsequent sampling and testing of the completed mixture. The engineer shall be the sole judge as to the number of passes required by the mixing equipment following the addition of the mixing water.

Where mixing equipment requires windrow operations, the material to be treated shall be shaped and sized prior to the addition of cement. The windrow shall be limited to such size that all material can be passed through the mixing machine at each operation. The tops of windrowed material shall be flattened or slightly trenched to receive the cement. Following the final mixing operation, the treated mixture shall be spread to the required lines, grade, and elevation as shown on the plans.

Compacting and Finishing

The length of treated sections shall be regulated by the Contractor such that final compaction of the mixture to the specified density shall be completed within 2-1/2 hours after the initial application of water during the mixing operation.

The cement treated material shall be compacted to a relative compaction of not less than 95% (ninety-five-percent) of the maximum density determined by California Test 312. The in- place density shall be determined by California Test 231, Part I, (Nuclear Density Gauge). The compaction test will be conducted by the AGENCY.

During finishing operations, the surface of the cement-treated material shall be shaped to the required lines, grades, and cross section, and shall be kept moist. The mixture shall be compacted in one layer.

Curing

After placement and compaction of the soil-cement is completed, it shall be protected against drying and from traffic for at least three (3) days minimum. If paving does not take place on the fourth day, the soil-cement shall be kept moist and free from traffic for seven (7) days.

Curing shall be moist (Water Fogging), or other method approved by the Engineer. If moist curing is used, exposed surfaces of the soil-cement shall be kept continuously moist with a fog spray for seven (7) days.

Construction Joints

Construction joints shall have vertical faces and shall be made in thoroughly compacted material. Additional mixture shall be placed against the construction joint until the joint has been approved by the Engineer. The face of the cut joint shall be lean and free of deleterious material and shall be kept moist until the placing of the adjacent soil-cement.

Repair

If the soil-cement is damaged, it shall be repaired by removing and replacing the entire depth of affected layers in the damaged area. Feathering will not be permitted for repair of low areas.

1.20 REMOVE EXCESS PULVERIZED MATERIAL

Removal of excess pulverized pavement shall be done in accordance with Section 300-1.3 of the Standard Specifications and these special provisions.

Excess pulverized material is the surplus that results after trimming and grading the pulverized pavement section to the lines and grades shown on the plans. The pulverized subgrade should be trimmed sufficiently low to allow for the leveling and surface course asphalt concrete overlays all as required to meet proposed finished surface grades called for on the plans.

Excess pulverized material shall consist of non-cement treated well mixed pulverized asphalt concrete pavement and subgrade. The Contractor will not be allowed to remove unmixed material or more specifically the Contractor will not be allowed to remove the more desirable asphalt concrete pavement off the top of the existing pavement section prior to mixing with the subgrade.

1.21 COLD IN-PLACE RECYCLING (CIR) / COLD CENTRAL PLANT RECYCLING (CCPR)

CIR and CCPR consist of milling the existing asphalt concrete pavement to the length, depth, and width as shown on the plans; mixing the cold milled material with emulsified recycling agent in place (CIR) or at a central plant (CCPR); then spreading and compacting the recycled pavement mixture to the lines and grades as specified in these special provisions and as shown on the plans. The Contractor shall have the option to use either CIR or CCPR.

A. JUST-IN-TIME TRAINING

Just-In-Time Training (JITT) shall consist of a formal joint training class on cold recycling materials, equipment, placement, and quality control. Construction operations for cold recycling shall not begin until the Contractor's and the Engineer's personnel have completed the mandatory JITT. The Contractor's personnel involved in cold recycling mix design and quality control, as well as equipment operators and crew involved in the recycling and recycled paving operation, plus the Engineer's representatives including inspectors and testers, shall attend JITT. The JITT class will be conducted for not less than two (2) hours on cold recycling operations and recycled paving techniques. The training class shall be conducted at a project field location convenient for both the Contractor and the Engineer. The JITT class shall be completed not more than five (5) days, not including Saturdays, Sundays, and AGENCY's holidays, prior to the start of cold recycling operations. The class shall be held during normal working hours. The JITT instructor shall be provided by the

Contractor. The instructor shall be experienced in the construction methods, materials, and test methods associated with construction of cold recycling projects. A copy of the course syllabus, handouts, and presentation material shall be submitted to the Engineer at least seven (7) days before the day of the training. The Contractor and the Engineer shall mutually agree to the course instructor, course content, and training site. JITT shall not relieve the Contractor of responsibility under the contract for the successful completion of the work in conformance with the requirements of the plans and specifications. JITT may be cancelled at the discretion of the Engineer.

B. SURFACE PREPARATION

Before any recycling work begins, the Contractor shall prepare the existing roadway by:

1. Removing from the roadway dirt, vegetation, standing water, combustible materials, oils, raised roadway markings, and other objectionable materials by sweeping, blading, or other approved method.

2. Adjusting affected utilities down or accommodating for utilities prior to recycling in some other means to the satisfaction of the Engineer.

3. Accurately referencing the profile and cross slope as shown on the plans for the finished surface of the recycled pavement material.

C. MATERIALS

Cold Milled Asphalt Concrete

Existing asphalt concrete pavement shall be cold milled, crushed and screened to conform to the following gradation before mixing with emulsified recycling agent:

Sieve Sizes	Percentage passing
1-inch	100

Graded millings shall uniformly be incorporated into the recycled pavement mixture and oversized or deleterious material shall be disposed of.

Emulsified Recycling Agent

The type of recycling emulsion to be used shall be determined by the mix design. A representative from the recycling emulsion supplier and/or the Contractor shall be at the job site at the beginning of the project to monitor the characteristics and performance of the recycling emulsion. Throughout the job, the representative will be available to check on the project and make adjustments to the recycling emulsion formulation as required, such as to improve coating or adjust breaking properties. Emulsified recycling agent shall conform to the following requirements:

	Test Method	***Requirement***

		Minimum	***Maximum***
Tests on emulsion:			
Sieve test, % of weight sample	AASHTO T59[(1)]	---	0.1
Residue by distillation, %	AASHTO T59[(1)]	60	67
RAP Coating Test	AASHTO T59[(2)]	Minimum Good	
Tests on residue by distillation:			
Penetration, 25°C, 100g, 5s (Target Value) [(3)]	AASHTO T49[(4)]	+/- 25%	
Absolute Viscosity at 60°C, poise	AASHTO T2171[(4)]	Report Only	

Notes:

1. Modify AASHTO T59 - distillation temperature of 177°C with a 20 minute hold.
2. Mix emulsified recycling agent and water rates shall be determined by the mix design and with jobsite RAP.
3. Target value shall be determined by the mix design.
4. Sieve residue from distillation on #20 sieve prior to determining viscosity.

The Contractor shall provide current test results and a Certificate of Compliance for emulsified recycling agent at the time of mix design submittal and for each load delivered to the jobsite. During cold recycling operations, the Contractor shall obtain two 1-liter samples of emulsified recycling agent from each load delivered to the project. One sample shall be used for the Contractor's quality control testing. The remaining samples shall be delivered to the Engineer at the end of each working day. Emulsified recycling agent shall be sampled in plastic containers that are clean, dry, and sealed. The emulsified recycling agent sample shall be handled with care. For bidding purposes, the emulsified recycling agent content is assumed to be **3.5%**.

Water

Water may be added to facilitate the uniform mixing of the emulsified recycling agent and the cold milled material. Water used for cold recycling shall be clean and free of foreign substances and shall not cause an adverse effect on either the emulsified recycling agent or the recycled pavement mixture. Water added by the milling machine shall be measured, and the rate of added water can be between 0.5 and 5.0 percent of water added by weight of the recycled pavement mixture per the approved mix design unless a greater variation has been directed by the person designated by the Contractor to make adjustments in the field. The quantity of residual recycling agent in the final recycled pavement mixture shall not vary due to the addition of water.

Additives

No additives shall be allowed in the cold recycled pavement.

D. MIX DESIGN

At least 14 days prior to beginning the recycling operation, the Contractor shall submit a cold recycled asphalt concrete mix design to the Engineer. The mix design shall be prepared under the supervision of and signed by an Engineer licensed by the State of California. The Contractor shall determine the rate of emulsified recycling agent to be added to the cold milled reclaimed asphalt pavement as part of the mix design for the recycled pavement mixture. Reclaimed asphalt pavement used in the mix design shall be obtained directly from the project site either by coring or milling, as approved by the Engineer. Based on the characteristics of the reclaimed asphalt pavement taken from the project site, more than one mix design may be required. If this process is used, the city may provide mix design requirements. If so, the mix design for the recycled pavement mixture shall conform to the requirements indicated in the – Lab Procedure "Method of Test for Determining the Percent of Emulsified Recycling Agent to Use for Cold Recycling of Asphalt Concrete".

As part of the mix design collection of core samples, the Contractor shall also perform dynamic cone penetrometer (DCP) testing to determine the condition of the base. Both the core and DCP results shall be submitted to the Engineer to determine the proper treatment of a given roadway segment.

The recycled pavement mixture shall conform to the following quality requirements throughout cold in-place recycling operations:

Cold In-Place Recycling Mix Requirements

	Requirement
A. Design Parameters	

Gradation of Reclaimed Asphalt Pavement (RAP): CT 202	1-inch
Asphalt Content of RAP: CT 362 or CT 379 or ASTM D 2172 Method B	Report
Bulk Specific Gravity of Compacted Samples [(1)(2)]: CT 308 Method C	Report
Maximum Theoretical Specific Gravity [(2)]: CT 309 (including provisions of Section J)	Report
Air Voids of Compacted and Cured Specimens [(2)]: CT 367 Part B	Report
Marshall Stability, Cured Specimen[(2)]: AASHTO T 245 40°C (104°F)	1,250 lb. Minimum
Marshall Retained Stability, AASHTO T 245, 40°C (104°F) Based on Moisture Conditioning on Cured Specimen [(2)(3)]	70% minimum
Ratio of Emulsion Residue to Cement (weight : weight)	3:1 Minimum
Raveling Test, Section 9 of Lab Procedure 8, 10°C (50°F)	Report

Notes:

1. 100 mm diameter mold compaction based on either 75 blow Marshall each side or gyratory compactor at 30 gyrations.
2. Measurement on specimens after 60°C (140°F) curing to constant weight for no less than 16 hours and no more than 48 hours.
3. Vacuum saturation of 55 to 75 percent, water bath at 25°C (77°F) for 23 hours, last 30 to 40 minutes in 40°C (104°F) water bath.

During the mix design, the Contractor shall determine the target values for penetration at 25°C and viscosity at 60°C of the emulsified recycling agent to be used in production of the recycled pavement mixture.

The mix design report shall include gradation of millings; recommended water content range as a percentage of dry millings; optimum emulsion content as a percentage of dry millings; and corresponding density, air void level, absorbed water, Marshall stability, retained stability, and raveling at recommended moisture and emulsion contents. For the emulsified recycling agent, include the designation, company name, location, residue content, and certificates of compliance.

Contractor Responsibility

The Contractor is responsible for the final product. Adjustments shall be made in the field to the actual application rate of emulsified recycling agent as needed, as provided by these special provisions, based on the opinion of the Contractor. Any changes made by the Contractor shall be documented in conformance with these special provisions.

The Contractor shall perform process and quality control sampling and testing, and exercise management control to ensure that cold recycling and placement conforms to these specifications. The Contractor shall provide a testing laboratory and personnel

to perform process and quality control sampling and testing during the cold recycling, spreading, compaction, and finishing. The proficiency of testing laboratories and sampling and testing personnel shall be reviewed and approved by the Engineer prior to providing services to the project.

Sampling and testing shall be performed at a rate sufficient to ensure that cold recycling, placement, compaction, and finishing conforms to these specifications. The Engineer shall have unrestricted access to the laboratory, sampling, testing sites, and all information resulting from mix design and quality control activities. All quality control testing results shall be submitted to the Engineer on a daily basis.

The project shall be divided into lots of not greater than 1500 square yards. The Contractor shall control the cold recycling operation as follows:

1. The Contractor shall measure and record the actual recycle depth at each end of the milling drum at least once every 350 feet along the cut length.

2. The amount of emulsified recycling agent shall be within 0.5 percent of the job mix formula established in the mix design for the cold recycled asphalt concrete mixture. Emulsion usage shall be recorded for each lot. The percent of emulsified recycling agent shall be determined based on the ratio of emulsion used to the theoretical dry weight of the millings processed.

3. The Contractor shall measure and report in-place density, and relative compaction for the lot, and shall rework or reprocess any lot not meeting the requirements of these specifications.

4. Sample the recycled material behind the recycling equipment or the sized reclaimed asphalt pavement prior to the addition of the emulsified recycling agent for each lot. If the reclaimed asphalt pavement does not meet the allowable maximum particle size, the test results shall be reported immediately to the Engineer. The Contractor shall reprocess the material or take other corrective actions to attain conformance.

5. On every third sample taken, the Contractor shall perform a wet field gradation for material passing the 1-inch to No. 4 sieves. The Contractor shall compare the sieved sample to the gradation band determined from the mix design and adjust the emulsified recycling agent as needed.

Some sections of the pavement being recycled may require field adjustment for optimum results. For any changes made by the Contractor from one lot to the next, the Contractor shall document the reason for the change and identify each lot where such changes were made.

E. TEST STRIP AND START UP PROCEDURES

The first day of operations, the Contractor shall construct within the limits to be cold recycled a test strip of a single lane width and no more than 1000 feet in length. The test strip section shall:

1. Demonstrate that the equipment, materials, and processes proposed can produce a recycled pavement material layer that conforms to the requirements of these special provisions.

2. Determine the optimal rates for emulsified recycling agents and water recommended for the reclaimed asphalt pavement.

3. Determine the sequence and manner of rolling necessary to obtain the density requirements of these special provisions.

The Contractor shall provide a sequence and manner of rolling which will define maximum compaction by establishing a rolling vs. density chart that shows the progress of densification from initial laydown through maximum obtainable density at the "break over point". The Contractor will determine relative compaction on the quantity within the test strip by measuring nuclear gage density. If the relative compaction of quantity within the test strip or any lot does not meet the density requirements of these special provisions, the Contractor shall construct additional test strips to define the maximum density obtainable for the millings being produced; the rates of emulsified recycling agents and water; and the site conditions.

Cold recycling operations may continue through the first day, unless the Contractor's equipment and process fail to meet the requirements for successful completion of cold recycling operations in conformance with these special provisions. Recycling operations shall not continue until a test strip conforming to the special provisions has been constructed and approved by the Engineer. Test strips that do not conform to the special provisions shall be reworked, re-compacted, or removed and replaced at the Contractor's expense.

Upon acceptance of the test strip by the Engineer, the Contractor shall use the same equipment, materials, and construction methods for the remainder of recycling operations, unless adjustments are made by the Contractor and approved by the Engineer. If adjustments are made, the Contractor will produce a new test strip to define the maximum density.

F. PROPORTIONING DURING THE COLD RECYCLING OPERATION

Emulsified recycling agent shall be metered or weighed into the mass of the cold milled material using a mass flow, Coriolis Effect, type meter that will accurately measure the amount of emulsified recycling agent to within 0.5 percent of the amount required by the mix design or as adjusted in the field.

G. COLD IN-PLACE RECYCLING (CIR) / COLD CENTRAL PLANT RECYCLING (CCPR) EQUIPMENT

General

CIR/CCPR equipment shall be capable of milling and crushing or sizing the existing asphalt pavement. The equipment used for mixing the cold millings with the emulsified recycling agent shall be capable of producing a homogeneous and uniformly coated recycled pavement mixture. The equipment used for placement of the recycled pavement mixture shall be capable of placement to the lines, grades, and requirements specified in these special provisions and shown on the plans. The Contractor shall have available on the site of the work all equipment and materials to be used for recycling operations.

CIR Equipment

Areas inaccessible to the CIR equipment due to vertical curves, horizontal curves and/or grades, cul-de-sac or any other circumstance shall be milled, recycled in adjacent roadway segments, or removed and replaced at the discretion of the Engineer.

1. Pavement Milling Machine

   The pavement milling machine shall be self-propelled. The primary milling equipment shall have a minimum 12.5-feet cutter capable of removing the existing pavement to the depths shown in the plans. Milling equipment shall be equipped with automatic depth controls capable of maintaining the cutting depth to within ¼-inch of the desired depth, and shall have a positive means for controlling cross slope. The milling operation shall not disturb or damage the underlying material. The use of a heating device to soften the pavement will not be permitted. A smaller milling machine may be used to mill the shoulders and miscellaneous areas.

2. Crushing or Sizing Equipment

   Crushing or sizing equipment shall be capable of producing reclaimed asphalt pavement to the size required prior to mixing millings with emulsified recycling agent.

3. Mixing and Proportioning Equipment

   The mixing equipment shall be capable of mixing the cold milled reclaimed asphalt pavement, emulsified recycling agent, and water to produce a completely and uniformly mixed, homogeneous recycled pavement mixture.

4. Pugmill

   The recycle train shall have a continuous pugmill mixing plant with a belt scale or integrated microprocessor control system to control the mass of the cold milled reclaimed asphalt pavement being delivered to the mixing chamber and automatic controls to obtain the proper amount of recycling agent being delivered.

   The pugmill shall be equipped with paddles of a type and arrangement to provide sufficient mixing action and movement to the cold milled reclaimed asphalt pavement and emulsified recycling agent to produce properly mixed recycled pavement mixture. The cold milled reclaimed asphalt pavement shall be fed from the crushing or sizing equipment to the mixer at a uniform and controlled rate. Mixing shall continue until a thoroughly and uniformly coated recycled pavement mixture of unchanging appearance is produced at discharge from the mixer.

5. Water Storage and Supply Equipment

   The recycle train shall have an independent source of water to properly disperse the emulsified recycling agent.

<u>CCPR Equipment</u>

1. Pavement Milling Machine

   The pavement milling machine shall be self-propelled. The milling equipment shall be capable of removing the existing pavement to the depths shown in the plans. Milling equipment shall be equipped with automatic depth controls capable of maintaining the cutting depth to within ¼-inch of the desired depth, and shall have a positive means for controlling cross slope. The milling operation shall not disturb or damage the underlying material. The use of a heating device to soften the pavement will not be permitted.

2. Crushing or Sizing Equipment

   Crushing or sizing equipment shall be capable of producing reclaimed asphalt pavement to the size required prior to mixing millings with emulsified recycling agent.

3. Mixing and Proportioning Equipment

   The mixing equipment shall be capable of mixing the cold milled reclaimed asphalt pavement, emulsified recycling agent and water to produce a completely and uniformly mixed, homogeneous recycled pavement mixture.

4. Pugmill

   The CCPR mixing plant shall have a continuous pugmill mixer with a belt scale or integrated microprocessor control system to control the mass of the cold milled

reclaimed asphalt pavement being delivered to the mixing chamber and automatic controls to obtain the proper amount of recycling agent being delivered.

The pugmill shall be equipped with paddles of a type and arrangement to provide sufficient mixing action and movement to the cold milled reclaimed asphalt pavement and emulsified recycling agent to produce properly mixed recycled pavement mixture. The cold milled reclaimed asphalt pavement shall be fed from the crushing or sizing equipment to the mixer at a uniform and controlled rate. Mixing shall continue until a thoroughly and uniformly coated recycled pavement mixture of unchanging appearance is produced at discharge from the mixer.

5. Water Storage and Supply Equipment

   The CCPR equipment shall have an independent source of water to properly disperse the emulsified recycling agent.

H. COLD RECYCING PAVING AND COMPACTION EQUIPMENT

Paving Equipment

The processed recycled mixture shall be spread using a self-propelled paver having electronic grade and cross slope control for the screed. The equipment shall be of sufficient size and power to spread the recycled material in one continuous pass, without segregation, to the lines and grades established by the Engineer and according to Plans. Pavers shall be track–type with a minimum power of 170 Hp. Heating of the paver screed will not be permitted. The asphalt paver loading equipment for CIR/CCPR shall be capable of picking up substantially all of the recycled pavement material and depositing it in the paving machine.

Compacting Equipment

Compacting of the recycled mix shall be completed using self-propelled rollers, complete with properly operating scrapers and water spray systems. The number, weight and types of rollers shall be as necessary to obtain the required compaction. At a minimum the following rollers shall be used:

- At least one pneumatic roller with a minimum weight of not less than 25 tons.
- At least one double drum vibratory steel-wheeled roller weighing at least 10 tons.

Rollers shall have a width of not less than 65-inches. Tires on the pneumatic rollers shall be evenly inflated and matched in size and profile so as to maximize compactive effort.

I. CONSTRUCTION

No CIR/CCPR work shall be performed during wet conditions, nor started if rain is imminent when the work is to be performed. No recycling work shall be performed

unless the pavement temperature is a minimum of 60°F and ambient temperature is a minimum 50°F and rising. If the temperature does not meet these requirements, the Contractor shall either be put on hold until the temperature reaches the specifications above or be required to use the Cold In-Place Recycling Expanded Asphalt Mix (CIREAM) treatment at the discretion of the Engineer. No additional compensation will be allowed for putting the Contractor on hold. Recycling operations other than compaction shall be completed a minimum of two (2) hours before sunset.

Where possible, ½ inch of existing asphalt concrete shall be protected in place during the grinding process to avoid exposure of existing subgrade. On street segments where it is not feasible to retain ½ inch of existing subgrade, the Contractor shall reduce the milled section or replace the proposed section as directed by the Engineer.

The Contractor shall ensure in the CIR method that there is no gap of un-recycled pavement material created between successive cuts (along the same longitudinal cut line), nor wedges of un-recycled pavement material created by the entry of the milling drum into the existing material. Longitudinal joints between successive cuts shall overlap a minimum of 3-inches.

In areas where the CCPR method is utilized and the recycled pavement is to be placed on the existing milled pavement surface, it shall be verified that the milled surface is firm and unyielding and there are no subgrade failure areas beneath the milled surface that might compromise the integrity of the recycled pavement. When CCPR pavement is placed on a milled surface or adjacent to structures such as curbs, concrete gutters, swales, planters, etc., these contact surfaces shall be swept of all loose material to create a dry clean surface. A tack coat of SS-1h emulsion, emulsified recycling agent or equivalent (0.05 gallon per square yard minimum) shall be applied to surface areas prior to placing the recycled pavement.

J. SPREADING AND COMPACTION

Prior to pick up or placement in the paver, remove and dispose of all visible oversized crack filler in the cold milled material or in the recycled pavement mixture. When a paving fabric is encountered during the recycling operation, the Contractor shall make the necessary changes in equipment or operations so that incorporation of the shredded fabric in the recycled material does not affect gradation, or inhibit placing or compaction of the recycled material. No fabric piece incorporated into the recycled section shall have any dimension exceeding a length of two (2") inches. The Contractor shall be required to remove and properly dispose of oversized pieces of paving fabric as directed by the Engineer. The recycled pavement mixture shall be graded and compacted to the depth, lines, and grades established by the plans or Engineer and as required by these special provisions.

The recycled pavement mixture shall exit from the mixing chamber in a manner that prevents particle segregation. Care shall be exercised while spreading to avoid segregation, tearing, or scarring of the final compacted surface.

Rolling shall commence at a time interval following the milling, mixing, and spreading of the recycled pavement mixture as determined by the mix design or directed by the Contractor. Time intervals shall be based on ambient temperatures, weather, and type of emulsified recycling agent. When possible, rolling shall not be started or stopped on uncompacted material.

Compacting of the recycled pavement mixture shall be completed using rollers meeting the requirements of these special provisions. The rolling pattern shall be changed and a new rolling pattern shall be established when:

- Relative compaction cannot meet the requirements of these specifications.
- There are changes in recycled pavement mixture or proportions.
- There are changes in placement equipment or procedures.
- There is a significant change in temperature or weather conditions or controlling factor.
- There is major displacement and/or cracking of the recycled pavement mixture.

The final compacted surface of the recycled pavement mixture shall be free of ruts, bumps, indentations, raveling, irregularities, or segregation and shall meet the smoothness requirements of these specifications. Cold recycled asphalt concrete that does not conform to these special provisions shall be reworked, re-compacted, or removed and replaced at the Contractor's expense.

Initial Compaction

After compaction but prior to opening the roadway to traffic, the average in-place density shall be determined based upon nuclear gage readings at random locations. During in-place density testing of the compacted recycled pavement, the nuclear gauge shall be set to the recycled section thickness. The average in-place density shall be used to calculate the relative compaction for each lot. The relative compaction shall be not less than 95 percent or greater than 105 percent of the maximum density obtained in the test strip as required in these special provisions. If additional rolling does not achieve relative compaction, a new rolling pattern shall be established such that a new maximum density is determined. However, care should be taken not to over-roll the mat based on visual observations of check cracking or shoving.

After initial compaction has been achieved, and prior to opening the recycled pavement mixture to traffic, the Contractor shall apply a fog seal of dilute (1:1) SS-1h emulsion, dilute emulsified recycling agent or equivalent at a rate of 0.08 to 0.12 gallon per square yard to all areas opened to traffic. Immediately following application of the fog seal, the cold in-place recycled pavement surface shall be covered with sand at a rate of 1.0 to 2.0 pounds per square yard. The exact rate will be determined by the Contractor. Excess sand shall be removed from the pavement surface by sweeping. Sand shall be free from clay or organic material.

Damage to the completed recycled material shall be repaired by the Contractor at the Contractor's expense. No additional compensation will be allowed therefore.

The recycled pavement shall remain in place prior to placement of the final surface seal either:

- For a minimum of two (2) days and until there is less than 1.5 percent moisture remaining in the cold in-place recycled pavement mixture; or
- A minimum of ten (10) days without rainfall.

Final Initial Compaction

Any subsequent surface treatment or overlay of the recycled pavement shall not be placed until the relative compaction of the recycled pavement layer is not less than 95 percent or greater than 100 percent of the maximum density determined by a test strip conducted on the recycled pavement after curing but prior to surface seal or overlay.

The Contractor shall be responsible for protecting and maintaining the recycled pavement material layer until the final surface seal is placed. Any repairs required shall be at the Contractor's expense. Any damage or defects in the layer shall be repaired immediately. An even and uniform surface shall be maintained.

Smoothness

The finished surface of the recycled material cross slope shall be checked regularly during placement using a level. The smoothness shall not vary more than $^{3}/_{8}$-inch from a 10-foot straight edge placed on the surface. Areas of the completed surface that do not meet the specified surface tolerances shall be brought within tolerance by a method chosen by the Contractor and approved by the Engineer.

1.22 COLD IN-PLACE RECYCLING EXPANDED ASPHALT MIX (CIREAM)

Cold In-Place Recycling Expanded Asphalt Mix consists of milling the existing asphalt concrete pavement to the length, depth, and width as shown on the plans; mixing the cold milled material with a mixture of liquid asphalt and water at a central plant; then spreading and compacting the recycled pavement mixture to the lines and grades as specified in these special provisions and as shown on the plans.

A. JUST-IN-TIME TRAINING

Just-In-Time Training (JITT) shall consist of a formal joint training class on cold recycling materials, equipment, placement, and quality control. Construction operations for cold recycling shall not begin until the Contractor's and the Engineer's personnel have completed the mandatory JITT. The Contractor's personnel involved in cold recycling mix design and quality control, as well as equipment operators and crew involved in the recycling and recycled paving operation, plus the Engineer's representatives including inspectors and testers, shall attend JITT. The JITT class will be conducted for not less than two (2) hours on cold recycling operations and

recycled paving techniques. The training class shall be conducted at a project field location convenient for both the Contractor and the Engineer. The JITT class shall be completed not more than five (5) days, not including Saturdays, Sundays and AGENCY's holidays, prior to the start of cold recycling operations. The class shall be held during normal working hours. The JITT instructor shall be provided by the Contractor. The instructor shall be experienced in the construction methods, materials, and test methods associated with construction of cold recycling projects. A copy of the course syllabus, handouts, and presentation material shall be submitted to the Engineer at least seven (7) days before the day of the training. The Contractor and the Engineer shall mutually agree to the course instructor, course content, and training site. JITT shall not relieve the Contractor of responsibility under the contract for the successful completion of the work in conformance with the requirements of the plans and specifications. JITT may be cancelled at the discretion of the Engineer.

B. SURFACE PREPARATION

Before any recycling work begins, the Contractor shall prepare the existing roadway by:

1. Removing from the roadway dirt, vegetation, standing water, combustible materials, oils, raised roadway markings, and other objectionable materials by sweeping, blading, or other approved method;

2. Adjusting affected utilities down or accommodating for utilities prior to recycling in some other means to the satisfaction of the Engineer.

3. Accurately referencing the profile and cross slope as shown on the plans for the finished surface of the recycled pavement material;

C. MATERIALS

Cold Milled Asphalt Concrete

Existing asphalt concrete pavement shall be cold milled, crushed and screened to conform to the following gradation before mixing with liquid asphalt:

Sieve Sizes	Percentage passing
1-inch	100

Graded millings shall uniformly be incorporated into the recycled pavement mixture and oversized or deleterious material shall be disposed of.

Asphalt

The type of liquid asphalt to be used shall be determined by the mix design. A representative from the liquid asphalt supplier and/or the Contractor shall be at the job site at the beginning of the project to monitor the characteristics and performance of the recycling emulsion. Throughout the job, adjustments shall be made to the

liquid asphalt formulation as required, such as to improve coating or adjust breaking properties. The Contractor shall provide current test results and a Certificate of Compliance for liquid asphalt at the time of mix design submittal and for each load delivered to the jobsite. For bidding purposes, the emulsified recycling agent content is assumed to be **2.4%**.

Water

Water shall be added to facilitate the uniform mixing of the liquid asphalt and the cold milled material. Water used for cold recycling shall be clean and free of foreign substances and shall not cause an adverse effect on either the liquid asphalt or the recycled pavement mixture. Water added by the milling machine shall be measured, and the rate of added water can be between 0.5 and 5.0 percent of water added by weight of the recycled pavement mixture per the approved mix design unless a greater variation has been directed by the person designated by the Contractor to make adjustments in the field. The quantity of residual recycling agent in the final recycled pavement mixture shall not vary due to the addition of water.

Additives

No additives shall be allowed in the cold recycled pavement.

D. MIX DESIGN

At least 14 days prior to beginning the recycling operation, the Contractor shall submit a CIREAM mix design to the Engineer. The mix design shall be prepared under the supervision of and signed by an Engineer licensed by the State of California. Prior to commencing the work, the Contractor shall obtain samples that are representative of the material that will be produced during the milling operation. Samples used in the mix design shall be obtained directly from the project site either by coring or milling, as approved by the Engineer. These samples shall be used to establish the design rate of expanded asphalt as a percent by mass of the reclaimed asphalt pavement. The design rate of the expanded asphalt shall be a minimum of 1.0%. Based on the characteristics of the reclaimed asphalt pavement taken from the project site, more than one mix design may be required. The mix design for the recycled pavement mixture shall conform to the requirements in the Wirtgen Cold Recycling Manual's Appendix A2.3.

The CIREAM shall meet the following minimum physical requirements:

Property	Minimum Requirement
Dry Tensile Strength	50 psi
Wet Tensile Strength	25 psi
Tensile Strength Ratio (TSR)	50%

Contractor Responsibility

The Contractor is responsible for the final product. Adjustments shall be made in the field to the actual application rate of liquid asphalt as needed, as provided by these special provisions, based on the opinion of the Contractor. Any changes made by the Contractor shall be documented in conformance with these special provisions.

The Contractor shall perform process and quality control sampling and testing, and exercise management control to ensure that cold recycling and placement conforms to these specifications. The Contractor shall provide a testing laboratory and personnel to perform process and quality control sampling and testing during the cold recycling, spreading, compaction, and finishing. The proficiency of testing laboratories and sampling and testing personnel shall be reviewed and approved by the Engineer prior to providing services to the project.

Sampling and testing shall be performed at a rate sufficient to ensure that cold recycling, placement, compaction, and finishing conforms to these specifications. The Engineer shall have unrestricted access to the laboratory, sampling, testing sites, and all information resulting from mix design and quality control activities. All quality control testing results shall be submitted to the Engineer on a daily basis.

The project shall be divided into lots of not greater than 1500 square yards. The contractor shall control the cold recycling operation as follows:

1. The Contractor shall measure and record the actual recycle depth at each end of the milling drum at least once every 350 feet along the cut length.

2. The amount of liquid asphalt shall be within 0.2 percent of the job mix formula established in the mix design for the cold recycled asphalt concrete mixture. Asphalt usage shall be recorded for each lot. The percent of liquid asphalt shall be determined based on the ratio of asphalt used to the theoretical dry weight of the millings processed.

3. The Contractor shall measure and report in-place density, and relative compaction for the lot, and shall rework or reprocess any lot not meeting the requirements of these specifications.

4. Sample the recycled material behind the recycling equipment or the sized reclaimed asphalt pavement prior to the addition of the liquid asphalt for each lot. If the reclaimed asphalt pavement does not meet the allowable maximum particle size, the test results shall be reported immediately to the Engineer. The Contractor shall reprocess the material or take other corrective actions to attain conformance.

5. On every third sample taken, the Contractor shall perform a wet field gradation for material passing the 1-inch to No. 4 sieves. The Contractor shall compare the sieved sample to the gradation band determined from the mix design and adjust the liquid asphalt as needed.

Some sections of the pavement being recycled may require field adjustment for optimum results. For any changes made by the Contractor from one lot to the next, the Contractor shall document the reason for the change and identify each lot where such changes were made.

E. TEST STRIP AND START UP PROCEDURES

The first day of operations, the Contractor shall construct within the limits to be cold recycled a test strip of a single lane width and no more than 1000 feet in length. The test strip section shall:

1. Demonstrate that the equipment, materials, and processes proposed can produce a recycled pavement material layer that conforms to the requirements of these special provisions.

2. Determine the optimal rates for liquid asphalt and water recommended for the reclaimed asphalt pavement.

3. Determine the sequence and manner of rolling necessary to obtain the density requirements of these special provisions.

The Contractor shall provide a sequence and manner of rolling which will define maximum compaction by establishing a rolling vs. density chart that shows the progress of densification from initial laydown through maximum obtainable density at the "break over point". The Contractor shall determine relative compaction on the quantity within the test strip by measuring nuclear gage density. If the relative compaction of quantity within the test strip or any lot does not meet the density requirements of these special provisions, the Contractor shall construct additional test strips to define the maximum density obtainable for the millings being produced; the rates of liquid asphalt and water; and the site conditions.

Cold recycling operations may continue through the first day, unless the Contractor's equipment and process fail to meet the requirements for successful completion of cold recycling operations in conformance with these special provisions. Recycling operations shall not continue until a test strip conforming to the special provisions has been constructed and approved by the Engineer. Test strips that do not conform to the special provisions shall be reworked, re-compacted, or removed and replaced at the Contractor's expense.

Upon acceptance of the test strip by the Engineer, the Contractor shall use the same equipment, materials, and construction methods for the remainder of recycling operations, unless adjustments are made by the Contractor and approved by the Engineer. If adjustments are made, the Contractor will produce a new test strip to define the maximum density.

F. PROPORTIONING DURING THE COLD RECYCLING OPERATION

Asphalt shall be metered or weighed into the mass of the cold milled material using a mass flow, Coriolis Effect, type meter that will accurately measure the amount of asphalt to within 0.2 percent of the amount required by the mix design or as adjusted in the field.

G. CIREAM EQUIPMENT

General

CIREAM equipment shall be capable of milling and crushing or sizing the existing asphalt pavement. The equipment used for mixing the cold millings with the liquid asphalt and water shall be capable of producing a homogeneous and uniformly coated recycled pavement mixture. The equipment used for placement of the recycled pavement mixture shall be capable of placement to the lines, grades, and requirements specified in these special provisions and shown on the plans. The Contractor shall have available on the site of the work all equipment and materials to be used for recycling operations.

CIREAM Equipment

1. Pavement Milling Machine

   The pavement milling machine shall be self-propelled. The milling equipment shall be capable of removing the existing pavement to the depths shown in the plans. Milling equipment shall be equipped with automatic depth controls capable of maintaining the cutting depth to within ¼-inch of the desired depth, and shall have a positive means for controlling cross slope. The milling operation shall not disturb or damage the underlying material. The use of a heating device to soften the pavement will not be permitted.

2. Crushing or Sizing Equipment

   Crushing or sizing equipment shall be capable of producing reclaimed asphalt pavement to the size required prior to mixing millings with liquid asphalt.

3. Mixing and Proportioning Equipment

   The CCPR mixing plant shall be capable of mixing the cold milled reclaimed asphalt pavement, liquid asphalt, and water to produce a completely and uniformly mixed, homogeneous recycled pavement mixture.

4. Pugmill

   The CCPR mixing plant shall have a continuous pugmill mixer with a belt scale or integrated microprocessor control system to control the mass of the cold milled

reclaimed asphalt pavement being delivered to the mixing chamber and automatic controls to obtain the proper amount of recycling agent being delivered.

The pugmill shall be equipped with paddles of a type and arrangement to provide sufficient mixing action and movement to the cold milled reclaimed asphalt pavement and liquid asphalt to produce properly mixed recycled pavement mixture. The cold milled reclaimed asphalt pavement shall be fed from the crushing or sizing equipment to the mixer at a uniform and controlled rate. Mixing shall continue until a thoroughly and uniformly coated recycled pavement mixture of unchanging appearance is produced at discharge from the mixer.

5. Water Storage and Supply Equipment

The CCPR mixing plant shall have an independent source of water to properly disperse the liquid asphalt.

H. CIREAM PAVING AND COMPACTION EQUIPMENT

Paving Equipment

The processed recycled mixture shall be spread using a self-propelled paver having electronic grade and cross slope control for the screed. The equipment shall be of sufficient size and power to spread the recycled material in one continuous pass, without segregation, to the lines and grades established by the Engineer and according to Plans. Pavers shall be track–type with a minimum power of 170 Hp. Heating of the paver screed will not be permitted. The asphalt paver loading equipment for CIREAM shall be capable of picking up substantially all of the recycled pavement material and depositing it in the paving machine.

Compacting Equipment

Compacting of the recycled mix shall be completed using self-propelled rollers, complete with properly operating scrapers and water spray systems. The number, weight and types of rollers shall be as necessary to obtain the required compaction. At a minimum the following rollers shall be used:

- At least one pneumatic roller with a minimum weight of not less than 25 tons.
- At least one double drum vibratory steel-wheeled roller weighing at least 10 tons.

Rollers shall have a width of not less than 65-inches. Tires on the pneumatic rollers shall be evenly inflated and matched in size and profile so as to maximize compactive effort.

I. CONSTRUCTION

No CIREAM work shall be performed during wet conditions, nor started if rain is imminent when the work is to be performed. No recycling work shall be performed unless the pavement temperature is a minimum of 50°F. Recycling operations other than compaction shall be completed a minimum of two (2) hours before sunset.

Where possible, ½ inch of existing asphalt concrete shall be protected in place during the grinding process to avoid exposure of existing subgrade. On street segments where it is not feasible to retain ½ inch of existing subgrade, the Contractor shall reduce the milled section or replace the proposed section as directed by the Engineer.

In areas where the CIREAM method is utilized and the recycled pavement is to be placed on the existing milled pavement surface, it shall be verified that the milled surface is firm and unyielding and there are no subgrade failure areas beneath the milled surface that might compromise the integrity of the recycled pavement. When CIREAM pavement is placed on a milled surface or adjacent to structures such as curbs, concrete gutters, swales, planters, etc., these contact surfaces shall be swept of all loose material to create a dry clean surface. A tack coat of SS-1h emulsion or equivalent (0.05 gallon per square yard minimum) shall be applied to surface areas prior to placing the recycled pavement.

J. SPREADING AND COMPACTION

Prior to pick up or placement in the paver, remove and dispose of all visible oversized crack filler in the cold milled material or in the recycled pavement mixture. When a paving fabric is encountered during the recycling operation, the Contractor shall make the necessary changes in equipment or operations so that incorporation of the shredded fabric in the recycled material does not affect gradation, or inhibit placing or compaction of the recycled material. No fabric piece incorporated into the recycled section shall have any dimension exceeding a length of two (2") inches. The Contractor shall be required to remove and properly dispose of oversized pieces of paving fabric as directed by the Engineer. The recycled pavement mixture shall be graded and compacted to the depth, lines, and grades established by the plans or Engineer and as required by these special provisions.

The recycled pavement mixture shall exit from the mixing chamber in a manner that prevents particle segregation. Care shall be exercised while spreading to avoid segregation, tearing, or scarring of the final compacted surface.

Rolling shall commence at a time interval following the milling, mixing, and spreading of the recycled pavement mixture as determined by the mix design or directed by the Contractor. Time intervals shall be based on ambient temperatures, weather, and type of liquid asphalt. When possible, rolling shall not be started or stopped on uncompacted material.

Compacting of the recycled pavement mixture shall be completed using rollers meeting the requirements of these special provisions. The rolling pattern shall be changed and a new rolling pattern shall be established when:

- Relative compaction cannot meet the requirements of these specifications.
- There are changes in recycled pavement mixture or proportions.
- There are changes in placement equipment or procedures.
- There is a significant change in temperature or weather conditions or controlling factor.
- There is major displacement and/or cracking of the recycled pavement mixture.

The final compacted surface of the recycled pavement mixture shall be free of ruts, bumps, indentations, raveling, irregularities, or segregation and shall meet the smoothness requirements of these specifications. Cold recycled asphalt concrete that does not conform to these special provisions shall be reworked, re-compacted, or removed and replaced at the Contractor's expense.

Initial Compaction

After compaction but prior to opening the roadway to traffic, the average in-place density shall be determined based upon nuclear gage readings at random locations. During in-place density testing of the compacted recycled pavement, the nuclear gauge shall be set to the recycled section thickness. The average in-place density shall be used to calculate the relative compaction for each lot. The relative compaction shall be not less than 95 percent or greater than 105 percent of the maximum density obtained in the test strip as required in these special provisions. If additional rolling does not achieve relative compaction, a new rolling pattern shall be established such that a new maximum density is determined. However, care should be taken not to over-roll the mat based on visual observations of check cracking or shoving.

After initial compaction has been achieved, and prior to opening the recycled pavement mixture to traffic, the Contractor shall apply a fog seal of dilute (1:1) SS-1h emulsion or equivalent at a rate of 0.08 to 0.12 gallon per square yard to all areas opened to traffic. Immediately following application of the fog seal, the cold in-place recycled pavement surface shall be covered with sand at a rate of 1.0 to 2.0 pounds per square yard. The exact rate will be determined by the Contractor. Excess sand shall be removed from the pavement surface by sweeping. Sand shall be free from clay or organic material.

The recycled pavement shall remain in place prior to placement of the final surface seal either:

- For a minimum of two (2) days and until there is less than 1.5 percent moisture remaining in the cold in-place recycled pavement mixture; or
- A minimum of ten (10) days without rainfall.

Final Initial Compaction

Any subsequent surface treatment or overlay of the recycled pavement shall not be placed until the relative compaction of the recycled pavement layer is not less than 95 percent or greater than 100 percent of the maximum density determined by a test strip conducted on the recycled pavement after curing but prior to surface seal or overlay.

The Contractor shall be responsible for protecting and maintaining the recycled pavement material layer until the final surface seal is placed. Any repairs required shall be at the Contractor's expense. Any damage or defects in the layer shall be repaired immediately. An even and uniform surface shall be maintained.

Smoothness

The finished surface of the recycled material cross slope shall be checked regularly during placement using a level. The smoothness shall not vary more than $^{3}/_{8}$-inch from a 10-foot straight edge placed on the surface. Areas of the completed surface that do not meet the specified surface tolerances shall be brought within tolerance by a method chosen by the Contractor and approved by the Engineer.

1.23 ASPHALT-RUBBER CAPE SEAL

This Section shall conform to Section 600 (chiefly, 600-2.7) of the Standard Specifications and these Special Provisions.

General

The construction sequence of asphalt-rubber cape seal shall be as follows:

a) 3/4" asphalt-concrete leveling course shall be constructed;
b) Asphalt-rubber shall be applied;
c) Cover aggregate shall be placed and rolled and loose material removed; and
d) Emulsion-aggregate slurry Type II shall be applied no sooner than 48-hours and no later than 7 days after cover aggregate is applied.

Certified volume or weight slips shall be delivered to the Engineer for all materials supplied.

Pavement Preparation - The pavement shall be cleaned with a power broom.

Asphalt-Rubber

Asphalt-rubber shall be Type A or B per Section 600-2. The Contractor shall submit a manufacturer's Certificate of Compliance and test reports for the asphalt and rubber.

Asphalt

The Asphalt for Types A and B shall conform to Subsections 600-2.2.4 and 600-2.2.5, respectively, and shall be viscosity grade AR-4000.

Asphalt-rubber shall be placed in accordance with Section 600-2.7.4.

Application shall be stopped before the distribution tank is empty to assure application does not run light.

All reasonable precautions shall be taken to avoid skips at joints and to protect the surfaces of adjacent structures from being spattered or marred. Correction of any such defects shall be made at no expense to the AGENCY.

Hot joints shall be made utilizing a squeegee man between the boot truck and the chip spreader to spread out or rake off overlaps or excess applications of the asphalt-rubber. The longitudinal joint between adjacent applications of screenings shall coincide with the line between designated traffic lanes.

Just before spreading asphalt-rubber, Contractor shall provide a measure of viscosity with a Haake hand-held viscosity meter, if requested by the Engineer. Viscosity shall be as specified in the standard specifications.

The distributor shall also include a tachometer, pressure gauge, volume measuring device and a thermometer.

When a job delay occurs after full reaction, the asphalt-rubber may be allowed to cool. Just prior to restart of application, the material shall be reheated slowly to a temperature not less than 375 degrees F nor more than 400 degrees F.

Cover Aggregate

This section shall conform with Section 600-2.7.5.

If the aggregate chips bounce or roll after striking the asphalt-rubber, the spreader shall be operated at reduced speed.

2.00 SPECIAL PROVISIONS - TRAFFIC SIGNING & STRIPING

2.01 SCOPE OF WORK

The work to be done consists, in general, removal and installation of signs, posts, raised pavement markers, stripes, pavement markings and curb markings as shown on the plans and as described below. Items or details not specifically mentioned in the following Sub-Sections that are required by the project plans, in the applicable 2015 Caltrans Standard Specifications, 2015 Caltrans Standard Plans, City of Santa Ana Standard Plans, Standard Specifications for Public Works Construction (SSPWC) or these Special Provisions shall be performed, constructed or installed.

2.02 STRIPING (TRAFFIC STRIPES AND PAVEMENT MARKINGS)

This Section shall conform to the latest City of Santa Ana Standard Plans, the Caltrans Standard Plans, provisions in Section 84 of the Caltrans Standard Specifications, and these Special Provisions.

A. GENERAL

All traffic stripes and pavement markings shall be thin-mil thermoplastic (sprayable) except for temporary striping, crosswalks and limit lines. All crosswalks and limit lines shall be thermoplastic.

All green bikeway markings shall be Methyl Methacrylate (MMA). MMA shall have skid resistance and be approved equal to Ennis-Flint CycleGrip MMAX or Transpo ViziGrip and comply with FHWA requirements.

All curb markings and median island markings shall be painted using Environmental Protection Agency (EPA) compliant paint material. Paint shall be fast or rapid dry type solvent of similar or approved equal to that manufactured by Ennis or Pervo Paint Companies and shall meet all requirements of South Coast Air Quality Management District. The rate of paint to be applied shall be per recommendation of the paint manufacturer.

All pavement markings including legends, arrows, and symbols shall be per Caltrans Standard Plan A24A - A24E.

All crosswalks at signalized intersections with wheelchair ramps shall be striped with a 5' diagonal (45º) cut-off at the curb return, as shown in City of Santa Ana Standard Plans No. 1130. Crosswalk stripes shall be 12 inches wide.

B. REMOVAL

Existing striping, pavement markings, curb marking and raised pavement markers superseded by the plans shall be removed. All conflicting striping within limit of project shall be removed even if not shown on the plan.

Removal of all traffic striping and pavement markings shall be by grinding. All traffic striping may be removed by grinding or by sandblasting with the Engineer's approval. Existing pavement markings, which are removed by grinding or by sandblasting with the Engineer's approval, shall be completely removed to the satisfaction of the Engineer. All removal areas shall be slurry sealed by rubberized slurry seal. Slurry seal shall cover from lane line to lane line unless directed otherwise by the engineer.

C. TEMPORARY STRIPING

The Contractor shall install temporary traffic striping within 24-hours after paving the street or on any unstriped lanes opened to traffic. Public traffic shall not be allowed on any multilane arterial street without temporary or permanent striping.

Temporary striping can be per City of Santa Ana Standard Plan Nos. 1125B-1 & B-2 (without the raised pavement markers) or by installing reflectorized chip seal markers (single for 4" line, double for 8" line) at 20 feet on center when on a taper or curve, and at 40 feet on center elsewhere. If striping is used, stripes shall be painted. All temporary striping shall be removed prior to the final striping.

Maximum length of workzone striped as temporary striping shall not exceed 1 mile in length, unless directed otherwise by the engineer.

D. FINAL STRIPING

All final stripes, legends, including limit lines, shall be permanently striped within 72 hours after the street has received the final surface course or after legends have been removed for re-striping.

Any existing striping to remain including striping on cross streets, which is disturbed during construction, shall be re-striped as necessary, even if not shown on the channelization plans.

All striping and related roadside signage shall be in place prior to opening the lane(s) to public traffic.

E. THIN-MIL THERMOPLASTIC (SPRAYABLE) AND THERMOPLASTIC

Thin-mil thermoplastic traffic stripes and pavement markings, and thermoplastic crosswalks and limit lines shall conform to the provisions in Sections 84-1, "General," and 84-2, "Thermoplastic Traffic Stripes and Pavement Markings," of the Caltrans Standard Specifications and these special provisions.

Specifications for glass beads shall be "8010-004 (Type II)." Glass beads shall be premixed within the thermoplastic material prior to application and also applied to the thermoplastic striping material immediately following the application of the striping.

Thin-mil thermoplastic material shall conform to the requirements of Caltrans Specification No. PTH-02SPRAY, for Thermoplastic Traffic Striping Material, Sprayable, White and Yellow. The binder material shall be Alkyd. Copies of the Caltrans Specification No. PTH- 02SPRAY are available at the Caltrans Transportation Laboratory, Sacramento, California. Thermoplastic material shall conform to the requirements of Caltrans Specification No. PTH-02ALKYD.

Thin-mil thermoplastic material for traffic stripes shall be applied by spray method in single uniform layer at the minimum thickness of 30 mils and not to exceed 45 mils. Thermoplastic shall not exceed 40-50 mils.

The Contractor shall not begin work until a written notice to proceed has been issued by the Engineer. The Contractor shall notify the City of Santa Ana - Public Works Agency Engineer a minimum of two working days prior to beginning the work to coordinate the work. A schedule of the streets to be re-striped for each day shall be provided to the Engineer one full workday prior to striping or re-striping any streets.

The Contractor shall adjust the thermoplastic application rate as necessary to achieve the thermoplastic application rate stated above prior to striping. Thermoplastic application rate tests (up to and including 5 thermoplastic application rate tests per day, including the thermoplastic application rate test at the start of each workday) may be conducted at random times and locations throughout each workday at the discretion of the Engineer.

Thermoplastic Application Rate Testing

The paint application rate shall be determined by passing the striper over a metal plate while the paint application system is operating. The flow of glass beads shall be stopped while passing over the metal plate. The Engineer shall measure thickness of the applied thermoplastic immediately after application of thermoplastic on the metal plate. Striping shall not continue if the proper thickness of thermoplastic is not being applied. Adjustments and corrective measures shall be applied to insure that the correct thickness of thermoplastic will be applied. Testing of the thermoplastic application rate, as described above, will be required following any adjustment to the thermoplastic application rate, thermoplastic applicator nozzles, or any other thermoplastic application equipment prior to commencement or re-commencement of striping. The initial testing and re-testing of thermoplastic application rates at any location shall be considered as a single thermoplastic application rate test.

Street sweeping of the areas to be re-striped will not be required, but obvious accumulations of loose material or debris shall be removed prior to application of paint or thermoplastic.

Thin-mil thermoplastic material shall be applied to the pavement at a temperature between 350º F. and 400º F., unless the manufacturer recommends a different temperature.

Section 84-2.04, "Payment," of the Caltrans Standard Specifications shall be deleted.

Section 84-3.04, "Payment," of the Caltrans Standard Specifications shall be deleted

F. RAISED PAVEMENT MARKERS

Raised pavement markers shall conform to Section 85, "Pavement Markers," of the Caltrans Standard Specifications and these Special Provisions. Reflective pavement markers shall have abrasion-resistant surfaces.

1. Removal - The contractor shall remove any existing raised pavement markers that do not conform to the channelization plans, and repair any damaged pavement due to raised pavement marker removal to maintain a smooth and uniform surface per SSPWC Section 302-5.6.2. Any missing or broken raised pavement markers shall be replaced, in kind, within the project boundaries.

2. Installation - Install raised pavement markers per the channelization plans in accordance with Section 85-1.06, "Placement," of the Caltrans Standard Specifications and City of Santa Ana Standard Plans Nos. 1125A - 1125C.

Section 85-1.04, "Payment," of the Caltrans Standard Specifications shall be deleted.

2.03 SIGNS (ROADSIDE SIGNS) AND MARKERS

This section shall conform to Section 56-2, "Furnish Signs Panels," of the Caltrans Standard Specifications and these Special Provisions.

A. GENERAL

All new signs shall be furnished and installed by the Contractor. The sign sizes, messages, and colors shall conform to the current edition of the Caltrans Sign Specifications. The sign sizes shall be the standard size shown in the Uniform Sign Chart unless shown otherwise on the plans. The sign backing material shall be anodized rolled sheet aluminum and shall be one piece with drilled holes for mounting.

All signs installed in parkways, sidewalks or pedestrian areas shall have a minimum of 7 feet of vertical clearance from the bottom of the lowest sign to the surrounding surface. Street name signs shall have a minimum 9 feet of vertical clearance. All signs installed in raised median areas shall have a minimum vertical clearance of 4 feet from the existing surface unless shown otherwise on the plans.

When two signs are installed on one post, the signs shall be installed in the proper standard vertical positions unless shown otherwise on the plans. Regulatory, Warning and Guide signs shall be posted above parking restriction signs. The Engineer shall determine the proper order for multiple signs. Sign panels shall not be overlapped.

If signposts are not long enough to provide standard clearance for all signs, a longer post shall be furnished and installed. Signs shall be installed at right angles to approaching traffic unless shown otherwise on the plans. In no case shall signs be installed on wood utility poles or on wood street light poles.

B. MATERIAL AND HARDWARE

1. Roadside signs shall be fabricated using 0.080-inch thick aluminum sheeting and traffic signal mastarm mounted signs shall be fabricated using 0.10-inch thick aluminum sheeting.

2. ASTM D4956-09 Type XI (3M Diamond Grade DG3 Series 4000 or equivalent) reflective sheeting shall be used for the followings:

a. All Regulatory signs except parking restrictions signs.

b. All Warning signs.

3. For school related signs, reflective sheeting shall be 3M Diamond Grade (Fluorescent) Series 4083 DG3 or equivalent.

4. For all other signs, including parking restrictions and Street Sweeping signs, the reflective sheeting shall be ASTM D4956-09 Type III, IV (3M High Intensity Prismatic series 3930 or equivalent).

5. Temporary or construction signs shall be ASTM D4956-09 Type III, IV (3M High Intensity Prismatic series 3930 or equivalent).

6. All signs, except for temporary or construction signs, shall have graffiti coating or film (such as 3M 1160 Overlay) as recommended by the manufacturer of the reflective material. Neither the color nor the reflective intensity of the finished sign panel shall be significantly diminished by the use of graffiti remover when used in a manner approved by Caltrans and the sheeting manufacturer.

7. All street name signs shall be manufactured and installed per City of Santa Ana Standard Plan No 1503.

8. The mounting hardware for all street name signs shall be Grimco 2SQF12 or BA8A12 or City approved equivalent.

9. All street names signs shall be installed with bolts through the sign into the mounting hardware. Compression type of installations will not be accepted.

Reflective sheeting will be applied to the sign panel utilizing the method approved by the manufacturer of the sheeting and shall produce a durable bond equal to or greater

than the strength of the reflective sheeting. No air pockets or bubbles shall exist between the sheeting and the aluminum backing. All sign panels furnished by the Contractor shall be new with no scratches or tears in the reflective sheeting.

No splice will be allowed in the sign panel reflective sheeting other than that which occurs in the manufactured roll of reflective sheeting on sign panels with a minor dimension of 48" or less. On all rectangular sign panels, the splice will be horizontal. No finished sign panel shall have more than one (1) splice and no splice will fall within 2" of the sign panel edge. When splices do occur, the adjoining reflective sheets shall be color matched under both incident and reflective light.

Prior to sign installation the contractor will provide a Certificate of Compliance for the signs.

Section 56-4.02B, Metal Posts, shall be deleted and replaced with the following paragraph:

> New signs shall be installed per City of Santa Ana Standard Plan No. 1504 using square tubing signpost (such as Unistrut Telspar™, UltiMate or Agency-approved equal), anchors and anchor sleeves. Anchors and sleeves shall be embedded with no more than four holes exposed and no less than two holes exposed. The signpost, anchor and anchor sleeve shall be fully perforated galvanized square 12 gauge steel tubing. The signpost shall be 2 inch square, the signpost anchor shall be 2.25 inch square (all dimensions are nominal).

Section 56-4.02C, "Wood Posts," of the Caltrans Standard Specifications shall be deleted.

Section 56-4.02D, "Laminated Wood Box Posts," of the Caltrans Standard Specifications shall be deleted.

The third paragraph of Section 56-4.02E, "Sign Panel Fastening Hardware," of the Caltrans Standard Specifications shall be amended to read as follows:

> All new signs shall be installed with all new mounting hardware. All new straps, saddle brackets, nuts, bolts, and washers shall be stainless steel and tamper-proof. Heavy duty banding straps of 0.030 shall be used. Each sign panel shall have a minimum of two rivets installed per sign. However, signs greater than 45 inches in height shall have three rivets per sign installed in the top, middle and bottom of the sign. Each signpost shall utilize a minimum of two rivets to attach the sign post to the sign post anchor assembly.

The fourth paragraph of Section 56-4.02E, "Sign Panel Fastening Hardware," of the Caltrans Standard Specifications shall be deleted.

C. INSTALLATION AND REMOVAL

Section 56-4.03, "Construction," of the Caltrans Standard Specifications shall be deleted and replaced with the following:

The Contractor shall install new and relocate existing signs as noted on the plans, shall protect-in-place existing signs, posts and parking meters which are not to be removed, and shall replace any of these signs which are damaged during construction.

Sign to be mounted on streetlight or traffic signal poles shall be installed using the strap and saddle bracket method as shown on Caltrans Standard Plan RS-4. Sign panels on traffic signal mast arms shall be installed per Caltrans Standard Plan ES-7N, Detail U. Signs mounted on streetlight poles (electroliers) shall be mounted so as not to cover electrolier identification tags.

Posts shall be installed in driven post anchors per the manufacturer's specifications.

New signs shall be installed on 10 foot posts, except a longer post shall be used if necessary to maintain a 7 foot vertical clearance from the bottom of the lowest sign to the top of the surrounding surface in pedestrian areas. Sign posts shall be installed a minimum of 6 feet from power poles, fire hydrants, and other obstructions. Sign posts shall be installed per City of Santa Ana Standard Plan No 1504.

All signs to be salvaged, as called for on the plans, shall be become property of the contractor.

All posts driven sign post anchors shall be completely removed and the sign post anchor assembly hole backfilled with clean fill dirt to match the existing surrounding grade (non-paved areas only). Driven sign post anchors in sidewalk or pavement areas shall be completely removed and backfilled with grout to the level of the surrounding grade.

Sign posts with foundations in parkway area shall be completely removed and backfilled with clean fill dirt to match the grade of the surrounding area. Sign posts located within sidewalk or other paved areas, shall core drill the sidewalk and remove the sign post to below sidewalk or paving then backfilled with concrete or paving material to match the existing.

3.00 SPECIAL PROVISIONS - TRAFFIC CONTROL

3.01 GENERAL

Street closures, detours, signs and barricades used for handling traffic shall conform to the requirements of latest edition of the "Work Area Traffic Control Handbook" (WATCH), City of Santa Ana Standard Plan No. 1125F, California Manual on Uniform Traffic Control Devices (CA MUTCD), and these Special Provisions.

Traffic control plan must be submitted and approved before starting work on any public street, except for the following temporary closures:

- Temporary single lane closure on 4 or 6-lane arterials can be done per WATCH handbook without submitting traffic control plan.
- Temporary two lanes closure on 6-lane arterials may be done per WATCH handbook without submitting traffic control plan. However, this will require prior approval from Traffic Engineer.
- Temporary closure of local streets may be done per WATCH handbook without submitting traffic control plan. However, this will require prior approval from Traffic Engineer.

Flashing arrow signs shall be used on streets consisting of four or more lanes or where deemed necessary by the City's Traffic Engineering section. The flashing arrow signs shall be solar powered and left in place for the duration of the lane closure.

Temporary striping installation for traffic control shall be painted.

Any existing speed limit signs or other conflicting signs in the construction zone shall be covered during construction with heavy duty black plastic (non-transparent) sheets or bags, which are secured to the sign post below the sign, with tape. In no case shall tape be applied to either front or back of any sign.

Intersections shall be kept open until work takes place within the intersection. Local vehicular and pedestrian access, including access to driveways and businesses, shall be maintained at all times. Pedestrian access (minimum 4-foot width) across both streets in an intersection must be maintained at all times.

Where parking is prohibited during construction, "TEMPORARY NO PARKING" signs shall be posted at least twenty-four hours, but no more than forty-eight hours, in advance of the work. The signs shall be placed no more than 150 feet apart on each side of the alleys, streets and parking areas and at shorter intervals if conditions warrant. The Contractor shall provide the signs and will be responsible for adding the dates and hours of closure to the signs.

No adjacent parallel street shall be constructed concurrently.

3.02 PROJECT PHASING AND LANE REQUIREMENTS

The contractor shall construct the project in the following methods:

A. Outside – Inside:

- Phase I: All work on the outside lane including curb, gutter, sidewalk, and bus pads. Maintain left turn lane and two through lane in each direction at all times.

- Phase II: All work in the middle portion of the street. Maintain two through lane in each direction at all times. Keep left turn lane open at intersection until construction is at the left turn lane or at the intersection.

B. One side – Other side:

- Phase I: All work on one side of the street including curb, gutter, sidewalk, and bus pads. Maintain left turn lane and two through lane in each direction at all times. The side of the roadway that requires widening will usually be Phase I.

- Phase II: All work on the other side of the street including curb, gutter, sidewalk, and bus pads. Maintain two through lane in each direction at all times. Keep left turn lane open at intersection until construction is at the left turn lane or at the intersection.

C. One side – Other side – Middle:

- Phase I: All work on one side of the street including curb, gutter, sidewalk, and bus pads. Maintain left turn lane and two through lane in each direction at all times. The side of the roadway that requires widening will usually be Phase I.

- Phase II: All work on the other side of the street including curb, gutter, sidewalk, and bus pads. Maintain two through lane in each direction at all times. Keep left turn lane open at intersection until construction is at the left turn lane or at the intersection.

- Phase III: All work in the median area that was not able to be done using the previously mentioned methods. Maintain two through lane in each direction at all times. Keep left turn lane open at intersection until construction is at the left turn lane or at the intersection.

A traffic control meeting is required prior to starting work to discuss the required traffic control plan.

3.03 ADVANCED WARNING SIGNS

A. CHANGEABLE MESSAGE SIGNS (CMS)

The Contractor shall provide 2 solar powered CMS two weeks prior to commencement of construction. The signs shall be posted in advance of each end of the project for the duration of the project. These CMS can be LED full matrix or letter matrix or equivalent, with preferred 8" letter (minimum 6"). The overall width of the sign including the trailer shall not exceed 8'.

- Prior to the start of the construction, display the following message:

  Screen 1: <PROJECT STREET NAME> CONSTR
  Screen 2: BEGINS xx/xx/xx

- When construction started, display the following message:

  Screen 1: <PROJECT STREET NAME> UNDER CONSTR
  Screen 2: USE ALT ROUTE

The messages and sign location may be changed at any time as determined by the Engineer.

B. STATIC WARNING SIGNS

The Contractor shall post 2 static advance warning signs at least two weeks prior to commencement of construction stating:

MAJOR ROAD CONSTRUCTION ON
<PROJECT STREET NAME>
FROM <DATE> TO <DATE>
EXPECT DELAYS
USE ALTERNATE ROUTE

The signs shall be posted in advanced of each end of the project. These warning signs shall be sized (5' height by 6'wide minimum) to fit the above wordings with orange reflective background, black border and 7" black letters. If sign is installed on the sidewalk, there shall be enough clearance for pedestrian access underneath the sign. The Engineer will determine sign placement and the dates.

In the event of construction delays that go beyond the posted completion date on the sign, the contractor shall keep the completion date on the sign updated on a monthly basis or as directed by the Engineer.

3.04 TRAFFIC CONTROL PLAN PREPARATION AND SUBMITTAL

Prior to start of project, the contractor shall submit traffic control plan for approval on all construction phases and/or stages. The traffic control plan shall be prepared by registered

Traffic/Civil Engineer specializing in Traffic Control. Unless directed otherwise, the traffic control plan shall conform to the format and requirements identified in the City of Santa Ana Standard Plan No. 1125F.

The submittal and review process is as follows:

- Within 1 week of receiving Award of Contract, contractor shall meet with the City to discuss the proposed traffic control plan and construction phasing
- Traffic control plans must be submitted within 4 weeks of receiving Award of Contract.
- The City will review all 1st submittal in 2 weeks.
- The City will review subsequence re-submittal with check print in 1 week.
- Contractor may submit traffic control plan for each Phase separately.
- Approval of the traffic control plan may take more than 2 submittals depending on the completeness and thoroughness of the plan.
- Incomplete traffic control plan will be rejected without reviewing. The City will not be responsible for any delay of the project due the incomplete submittal of the traffic control plan.

3.05 PAYMENT

Payment for all traffic control, including but not limited to providing the CMS, preparing traffic control plan, sandblasting, barricades, temporary striping, move-ins, and the above warning signs shall be paid under other items of work involved and no additional compensation will be allowed therefore.

4.00 SPECIAL PROVISIONS - TRAFFIC SIGNAL SYSTEMS

4.01 DESCRIPTION

This work consists of traffic signal installation or modifications and any other related work required to provide the intended operation at the locations shown on the project plans.

This work shall be in accordance with the Plans, these Special Provisions, the Standard Specifications for Public Works Construction (SSPWC), Section 86 of the 2015 Caltrans Standard Specifications, the 2015 Caltrans Standard Plans, and any applicable errata (or Revised Standard Plans).

The SSPWC will control the general provisions, construction materials and constructions methods, except for the following Sections:

- Section 209: Street Lighting and Traffic Signal Materials
- Section 307: Street Lighting and Traffic Signal Systems

The Caltrans Standard Specifications Section 86 set forth above will control the construction materials, and construction methods for specific work relating to Street Lighting, Traffic Signal Materials and Traffic Signal Systems, except as amended by the Project Plans and these Special Provisions.

4.02 NEC CERTIFICATE REQUIREMENT NOTICE

Certification is required for all persons who perform work as electricians for contractors licensed as Class C-10 electrical contractors under the Contractor's State License Board Rules and Regulations.

4.03 FURNISHING AND INSTALLING

Unless specifically called out by the plans or special provisions that a piece of equipment or material will be supplied by a third party, it is the Contractor responsibility to furnish and install all necessary equipment and material, even if not identified on the plan or in these special provisions, to provide the intended operation as shown on the plans.

4.04 SCHEDULING OF WORK

The City of Santa Ana requires that all pole locations shall be potholed to determine the proper pole type and mast arm length prior to ordering.

The City of Santa Ana will issue the notice to proceed to pothole following preconstruction meeting. All potholing is to be completed within 10 days following the issuance of the notice to proceed. Work shall be suspended following the completion of the potholing.

The contractor may order traffic signal equipment following the contract award including poles. However, the City is not responsible for any pole changes due to unforeseen utilities conflict resulting from ordering of equipment prior to potholing.

It is the intent of the City of Santa Ana that the Contractor be allowed to start construction activity at a reasonable length of time prior to delivery of equipment and following receipt of written notice to proceed. This will permit excavations, installation of conduits, pull boxes and foundations in a most expedient manner, and minimize the disruption and inconvenience of an extended construction schedule. Construction, once started, shall be pursued until completion.

Above ground signal work shall not commence until such time that the Contractor notifies the Engineer, in writing, of the date that all electrical materials and equipment controller assemblies, are received; and said work shall start within fifteen (15) days after said date.

No materials or equipment shall be stored at the job site (outside of the public right-of-way) until the City issues a Notice to Proceed. The job sites shall be maintained in a neat and orderly condition at all times. No materials or equipment shall be stored within the public right-of-way.

Unless noted otherwise, at least 5 working days of advanced notice shall be given (on any working day except Friday or the day preceding a legal holiday) to the Inspector for any installations of or modifications to channelization, signing, traffic signal and lighting systems. If sufficient notice is not given, the City shall not be liable for any resulting delays.

4.05 SUBMITTAL OF EQUIPMENT LIST AND DRAWINGS

The contractor shall submit the followings for approval prior to the start of construction or some cases, before manufacturing:

1. Certificate (or letter from manufacturer) of Compliance to Caltrans specifications for traffic signal poles and equipment.

2. Certificate (or letter from manufacturer) of Compliance to Caltrans specifications for LED units.

3. Layout of each Reflectorized Street Name Sign.

Certificate of Compliance is not required for equipment specifically called for by manufacture name and model.

For new traffic signal installation, the Contractor shall supply 3 bond copies (24”x36”) of the controller cabinet schematic wiring diagrams.

For simple traffic signal modification, the contractor will make necessary revisions to the existing traffic cabinet print and supply the City 3 bond copies (24"x36") of the revised traffic cabinet print.

For major traffic signal modification where revision to the existing cabinet print is not feasible, the contractor shall prepare and supply new cabinet prints as required.

Materials lists, manufacturer's data, equipment brochures and operations manuals, technical data, controller cabinet wiring diagram, and all other related equipment information, shall be labeled and identified, and shall be submitted in bound booklet form.

4.06 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS

The contractor shall keep the traffic signal system in operations at all times during construction except for the two switchover shutdowns described below.

The traffic signal system consists of but not limited to the traffic signal and safety lights, twisted pair interconnect cables, fiber optic cables, Emergency Vehicle and Railroad Pre-emption Systems, CCTV and/or Video Imaging Detection Systems, Wireless Communication System. The contractor is required to maintain these systems in working condition during construction by providing temporary wiring, splicing, relocating or any other necessary action.

1. Traffic Signal and Safety lights: Contractor shall provide temporary overhead wiring to maintain all vehicle and pedestrian signal indications and pedestrian push buttons and safety lights in operation. Maintain operation of undamaged loops where feasible.

2. Traffic Signal Interconnect Cable: Contractor shall provide temporary cable and/or splicing necessary to maintain continuous communication from the TMC to the traffic signal under construction and other traffic signals on the same interconnect cable.

3. Emergency Vehicle and Railroad Pre-emption: Contractor shall provide temporary wiring to maintain all pre-emption systems in working order.

4. Fiber Optic Cable and CCTV System: Contractor shall provide temporary cable and/or splicing necessary to maintain the CCTV system in working order.

Traffic signal system shutdowns for switchover of equipment, if applicable, shall be limited to two times per traffic signal. Each shutdown period shall be limited to the hours between 9:00 AM and 3:00 PM. First shutdown is allowed for switching from the existing wiring to the temporary wiring and second shutdown is allowed for switching from the temporary wiring to the new permanent wiring. **If deemed necessary by the Engineer, the contractor shall provide traffic control personnel to direct traffic during shutdown period.** The Inspector shall be notified at least five (5) working days before the intended shutdowns.

The contractor shall furnish “STOP AHEAD” and “STOP” signs during any shutdown period. Two "STOP AHEAD" signs and two "STOP" signs shall be placed for each direction of traffic. Sign sizes shall be 30” minimum. Locations of the signs shall be as directed by the Engineer.

The contractor shall be responsible for any additional temporary wiring, which may be required on a day-to-day basis due to the construction.

4.07 TURN-ON AND FUNCTIONAL TESTING

The Inspector shall be notified at least five (5) working days before the intended turn-on and provide method and schedule of turn-on procedure.

The Inspector shall be notified a minimum of two work days in advance of planned connection of the new or modified traffic signal to the traffic signal communications system, if the new or modified traffic signal is to be connected to the traffic signal communications system.

All permanent striping, pavement markings, and signing shall be in place prior to beginning of the Functional Test Period for any new or modified traffic signal system. The Contractor shall complete all sandblasting, striping, pavement markings, and roadside signing installations and modifications shown on the plans prior to beginning the Functional Test Period.

The Contractor shall at his own expense, arrange to have a technician, qualified to work on the equipment listed below and employed by the equipment manufacturer, or his representative, present at the time the equipment is turned on:

1. Traffic signal controller and cabinet assembly
2. Video detection equipment (if applicable)
3. Microwave detection equipment (if applicable)
4. Emergency vehicle preemption equipment (if applicable)
5. Uninterruptible power supply equipment (if applicable)

The Engineer shall be notified at least two working days prior to the beginning of the functional test period.

The Functional Testing Period of the modified traffic signal system shall not be made on Friday, Saturday, Sunday, or the day preceding or following a Federal holiday. The Engineer shall be notified at least two working days prior to the beginning of the Functional Testing Period. The Functional Testing Period will not be allowed to begin without prior authorization by the Engineer.

4.08 SERVICE

The Service Cabinet shall be aluminum clear anodized Type II-B, 2 Wire 120V, wired for both metered and un-metered circuits as follows:

- 100A main bus with 4-circuit interior metered and 4-circuit interior un-metered.
- Metered Circuits:
  - 30A for Traffic Signal
  - 30A Spare.
  - 15A Spare.
- Un-Metered Circuits:
  - 30A for Safety Lights.
- Type V Photo Electric Cell (PEC).

There shall be a shield in front of PEC window to prevent direct light from reaching the PEC.

The Contractor shall be responsible for all service details, coordinating and scheduling of work and necessary connections in advance of need.

The City has incorporated Edison service design into the City's plan; however, it is the contractor's responsibility to verify the service requirement and installation prior to work. If any discrepancy exists between the plans and Edison design, the Edison design shall take precedence. No additional compensation will be provided for the discrepancy.

Stencil service address using 2" minimum lettering and black paint on the service cabinet. Permanent self-adhesive letters and numbers will also be acceptable.

Contractor shall obtain the necessary electrical permits from the Planning & Building Agency for service cabinet installation, inspection and electrical service authorization. The permit fee will be waived for City projects. City will provide Electrical Permit Fee Waiver Memorandum to be presented to Planning & Building Agency at the time of obtaining permit.

4.09 TYPE 332L CABINET ASSEMBLY

If called for in the plans, the cabinet shall meet the following:

1. Type 332L Traffic Signal Cabinet Assembly shall meet the requirements of Caltrans Transportation Electrical Equipment Specifications (TEES) dated March 12, 2009

2. Fully loaded cabinet shall be tested for functionality by an independent party and certificate of completion shall be provided to the City prior to field installation. Cabinet can be tested at:

Econolite Systems

1250 N. Tustin Ave
Anaheim, CA 92807

3. The Cabinet Assembly shall consist of but not limited to the following:

   a. Housing #1 – Clear Anodized
   b. Mounting Cage #1
   c. Fan and thermostat assembly
   d. Power Distribution Assembly #2L
   e. Input Files I & J
   f. Input Panel #1
   g. Service Panel #1
   h. Service Panel Assembly
   i. Output File #1
   j. C1 Harness #1
   k. All other associated wiring, hardware and foundation bolts.

4. In addition to the Caltrans Standard TEES requirements, the following shall be provided:

   a. **Red Monitoring Interface**
   All cabinets shall be equipped with a Red Monitoring Interface, mounted integrally with the Output File #1. The Switchpacks to Conflict Monitor Unit channel assignments are as follows:

Switchpacks	CMU Channel
Swpk Ø1- Swpk Ø8	Ch. 1 – Ch. 8
Swpk OLA, OLB, OLC, OLD	Ch. 9 – Ch. 12
Swpk 2P,4P,6P,8P	Ch. 13, 14, 15, 16

   b. **Cabinet Lights**

   Each cabinet shall be equipped with two (2) fluorescent lighting mounted inside the top front and rear portion of the cabinet. A door actuated switch shall be installed to turn the cabinet lights on when either the front or rear door is opened. The door switches shall be on a separate circuit by itself; and used only to turn on the cabinet light.

   c. **Pullout Drawer/Cabinet Print Holder Assembly**

   A pullout drawer shall be installed in the cabinet cage. The drawer shall be 17" long by 12" long wide by 1 ¾ in. deep. It shall have a hinged top that covers the storage box area and also provides a smooth surface to write on.

   d. **Door Ajar Switch**

This switch shall be provided within the cabinet to trigger the Alarm #1(C1-54) input of the controller whenever the front door is opened. This switch shall be a normally closed switch connected to apply a logic ground signal to the J11-F position of Input File J.

e. **C11P Harness**

A harness shall be provided to access the signals available on the 2070 Controller's C11S Connector. The harness shall be a minimum of 4 ft in length. The harness wire bundle shall be provided with external protection and routed on the Input Panel Side of the Cabinet. The harness shall be connectorized and be of adequate length to properly mate with a 2070 Controller's C11S connector and the other end shall be terminated as called out on the following table. All unused signals shall be made available on termination points within the cabinet for future use.

C11P Pin assignment:

PIN	SOURCE	FUNCTION	TERM
1	O8-1	OUTPUT #56	*
2	O8-2	OUTPUT #57	*
3	O8-3	OUTPUT #58	*
4	O8-4	OUTPUT #59	*
5	O8-5	OUTPUT #60	*
6	O8-6	OUTPUT #61	*
7	O8-7	OUTPUT #62	*
8	O8-8	OUTPUT #63	*
9	DC GND	DC GND	DCG
10	I4-1	6-Ø2	I4-W
11	I4-2	6-Ø4	I8-W
12	I4-3	6-Ø6	J4-W
13	I4-4	6-Ø8	J8-W
14	DC GND	DC GND	DCG
15	I7-1	FUT 1	I1-W
16	I7-2	FUT 2	I5-W
17	I7-3	FUT 3	J1-W
18	I7-4	FUT 4	J5-W
19	I7-5	INPUT # 52	*
PIN	SOURCE	FUNCTION	DCG
20	I7-6	INPUT # 53	*
21	I7-7	INPUT # 54	*
22	I7-8	INPUT # 55	*
23	I8-1	INPUT # 56	*
24	I8-2	INPUT # 57	*
25	I8-3	INPUT # 58	*
26	I8-4	INPUT # 59	*
27	I8-5	INPUT # 60	*

28	I8-6	INPUT # 61	*
29	I8-7	INPUT # 62	*
30	I8-8	INPUT # 63	*
31	DC GND	DC GND	DCG
32			
33			
34			
35			
36			
37	DC GND	DC GND	DCG

f. **Output File #1 Modifications:**

The output file as defined by CalTrans Standards shall be modified to enable the use of an 18 Channel Conflict Monitor. It shall be made compatible with the use of an Eberle Design Inc.'s Model 2018KCLip. Additional wiring for Channel 17 and 18 signals shall be added. The Yellow and Green signal wires shall be made available but labeled and capped for future use. The Red signal wires shall be terminated to the same AC+ source point as that feeding the Red Enable Signal input. The following are the signals required for compatibility:

PIN	FUNCTION	TERM
14	Channel 17 Green	*
17	Channel 18 Green	*
19	Channel 17 Red	AC+
P	Channel 17 Yellow	*
T	Channel 18 Yellow	*
W	Channel 18 Red	AC+

g. **Other Electronic Components:**

Each cabinet shall be provided with the following electronic components:

- One (1) Conflict Monitor Unit – Eberle Design Inc. Model 2018KCLip
- Two (2) Model 204 Flashers
- Twelve (12) Model 200 Switch Packs
- Four (4) Flash Transfer Relay
- One (1) Model 206L Power Supply
- Fourteen (14) Model 222 Two-channel Loop Detectors
- Three (3) Model 242 Two-channel DC Isolators

4.10 TYPE 334 HUB/COMMUNICATION CABINET ASSEMBLY

If called for in the plans, the Type 334 Hub/Communication cabinet shall meet the following:

1. Assembly shall meet the requirements of the Caltrans Transportation Electrical Equipment Specifications (TEES) dated March 12, 2009. The Cabinet Assembly shall consist of but not limited to the following:

   a. Housing #1 – Clear Anodized
   b. Mounting Cage #1
   c. Fan and thermostat assembly
   d. Service Panel #1
   e. Service Panel Assembly
   f. All other associated wiring, hardware and foundation bolts.

2. In addition to the Caltrans TEES requirements, the following shall be provided:

   a. Cabinet Lights

      Each cabinet shall be equipped with two (2) fluorescent lighting mounted inside the top front and rear portion of the cabinet. A door actuated switch shall be installed to turn the cabinet lights on when either the front or rear door is opened. The door switches shall be on a separate circuit by itself; and used only to turn on the cabinet light.

   b. Pullout Drawer/Cabinet Print Holder Assembly

      A pullout drawer shall be installed in the cabinet cage. The drawer shall be 17" long by 12" long wide by 1 ¾ in. deep. It shall have a hinged top that covers the storage box area and also provides a smooth surface to write on.

   c. Other Electronic Components:

      A Switched Rack Power Distribution Unit mounted on the Cabinet cage. This network manageable device shall allow programmable control of eight power outlets. Model shall be an APC Model AP7900.

4.11 TRAFFIC SIGNAL CONTROLLER

If called for on the plans, the controller shall meet the following:

Traffic signal controllers shall be a **Safetran ATC** 2070C controller complying with the latest Caltran's TEES requirements. The Model 2070 Unit for operation within a 332 cabinet shall consist of:

a. Unit Chassis
b. 2070-1C CPU Module **(ATC Engine Board)**

c. 2070-2E Field I/O Module
d. 2070-3B Front Panel Module
e. 2070-4A Power Supply Module

In addition, the Controller must be preloaded with the latest release of an Econolite ASC3-2070 Firmware.

The City may request the controllers to be delivered to Traffic Engineering two weeks prior to any scheduled traffic signal turn on for testing and configuration without any affect upon the controller's manufacturer warranty.

4.12 EXCAVATING AND BACKFILLING

Excavating and backfilling shall conform to Section 86.2.01, "Excavating and Backfilling," of the Caltrans Standard Specifications and these Special Provisions.

All excavated material shall be removed from the site and backfilled with compacted crushed aggregate base material topped with temporary asphalt concrete on the same working day as removed. A temporary alternative to backfilling, with permission of the Engineer, shall be the placement of steel plates with temporary asphalt concrete ramping at edges of the steel plates. Such plating shall not be allowed for more than five (5) working days, after which backfill shall be required.

Traffic signal pole foundations, sign foundation locations, tree root balls, utility potholing locations, and other excavations allowed by the Engineer, shall be backfilled in accordance with Section 19-3, "Structure Excavation and Backfill," of the Caltrans Standard Specifications, to a relative compaction of 95 percent, or by use of the Slurry Backfill method described below. The Contractor may choose either method for backfilling any of the excavations listed above to the bottom of the existing or proposed roadway structural section, sidewalk structural section, parking lot structural section; or as directed by the Engineer. A combination of methods shall not be allowed for any individual excavation and backfill location.

Slurry backfill: Use of a one-sack cement and sand slurry provided by a commercial ready-mix concrete vendor. The slurry shall be placed in conformance with Section 51, "Concrete Structures," of the Caltrans Standard Specifications and shall be placed "in the solid" and monolithic from the bottom of the excavation to the bottom of the existing or proposed roadway structural section, sidewalk structural section, or parking lot structural section; or as directed by the Engineer.

4.13 FOUNDATIONS

Foundations for controller cabinets, standards, posts, and pedestals shall also conform to the provisions in 86-2.03, "Foundations," of the Caltrans Standard Specifications and these Special Provisions.

All material removed for pole foundations shall become the property of the Contractor and shall be disposed of outside the site of work by and at the expense of the Contractor.

The height of foundations shall be 18" above grade for Type P cabinet and 4" above grade for Type 332 cabinet.

Foundation concrete shall be vibrated to eliminate air pockets.

Contractor shall define exact location of all utilities in the vicinity of the new foundations, by hand digging if necessary. After all utilities are established, Contractor shall contact the Engineer for authorization of specific foundation location. Foundations shall be hand-dug until clear of obstructions.

Foundations for traffic signal and luminaire mast arm poles shall be constructed to ensure that the traffic signal or luminaire mast arm is perpendicular (with a tolerance of 2° from perpendicular) to the adjacent tangent curb face or to the alignment as shown on the plans. Foundations that do not provide the proper alignment of the traffic signal or luminaire mast arm (as specified above) shall be completely removed and reconstructed at the Contractor's expense. **The Contractor shall verify the proper alignment of the traffic signal pole or electrolier foundation anchor bolts prior to placement of Portland cement concrete.**

As included in the contract documents, the Contractor shall locate and install foundations as directed by the Engineer. No foundation shall be located within five feet of a water meter or fire hydrant.

The top two inches of the concrete foundation shall be grouted after they are in position. The exposed portions of the foundations shall be formed to present a neat appearance.

Replace pavement or sidewalk in kind to match existing material, color and pattern, from score mark to score mark, after foundations have been installed.

4.14 STANDARDS, STEEL PEDESTALS AND POSTS

Standards, steel pedestals and posts shall conform to the provisions in Section 86-2.04, "Standards, Poles, Steel Pedestals, and Posts," of the Caltrans Standard Specifications and these Special Provisions.

The Engineer shall approve the location of all standards, steel pedestals, and posts in the field, prior to installation.

Contractor shall furnish all new nuts, bolts, washers, foundation anchors, pole caps, hand hole covers, and other hardware, as required to provide the intended installation, for all Contractor-furnished or relocated equipment. Nuts, bolts, washers, foundation anchors, pole caps, hand hole covers and other hardware shall comply with the Caltrans Standard Specifications, Caltrans Standard Plans, these Special Provisions, and the Plans.

4.15 CONDUIT

Traffic signal, interconnect communications, and roadway lighting conduit shall conform to the provisions in Section 86-2.05, "Conduit," of the Caltrans Standard Specifications and these Special Provisions.

Traffic signal conduit shall be schedule 80 PVC unless shown otherwise on the plans. SCE service conduit shall be Schedule 40 PVC unless otherwise noted. Insulated bonding bushings will be required.

All conduits, excluding SCE service conduits, shall be installed at the depth not less than 42" below finished grade. Only when conduits are to be installed between adjacent pull boxes, from traffic signal pole to pull box or pull box to cabinet where the in-between distance is too short to meet the 42" depth and the 45-degree sweep requirements, the conduit may be installed at lower depth but not less than 18" below finished grade.

Unless shown otherwise on the plans, the minimum size of conduit shall be:

1. 2" between an electrolier and the adjacent pull box
2. 2" between a pedestrian push button post and the adjacent pull box
3. 2" between a 1A signal standard
4. 3" between signal standard with mastarm and the adjacent pull box
5. 2-4" between a controller cabinet and the adjacent pull box
6. 2" for advanced inductive loop detector runs
7. 2" between an overhead sign and the adjacent pull box
8. 3" for street crossings containing traffic signal conductors
9. 3" for traffic signal interconnect cable (SIC) only
10. 3" between pull boxes not otherwise specified

Curb terminations shall be as shown on Caltrans Standard Plan ES-5E, Type A, except that conduit shown in Caltrans Standard Plan ES-5E, Type A shall be 2" (53 mm).

A Bull-Line pull tape or equivalent with a minimum tensile strength of 500 pounds shall be installed in all conduits.

The ends of conduit and conduit fittings shall be provided with insulated and galvanized bonding bushings. After conductors have been installed, the ends of conduits shall be sealed with industry grade sealing compound.

Conduit installation by "Trenching in Pavement Method" shall not be allowed within the traveled way of any public street without prior written authorization by the Engineer.

If a conduit is bored or jacked across existing sewer mains, the contractor shall conform to the following requirements:

1. Pothole to determine location and depth of the sewer mains.

2. Visual confirmation by City Inspector shall be done during the boring/jacking of the conduit across the sewer mains for any damages prior to back filling the pothole.
3. If visual confirmation is not done, the contractor shall perform Video Inspection of Sewer Mains per the following specifications.

   a. Video Inspection of Sewer Mains

   The contractor shall use CCTV equipment to verify that City sanitary sewer mains have not been impacted. This includes all mains that appear on the plan of construction drawings as possible points of interference, regardless of the relative elevation of the sewer and what is believed to be the elevation of the newly constructed facility.

   The contractor shall use equipment specially designed and constructed for sewer inspection and televising. The camera must have light sources of suitable illumination output to provide a clear picture of the entire periphery of pipe. The camera must be able to be rotated to a position that will assure that the total periphery of the sewer is in focus at all times, regardless of the diameter of the pipe being inspected. The camera, transport system, and other components of the video system shall be capable of producing a picture adequate for the purposes of the inspection as stated herein. Video runs showing condensation or submersion of the lens, poor or out-of-focus images, poor audio, or otherwise poor image quality shall be cause for rejection and may necessitate re-televising at the consultant's expense if the City determines the video run is not of acceptable quality.

   A cable footage counter, accurate to within one (1) foot in 1000 feet, shall be used and shall be indicated on the monitor and recorded on the video. The date of inspection, continuous forward and reverse readout of camera distance from referenced access hole, the **City supplied upstream and downstream manhole identification number** with an arrow indicating the direction of flow, the size of the pipe, the name of the street, the time of day and the project or location name as supplied by the City shall be displayed continuously on the monitor and recorded on the video. **The use of non-standard or incorrectly numbered manholes by the contractor on the video overlay is cause for rejection of the digital video and any costs associated with re-videoing of the main that are necessitated by the contractor's failure to use designated naming conventions will be borne entirely by the contractor.** The footage relative to the center of the manhole at the start of each run shall be set to accurately reflect a center of manhole starting position of 0.00 feet regardless of where along the pipe and at what footage the run begins. All video operations shall begin at a manhole adjacent to the most likely point of interference and unless blocked by an impassable obstruction, shall end at the closest upstream or downstream manhole or cleanout structure. **Under no circumstances shall the contractor deliver to the City a video of a survey that was otherwise abandoned.** If the camera

cannot pass the entire sewer reach from its point of insertion, the reach shall be inspected from both directions. The consultant shall notify the City immediately of any such obstruction so that it may be repaired or mitigated by the City and/or the contractor and complete inspection of the pipe may proceed.

Television inspection of sewer mains with high volumes of flow (pipe running 1/3 full or more) may, with prior consent of the City, be done at night between the hours of 10 p.m. and 5 a.m. No added compensation shall be allowed for night work. Notwithstanding, **the consultant shall always use whatever mechanical means are available, including modification or changing of the camera wheels or treads, to insure that the image is recorded in an upright, un-rotated position**. The City reserves the right to reject any videotape where changes in the orientation of the camera could have been corrected by such modifications or by performing the work during periods of low flow.

CCTV inspections shall be delivered in an electronic format (CD/DVD) to the Engineer for review and approval.

Cost for video inspection if required, shall be considered as included in other bid items.

4.16 PULL BOXES

Pull boxes shall conform to the provisions in Section 86-2.06, "Pull Boxes," of the Caltrans Standard Specifications, Caltrans Standard Plan ES-8, and these Special Provisions.

Pull boxes' size shall be Number 6 except where shown otherwise on the plan or as directed by the Traffic Engineer. Bottoms shall be bedded in crushed rock. Pull boxes shall not be grouted. Pull boxes shall be polymer concrete reinforced with heavy-weave fiberglass and plastic lining. Pull box covers shall be lightweight (Christy Fibrelyte, or approved equal).

Pull boxes adjacent to Traffic Signal poles shall have 10 foot ground rod with ground clamp and shall be fastened to bare grounding conductor from Traffic Signal pole.

New pull boxes shall not be installed within any curb access ramp. No new pull box shall be located within five feet of a water meter or fire hydrant.

Replace sidewalk in-kind to match existing material, color, and pattern, from score mark to score mark after pull boxes have been installed.

4.17 CONDUCTORS AND CABLES

Conductors shall conform to the provisions in Section 86-2.08, "Conductors," of the Caltrans Standard Specifications and these Special Provisions.

New and modified traffic signals shall utilize multiple conductor traffic signal cable conforming to the provisions in Section 86-2.08D, "Signal Cable," of the Caltrans Standard Specifications, the plans, and these Special Provisions.

Individual conductors shall not be used for new traffic signal installations or modifications of existing traffic signals unless specifically directed by the Engineer and shown on the plans.

Each traffic signal pole shall be served by a single 12 CSC cable per each two vehicle phases. Each pedestrian push button or bicycle push button assembly shall be served by a single 3 CSC. The 12 CSC and 3 CSC cables shall be run continuous between terminal block terminals and traffic signal controller cabinet load switch bay terminals. Splices will not be allowed and no daisy-chaining of traffic signal cables shall be permitted.

Mastarm mounted traffic signal indications shall be connected to the side mount vehicle indication terminal box using a 5 CSC. Three section and four section vehicle indications shall use a single 5 CSC. Five section vehicle indications shall use 2-5 CSC. 5 CSC shall be run continuous between the signal indication and the side mount vehicle indication terminal box and no splicing will be allowed. Multiple indications for the same vehicle phase shall not use the same 5 CSC. Each CSC shall be labeled in a permanent, color-coded manner at the side mount vehicle indication terminal box, such that the vehicle phase and placement are noted on the cable. For example, Ø2 Inboard would indicate the cable serving the indication closest to the traffic signal mastarm pole.

4.18 WIRING

Wiring shall conform to Section 86-2.09, "Wiring," of the Caltrans Standard Specifications and these Special Provisions.

If necessary, multiple lighting circuit conductors can be soldered and insulated by "Method B" as shown in Caltrans Standard Plan ES-13A. Conductors No. 8 AWG or larger shall be spliced by the use of "C" shaped compression connectors and soldering.

Compression-type terminals (spade or eyelet) shall not be permitted for termination on solid conductors.

4.19 BONDING AND GROUNDING

Bonding and grounding shall conform to the provisions in Section 86-2.10, "Bonding and Grounding," of the Caltrans Standard Specifications and these Special Provisions.

4.20 VEHICLE SIGNALS

All new vehicle signal indications shall be 12" nominal diameter. All new signal indications shall be Light Emitting Diode (LED), as specified elsewhere in these Special Provisions.

All new signal section housings shall be provided with visor and backplate. Signal section housings, visors, and backplates shall be metal. All visors shall have twist-on attaching ears to facilitate installation.

The stainless steel machine screw shall have anti-seize compound (NOA-Lox or Agency approved equal) applied before installation. The door shall be equipped with a neoprene gasket, permanently secured, to prevent water from entering the terminal compartment.

Side mounted signal heads shall be mounted on the side away from the traveled roadbed. The Contractor shall furnish and install new mounting hardware as required to provide for the intended design and operation.

4.21 COUNTDOWN PEDESTRIAN SIGNALS

Pedestrian signals shall conform to the provisions in Section 86-4.06, “Pedestrian Signal Faces,” of the Caltrans Standard Specifications and these Special Provisions.

Pedestrian signal shall be LED countdown type with 9” high number (GE model PS7-CFF1-VLA or approved equal). Pedestrian signal indication housings shall be metal, mounted with Type Z-crate front screens. Pedestrian signal housings shall be furnished with a terminal compartment identical to that specified elsewhere in these special provisions.

4.22 LIGHT EMITTING DIODE (LED) MODULES

Light emitting diode (LED) signal and pedestrian modules shall conform to the provisions in sections 86-4.01D of CSS and these Special Provisions.

LED signal modules shall be manufactured by Dialight or Agency approved equal.

Written warranty must be provided by manufacturer for full replacement of the luminaire due to any failure for a minimum period of fifteen (15) years.

The LED signal module manufacturer shall provide a detailed written warranty issued by the factory of module origin with the following minimum provisions:

- Modules shall, at the manufacturer’s option, be repaired or replaced if the module fails to function as intended due to workmanship or material defects within the first 15 years from the date of delivery.

- Modules shall, at the manufacturer’s option, be repaired or replaced if the module exhibit luminous intensities less than the minimum specified values within the first 15 years of the date of delivery.

4.23 VEHICLE DETECTORS

Detectors and detector lead-in cable shall conform to the provisions in Section 86-5, "Detectors" of CSS and these Special Provisions.

Loop wire shall be Type 2. Loop detector lead-in cable shall be Type B.

Loop sealant can be Asphaltic Emulsion Sealant or Hot-Melt Rubberized Asphalt Sealant.

Unless shown otherwise on the plans, all new inductive loop detectors shall be round, 6' (1.8 m) diameter, per CSP plan ES-5B, Type E.

All loop connection shall be in series only.

Bicycle Loop Detectors in Vehicle lane shall be per CSP Type D Circular. Bicycle Loop Detectors in Bicycle lane shall be per CSP Type Q.

All new or modified loop curb terminations shall be Type A as shown in CSP ES-5D. Curb termination conduit shall be 2" (53mm).

If any inductive loop detector wires or loop detector lead-in cables are to be left un-terminated in a pull box for more than a 24-hour period, the ends shall be securely taped and sealed with an electrical insulating coating.

4.24 PEDESTRIAN PUSH BUTTON ASSEMBLIES

Pedestrian push button assemblies shall conform to section 86-5.02, pedestrian push button assemblies, of the CSS and these special provisions.

Unless shown otherwise on the plans, Pedestrian Push Button shall be Type B

Pedestrian push button assembly shall be ADA compliant furnished with stainless steel tamper-proof screws. Pedestrian push button assembly shall consist of 5"x7" housing (Color: Green), 2" ADA Moving Push Button (Color: Green, Button: Silver Stainless Steel) and Caltrans standard 5" by 7.5" R62D sign. The Pedestrian Push Button Assembly shall be installed at ADA standard height of 42", measured from top of sidewalk to center of push button.

When an Audible Pedestrian Signal (APS) system is required, the Contractor shall furnish and install Polara iN2 iNavigator 2-wire system as shown on the plan. The APS system shall include Polara iN2 INavigator 2-wire Push Button Station (iN2 5AN0-B), iCCU Control Unit (Card Rack Control Unit) and all necessary equipment, mounts, cabling, connectors, and any other items necessary to provide the intended operation as shown on the plans.

All exposed fasteners shall have anti-seize compound (NOA-Lox or Agency approved equal) applied before installation.

4.25 VIDEO DETECTION SYSTEM

When video detection is required, the Contractor shall furnish and install rack mounted Video Detection System as shown on the plan. The system shall include video detection equipment and cameras, modules and all necessary equipment, mounts, cabling, connectors, and any other items necessary to provide the intended operation as shown on the plans.

Video detection camera signal cable shall be Belden Model 8281 coaxial cable, or recommended by the manufacturer. Video detection signal cables shall be labeled in a permanent, color-coded manner in each pull box and the traffic signal controller cabinet indicating the vehicle signal phase and direction. Video detection camera signal cables shall not be spliced.

Video detection camera power cable shall be 16/3 SJO, SJT or as recommended by manufacturer. Video detection camera power cables shall be run continuous between the video detection camera and the electrical service equipment enclosure and shall not be spliced. Video detection cables shall be labeled in a permanent, color-coded manner in each pull box and the traffic signal controller cabinet indicating the vehicle signal phase. Video cables shall not be spliced.

4.26 EMERGENCY VEHICLE PREEMPTION (EVP) SYSTEM

When EVP is required, the Contractor shall furnish and install a rack mounted Global Traffic Technologies (GTT) Opticom™ Infrared System as shown on the plans. Phase selectors shall be Model 762 or 764, as shown on the plans. Detectors shall be Model 711, 721, or 722 as shown on the plans.

Detectors shall be mounted on the traffic signal mast-arm unless noted otherwise.

The EVP cables shall be GTT Opticom™ Model 138. EVP cables shall be labeled in a permanent, color-coded manner in each pull box and the traffic signal controller cabinet indicating the vehicle signal phase and direction. EVP cables shall not be spliced

4.27 LIGHT EMITTING DIODE (LED) LUMINAIRES

All new luminaires shall be light emitting diode (LED), I.E.S. Type III distribution, full cut-off, as shown on the plans. All new luminaires shall be Leotek GC1-60F-MV-NW-2-GY-700 GreenCobra™ LED Street Light. Each luminaire shall be equipped with photoelectric control.

Written warranty must be provided by manufacturer for full replacement of the luminaire due to any failure for a minimum period of seven (7) years. Luminaires shall, at the sole discretion of the City, be repaired or replaced if the luminaire fails to function as described in the above specifications for a period of eighty-four (84) months from date of installation. All luminaires shall be SCE prequalified.

4.28 CONDUCTOR LABELING

Conductors shall be labeled in all pull boxes and in the traffic signal cabinet.

1. Labeling Convention:

   a. Conductor Signal Cable shall be labeled to indicate cable size and signal phases (Ex. 12 CSC, P1&6 for 12 conductor cable, phases 1 & 6).

   b. Detector Lead-In cable shall be label to show detector designation per plan (Ex. DLC 1-P2, DLC 2-P2).

   c. System Detection Lead-In cable (SDLC) shall be labeled to show detector designation per plan (Ex. SDLC-SD1 for system detection SD1)

   d. Signal Interconnect cable (SIC) shall be labeled to size and content (Ex. 12PR#19).

   e. Video Detection (VD) cable shall be labeled to indicate video camera and phase or power (Ex. VD-P8 for phase 8 video camera cables or VD-P8 PWR for phase 8 Video camera power cable).

   f. Emergency Vehicle Pre-emption Cable shall be labeled to indicate EVP and phase or power (Ex. EVP-A for EVP cable channel A or EVP-A PWR for EVP power cable).

   g. Closed Circuit Television (CCTV) cable shall be labeled to indicate camera or power (Ex. CCTV-1 for CCTV camera 1 or CCTV-1 PWR for CCTV 1 power cable).

   h. Changeable Message Signs cable shall be labeled to indicate sign or power (Ex. CMS-1 for sign 1 or CMS-1 PWR for sign 1 power cable).

   i. Individual traffic signal conductor or street lighting conductor shall not be labeled in the pull boxes. Traffic signal conductor shall be labeled to show phase in the traffic signal cabinet only.

2. Method of Labeling:

   a. In Pull Boxes:

      Labels shall be produced using tape designed for outdoor use.

   b. In Traffic Signal Cabinet:

      All conductors and cables in the cabinet shall be labeled, including individual traffic signal conductors from CSC.

4.29 PHOTOELECTRIC CONTROLS

The Contractor shall furnish and install Type V photoelectric controls on all luminaires.

4.30 OVERHEAD REFLECTIVE STREET NAME SIGNS

All sign layouts shall be the contractor's responsibility and shall be in accordance to the City layout guideline. All signs shall be made in accordance with drawings furnished by the City and these Special Provisions. All sign layouts must be approved by the City prior to final production.

A. GENERAL

All items shall be new. The materials and workmanship shall be the best quality for the purpose.

The contractor shall replace any sign delivered under this contract which does not conform to these specifications at no cost to the City.

B. DETAILED REQUIREMENTS

1. Base Metal:
The base metal substrate shall be new sheet aluminum alloy 3003-H14 or 5052-H32.

The thickness of the aluminum shall be 0.05" (1 mm). The material shall be subject to inspection prior to degreasing and chromate conversion coating operations. Alloy and temper designations shall be verified in mill test certifications.

All sign panel edges shall be shear-trimmed or roll-slit to produce neat edges and square corners. Sign panel edges shall be straight within 1/32" (1 mm) form the straight plane. Edge delaminating or incomplete coverage of the base metal substrate up to and coincident with the cut edge of the sign panel shall be sufficient basis for rejection of the entire sign panel.

All treatment tanks and/or spray-applied systems must be performed on the contractor premises, to ensure proper adhesion of reflective sheeting materials. All treatment tanks or spray-applied systems shall be charged with fresh chemicals at least once a year. If pretreatment is performed by immersion methods, the tanks must be sufficient size to accommodate the complete panel. Titration equipment shall be available for the inspectors to check the solutions strengths. The cleaned and coated base metal shall be handled only by a mechanical device or by operators wearing clean cotton or rubber gloves. After cleaning and coating operations, the panels shall be protected at all times from contact or exposure to grease, oils, dust or other contaminates.

The front and back surfaces of the aluminum base metal shall be cleaned, deoxidized, and coated with a light tightly adherent chromate conversion coating free of any powdery residue. The base metal pretreatment process shall be in conformance with Section 5, "Recommended Processing methods" of ASTM Designation B-449. The coating weight shall be 30-100 mg/sq.ft. (285-950 mg/sq.m.), A class 1 coating.

2. Sign Message and Reflectorized Material:

   Sign panels with identical legends shall be displayed on both sides of the sign frame unless otherwise indicated.

   Letter size, style, spacing, arrows, and figures shall conform to the current standards established by Caltrans.

   a. The legends or street name shall be 8" (200 mm) upper case and 6" (150 mm) lower case. Series D shall be used.
   b. Street suffixes and block number will be 4" (100 mm). Series D shall be used.
   c. 1" (27 mm) border.
   d. Message layout shall be per attached drawing. Side margins and spacing may be compressed when necessary to stay within sign length.

   3M Diamond Grade DG3 Series 4000 or equivalent shall be used on both fore and background. **The standard color shall be white legends, letters, borders, etc., on a screened green background.** No cut out legends, letters or border shall be used.

3. Sign Frame & Panel Construction:

   The width or the sign shall be 18" (450 mm). Length to be determined by the text and shall not be less than 48" (1200 mm) or more than 96" (2400 mm).

   a. Frames:

      The frame shall be aluminum channel extrusion, 1.25" x 1.25" x .125" (35 x 35 x 3 mm) wall thickness. Alloy 6063-T5. All joints of the aluminum channel shall be welded with an inert gas shielded-arc welding process using 4043 electrode filler wire in accordance with good shop practice. The width of the filler wire shall be equal to the wall thickness of the channel being welded.

      The top of the frame will have two 2" x 2" x .250" (53 x 53 x 6 mm) wall thickness channel members welded and fastened to the frame with stainless steel bolt, washer, lock nuts and cotter pins. The adjustable swing assembly will be attached to these members.

b. Assembly:

A sign panel shall be fastened to both sides of the channel frame to make a double-faced unit. Each sign panel must be a continuous sheet, no vertical or horizontal splices to make up one panel.

The sign panels shall be affixed to the frame with 3/16" (5 mm) diameter blind pop rivets, alloy 5052, or a type approved by the City. They must be aluminum approved. The exposed face of the rivet shall be of similar shade and compatible with face color of the finished sign. The rivets shall be placed through the face of the sign with the wall of the channel placed against the back of the sign panel. Rivets shall be placed no closer than ½" (13 mm) from the edge of the sign panel and a maximum of 8" (200 mm) apart from one another. All rivets must penetrate the web of the channel frame for proper grip strength between sign panel and frame.

The swing hinge is attached to the 2" x 2" (53 x 53 mm) channel member with a ¼" (7 mm) stainless steel bolt and bronze bushing, and then secured with any-lock nut.

4. Mounting Assemblies:

The top of the sign frame shall have two free swinging mounting brackets. They shall be of all aluminum, bronze, and stainless steel parts. The 5" (125 mm) long stainless steel bolt for fine adjustments shall have nuts and lock washers, or self-locking nuts and cotter key. Dampening springs are required. The bracket assembly shall permit the sign to swing perpendicular to the support hardware.

The aluminum mounting brackets shall be adjustable (Safeway EZ-B 1321 Bracket Assembly or MD Solutions Inc. Oscillating Mast Arm Bracket-Adj or equivalent).

When installation of the sign to the mast arm is complete, the sign should swing freely 90 degrees in both directions when moved by the installer.

5. Finish:

The finished sign shall be flat within a ratio of 0.40" (10 mm) per linear foot when measured across the plane of each panel from opposite corners or at any location on the panel. All finished signs shall have a smooth flat surface without defects or objectionable marks of any kind on either the front or the back faces. All letters and designs shall be clearly cut and sharply defined.

The appearance of the sign face shall be uniform throughout and shall be free of wrinkles, gel, hard spots, streaks, extrusion marks, air bubbles or blemishes that may impair the serviceability, detract from the general appearance or color-matching of the sign when viewed from a distance of twenty-five (25) feet (7.5 m).

The finished sign shall be clean and free from all burns, sharp edges, loose rivets and aluminum marks.

Signs with any defects or damage that affect their appearance and serviceability will not be acceptable. All metal parts shall be fabricated in a uniform and quality workmanlike manner with all sign surfaces and edges free of defects. No repairs shall be made to the face sheet without the approval of the City inspectors.

4.31 REMOVING, REINSTALLING, OR SALVAGING ELECTRICAL EQUIPMENT

Salvaging and stockpiling electrical equipment shall conform to the provisions in Section 86-7, "Removing, Reinstalling, or Salvaging Electrical Equipment," of the Caltrans Standard Specifications and these Special Provisions.

When called for on the plan, salvaged equipment shall be delivered to the City of Santa Ana Public Works Agency Maintenance Yard, Santa Ana. The Contractor shall notify the City a minimum of two working days prior to delivery of salvaged equipment.

Existing equipment removed and not to be reused or salvaged to the City of Santa Ana shall become the property of the Contractor and shall be removed from the site by the Contractor. The Contractor shall provide all labor, equipment, and materials necessary to remove, salvage, transport, and dispose of equipment not reused.

All reused or relocated vehicle and pedestrian heads shall be painted to match new equipment color.

4.32 COMMUNICATION CABLES

A. **Signal Interconnect Cable**

Signal Interconnect Cable (SIC) shall be AWG#22 and conform to IMSA Specification 40-2, REA Specification PE-39 and the following:

SIC shall not be spliced unless shown otherwise on the plan. The number of pairs to be provided shall be as shown on the plans. The ends of unused SIC conductors shall be folded back and taped securely to the cable
Where splicing is required, the Contractor is responsible for supplying the splice closures and all accessories including bond connectors and proper end plates to provide splices as recommended by the manufacturer.

Manufacturer recommended lubricant shall be applied to the cable to reduce friction between the cable and the duct. Mechanical aids and pulling cable or ropes shall be used as required.

Personnel shall be stationed at each cabinet, splice vault and/or pull box through which the cable is to be pulled to observe and lubricate the cable.

At least ten feet of slack shall be provided at each pull box. The shield shall be grounded at each trunk splice and at every terminus point.

The cable shall be securely fastened in-place within pull boxes, vaults, and/or cabinets.

The cable shall not be stressed beyond the Manufacturer's minimum bending radius at any time.

All exposed cable ends shall be protected from moisture ingress.

Following installation of the cable in the duct, all duct entrances at pull boxes, vaults and cabinets shall be sealed with duct sealing compound to prevent the ingress of moisture, foreign materials, and rodents.

Cable markers shall be used to identify the cable and pair-count.

The Contractor is responsible for all testing and documentation required to establish approval and acceptance of the production, installation and operation of fabrication materials and installation hardware. The following identifies the specific quality control requirements for this specification.

Cables shall be tested at the factory to ensure the cable complies with the specifications.

Reels of cable shall be tested for insulation breakdown and continuity prior to installation in ducts.

As a post-installation check, the Contractor shall measure the continuity and insulation breakdown of the cable pairs in each length of cable after installation, prior to connection. The Contractor shall measure these parameters on a minimum of two pairs selected by the Engineer. The same pairs shall not be measured on consecutive lengths.

The Contractor shall record the reel number from which the cable came, the identification of the pairs measured, and the results of continuity and insulation tests.

The Contractor shall carry out system integration testing to ensure that the twisted-pair cables perform as specified when used in operation with equipment installed under the contract.

Where splicing is required inside the pull box or splice vault, the Contractor is responsible for supplying the splice kits and all accessories including bond connectors and proper end plates to provide splices as recommended by the manufacturer. Unless noted otherwise, splice kit shall be COYOTE Series manufactured by Performed Line Products, (909) 949-0661, www.preformed.com. All splicing shall

be done by the Contractor, the City will supply necessary wiring information or splicing diagram.

Individual wire splicing shall be done using weather resistant connector (AMP Picabond Connector, Part number 61226 from Tyco Electronics Corporation, http://www.te.com/usa-en/product-61226-3.html).

B. Fiber Optic Cable

This work consists of installation of Single Mode Fiber Optic Cable per plan.

This work shall be in accordance with the Plans, Section 86 of the Caltrans Standard Plans & Specifications and these Special Provisions.

Each fiber optic cable for this project shall be Corning Cable Systems, ALTOS Lite Gel-Free Cables, Single-Jacket/Single-Armor type, loose tube and contain single mode (SM) dual-window (1310 nm and 1550 nm) fibers as shown on the Plans and shall conform to these special provisions.

The drop cables shall be connectorized with SC connectors in the cabinets. This shall require additional aramid strength members in the cable or the use of furcation tubing at the terminus.

1. Quality Assurance Provisions

Documentation of factory test results shall be provided to the Engineer for approval prior to shipping.

The attenuation of 100 percent of the fibers shall be tested by the Manufacturer and certified as satisfying the requirements of this specification. A copy of the test results for each fiber in the cable shall be provided with each reel of cable.

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

The Contractor shall furnish a Manufacturer's certification that the fiber optic cable materials proposed for use on this project will meet all applicable special provisions.

The material shall not be installed in the field prior to the Engineer's approval.

2. Installation

Installation procedures shall conform to the procedures specified by the Manufacturer of the specific cable being installed.

Prior to installing the optical fiber cable, the Contractor shall test the cable on the shipping reel. The Contractor shall submit the manufacturer's recommended procedures for pulling the fiber optic cable to the Engineer for review and approval at least 20 working days prior to installing cables. Mechanical aids may be used to assist cable installation. A tension measuring device or break away swivel shall be placed between the end of the cable grip and the pull rope, to ensure that the tension does not exceed 80 percent of recommended tension or 2225 N, whichever is less. The cable grips for installing fiber optic cable shall have a ball bearing swivel to prevent the cable from twisting during installation.

The fiber optic cable shall be installed using a cable pulling lubricant recommended by the fiber optic cable and/ the innerduct manufacturer and a non-abrasive pull tape conforming to the provisions described under "Conduit" elsewhere in these special provisions. Contractor's personnel shall be stationed at each splice vault and pull box through which the cable is to be pulled to lubricate and prevent kinking or other damage.

During cable installation, the bend radius shall be maintained at a minimum of 20 times the outside diameter of the cable.

Splices shall only be allowed at cable transitions, such as, changes in the size of cables or at entry points for drop-cables. Splice closures shall be required at every junction point and at every device being serviced by the fiber optic cable as indicated on the fiber optic conductor schedules. At each splice closure, all useable fibers in the cable shall be continuously spliced as indicated on the plans. The end-to-end attenuation of the completed cable plant shall not exceed 8 dB from the termination point of the fiber to the City of Santa Ana Traffic Management Center. A minimum of 15 feet of slack shall be maintained on either side of any splice enclosure.

Following installation of the cable in duct, all duct entrances in cabinets, pull boxes and vaults shall be sealed with duct sealing compound to prevent the ingress of moisture, foreign materials and rodents.

3. Splicing

All fiber optic splices shall use the fusion method. The mean bi-directional splice loss of any splice shall not exceed 0.15 dB.

The termination splices shall connect the fiber optic cable span ends with pigtails. The termination splices shall be placed in a splice tray. The individual fibers shall be looped one full turn within the splice tray to avoid bending losses. A 2-inch

minimum bending radius shall be maintained during installation and after final assembly in the optical fiber splice tray. Each fiber shall be individually restrained in the splice tray. The optic fibers in buffer tubes and the placement of the 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 thermal shrink sleeve or approved equivalent.

All fibers shall be labeled in the splice tray with permanent vinyl markers. Pigtail ends shall also be labeled to identify the destination of the fiber.

4. Field Splice Closures

Where splicing is required inside the pull box or splice vault, the Contractor is responsible for supplying the splice closure and all accessories including bond connectors and proper end plates to provide splices as recommended by the manufacturer. Unless noted otherwise, splice closure shall be Corning Splice Closure part number SCF-6C22-01-72. All splicing shall be done by the Contractor, the City will supply necessary splice detail information or splicing diagram.

5. Connectors

The fiber optic connectors shall be the ceramic ferrule SC type for single mode applications.

All fiber optic connectors shall be the 2.5 mm SC connector ferrule type with Zirconia Ceramic material with a PC (Physical Contact) pre-radiused tip.

Field terminations shall be limited to splicing of adjoining trunk cable ends and pigtail breakouts. The pigtails shall utilize factory installed SC connectors.

6. Fiber Optic Testing

a. 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. All 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 in writing a minimum of 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 for approval within two working days after the test involved. The Contractors attention is

directed to "As-Builts" elsewhere in these special provisions, regarding the requirements for recording test results.

Attenuation tests shall be performed with an OTDR capable of recording and displaying anomalies of 0.2 dB as a minimum. Single mode fibers (SM) shall be tested at 1310 nm and 1550 nm.

The OTDR shall have a printer capable of producing a verifying test trace with fiber identification as shown in the sample "Link Loss Budget Work Sheet", numerical loss values, the date and the operator's name. It shall also have a DOS based 3.5 inch-disk recording capability that has associated software to do comparisons and reproductions on 8.5 inch x 11 inch paper, via a personal computer.

Prior to arrival of the cable, the Contractor shall provide detailed test procedures for all field testing to the Engineer. The procedures shall include the tests involved and how the tests are to be conducted. These test plans shall be subject to the approval of the Engineer. 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, calibration and alignment procedures for all proposed test equipment.

b. Factory Testing

Verification of the fiber specifications as listed in the Fiber Characteristics Table shall be supplied by the Manufacturer with the appropriate documentation. After cabling, before shipment but while on the shipping reel, 100 percent of all fibers shall be tested for attenuation. Copies of the results shall be (1) maintained on file at the Contractor's, Manufacturer's and Owner's place of business with a file identification number for a minimum of 10 years, (2) attached to the cable reel in a waterproof pouch, and (3) submitted to the Contractor and to the Engineer prior to the delivery of the cable to the job site.

c. Arrival On Site

The cable and reel shall be physically inspected by the Contractor on delivery and 100 percent of the fibers shall be tested with the OTDR for attenuation to confirm that the cable meets requirements. Test results shall be recorded, dated, compared and filed with the copy accompanying the shipping reel in a weather proof envelope. Attenuation deviations from the shipping records greater than 5 percent shall be brought to the attention of the Engineer in writing. The cable shall not be installed until completion of this test sequence and written approval by the Engineer is received. Copies of traces and test results shall be submitted to the Engineer. If the OTDR 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 for approval.

d. After Cable Installation

After the fiber optic cable has been pulled but before breakout and termination, 100 percent of all the fibers shall be tested for continuity. Test results shall be recorded and dated. Any segment of cable that does not meet specifications shall be replaced with a new segment, without additional splices, at the Contractor's expense. The new segment of cable shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer for approval.

e. Outdoor Splices

At the conclusion of splicing operations at one location, and before the closure is sealed, all splices shall be tested with the OTDR, in both directions. Splice segments shall be tested at 1310 nm and at 1550 nm. The mean bi-directional loss of individual splice losses shall not exceed 0.2 dB. Measurement results shall be recorded, dated, validated by the OTDR trace printout and filed with the records of the respective cable runs. Copies of traces and test results shall be submitted to the Engineer. If the OTDR test results are unsatisfactory, the splice shall be unacceptable. The unsatisfactory splice shall be replaced at the Contractor's expense. The new splice shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer for approval.

f. System Verification at Completion

a. OTDR Testing

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. Test results shall be recorded, dated, compared and filed with previous copies. Copies of traces and test results shall be submitted to the Engineer for approval. 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 for approval.

b. Test Failures

If during any of these system verification tests, the results prove to be unsatisfactory, the fiber optic cable and or defective splice enclosures will not be accepted. The unsatisfactory components shall be replaced 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 for approval. 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.

4.33 CLOSED CIRCUIT TELEVISION (CCTV) SYSTEM

When CCTV system is required, the Contractor shall furnish and install Axis Q6055-E PTZ Network Camera as shown on the plan. The CCTV system shall consist of camera/pan-tilt assembly, mounting, cables, conductors and wires, control software and video management system licensing.

1. Mounting

The Contractor shall mount the integrated camera/position unit on existing traffic signal pole as shown on plans and per manufacturer's recommendation. The Contractor shall verify the mounting requirements of the integrated camera/position unit, and the suitability of the approach depicted in these plans. The Contractor may request approval for alternate mounting details by submitting a shop drawing signed by a registered Engineer.

2. Video Cable

The Contractor shall furnish and install manufacturer recommended Outdoor CAT-6 Ethernet cable with IP66-rated connectors and incidental hardware from the camera to an Ethernet switch in the cabinet to establish circuit continuity. The cable shall be installed without damaging the conductors, dielectric or jacket. The cable assembly shall not be kinked or bent tighter than the Manufacturer's recommended bending radius.

3. Testing

The Contractor shall test and document the installation and operation of all material, equipment, cables and connectors for continuity, shorts or grounds. The Contractor shall also carry out system integration testing to ensure that the video interface and camera interconnect wiring performs to the specified standards when used in operation with all other devices installed under the contract.

4. Warranty

The Contractor shall provide a warranty for all equipment installed or modified under these projects for the extended warranty period provided by the manufacturer. The warranty shall be 12 months from the time the Agency accepts the Project. The warranty on all parts and equipment used on these projects shall be provided by the manufacturer or agent of the equipment. The Contractor shall provide, at no cost to the Agency, all labor, materials, testing, and equipment required restoring the system to its fully operational condition. Following this warranty period, the Contractor shall assign to the

Agency the balance of the manufacturer's warrantees or guarantees on all electrical and mechanical equipment of the system.

4.34 IP COMMUNICATION SYSTEM

When required by the plan, the contractor shall supply and install necessary equipment to establish communication via IP addressing between the City Advanced Traffic Management System (ATMS) and existing field devices or field devices being installed.

Locations and equipment list to be added per project requirements.

4.35 PAYMENT

Payment for any items of work required by the plans, the specifications or other reference documents that are not covered by a contract bid item shall be considered as included in other bid items.

Payment for traffic signal work shall be included in the lump sum or unit price paid for **Traffic Signal Modification or Installation** except for other listed contract bid items. The prices paid for traffic signal system modification or installation shall include full compensation for furnishing all labor, materials, testing, tools, equipment and other incidentals for work as shown on the plans, in the Specifications, and Special Provisions, and no additional compensation will be allowed.

Payment for inductive loop detector shall be included in the unit priced paid for **Traffic Signal Loop** installation. The prices paid for each loop installation shall include full compensation for furnishing all labor, materials, testing, tools, equipment and other incidentals for work as shown on the plans, in the Specifications, and Special Provisions, and no additional compensation shall be allowed.

Payment for CCTV and IP Communication System shall be included in the unit priced paid for **CCTV and IP Communication System** installation. The prices paid for CCTV and IP Communication System shall include full compensation for furnishing all labor, materials, testing, tools, equipment and other incidentals for work as shown on the plans, in the Specifications, and Special Provisions, and no additional compensation shall be allowed.

5.00 SPECIAL PROVISIONS - IRRIGATION, LANDSCAPING, & MAINTENANCE PERIOD

5.01 IRRIGATION

GENERAL:

5.01.01 WORK INCLUDED

A. SUMMARY OF WORK

The Work of this Section includes all labor, materials, and equipment required to complete work indicated on the drawings.

B. REGULATIONS

All local, municipal and state laws, and rules and regulations governing or relating to any portion of this Work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations or requirements of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

C. SCHEDULE OF WORK

1. Verification of site conditions.
2. Physical layout.
3. Trenching.
4. Assembly of system.
5. Piping under roadways.
6. Connection to water supply.
7. Backfilling.
8. Adjustment of system.
9. Testing.
10. Clean up.
11. Inspection.

12. Record Drawings.

13. Guarantees.

5.01.02 APPROVALS

A. INSPECTION

All hardscape work shall be inspected and approved before start of any work of this section.

B. UTILITIES

Prior to commencement of work, locate all electrical cables, conduits, and all utility lines so that proper precautions may be taken not to damage such improvements. In the event of a conflict between such lines and irrigation system locations, promptly notify the Engineer who shall arrange for the relocation for one or the other. Failure to follow this procedure places under the Contractor the responsibility for, at his own expense, making any and all repairs for damages resulting from work hereunder.

C. COORDINATION

Coordinate installations of all sprinkler materials, including pipe, so there shall be no interference existing with or difficulty in planting, trees, turf, or utilities and other construction.

D. PERMITS

The Contractor shall obtain and pay for any and all permits and all inspections as required.

E. GRADES

Carefully note all established grades before commencing work. Restore any established grade changed during course of this work to original contours.

5.01.03 VERIFICATION OF DIMENSIONS AND QUANTITIES

A. QUANTITIES AND TYPES

Irrigation materials shall be furnished in the quantities and/or spacing as shown or noted and shall be of the size and manufacture as indicated on the drawings and specifications.

B. DIMENSIONS

All scaled dimensions are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and quantities and shall immediately inform the Engineer of any discrepancy between the drawings and/or the

specifications and actual conditions. No work shall be done in any area where there is such a discrepancy until approval for same has been given by the Engineer.

C. LAYOUT

Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. The Contractor shall carefully investigate the finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc., as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in the most direct and workmanlike manner, so that conflicts between irrigation systems, planting and hardscape features will be avoided.

D. GRADES

The Contractor shall carefully check all grades to satisfy himself that he may safely proceed before starting work on the sprinkler system.

5.01.04 INSPECTION

A. GENERAL

All inspections herein specified shall be made by the Engineer. The Contractor shall request inspection at least two days in advance of the time inspection is required.

B. INSPECTION REQUIREMENT

Inspection will be required for the following parts of the work:

1. Staked out layout of all pressure supply lines, routing, and location of sprinkler heads.
2. Pressure test and trench depth prior to backfill.
3. Pressure test prior to start, at Point of Connection.
4. Coverage test upon sprinkler system completion.
5. Final inspection upon completion of job.

PRODUCTS:

5.01.05 MATERIALS

A. REQUIREMENTS

All materials and equipment listed on the drawings and specifications will be subject to the following:

1. The Contractor shall furnish the articles, equipment materials, or processes specified by name in the drawings and specifications. No substitution will be allowed without prior written approval by the Engineer.

2. The Contractor shall submit with the material list, catalog data and full descriptive literature whenever he wishes to use items different than those specified.

3. Equipment or materials installed or furnished without the prior approval of the Engineer may be rejected and the Contractor required to remove such materials from the site at his own expense.

4. Approval of any item, alternate or substitute indicates only that the product(s) apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted.

5. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

6. The Engineer can, at his option, require a manufacturer's warranty on any product offered for use.

B. MAIN LINE PIPE AND FITTINGS

1. All main line piping up to 2.5” diameter be shall be Type 1120-1220 PVC, Schedule 40, NSF approved - Lasco, Johns-Manville, or approved equal.

2. All main line piping 3.0” diameter and larger shall be Class 315.

3. All mainline elbows and tees shall have Leemco Restraint fittings, or approved equal. (no concrete thrust block needed)

C. LATERAL LINE PIPE AND FITTINGS

1. All lateral line piping shall be PVC Type 1120-1220, Schedule 40-Lasco, Johns-Manville, or approved equal.

2. All lateral PVC pipe fittings shall be Type 1-11, Schedule 40, NSF approved - Lasco, Sloane, or approved equal.

3. All solvent shall be a type approved by the manufacturer of the pipe and fittings.

D. GATE VALVES

1. Gate valves shall conform to Federal Specifications WW-V-54, Type 1, Class A, with all bronze body, nonrising stem, Nibco No. T-133, or approved equal.

2. Gate valve boxes shall be 10" x 10-1/4" round plastic box with green bolt-down cover, Carson Industries #910-12E, or approved equal.

E. QUICK COUPLING VALVES

1. Quick coupling valves shall have a brass two-piece body designed for working pressure of 150 psi operable with quick coupler. Key size and type shall be as shown on plans.

2. Quick Couplers shall be installed on swing joints.

3. Quick coupling valve boxes shall be 10" x 10-1/4" round plastic box with green bolt-down cover, Carson Industries #910-12E, or approved equal.

F. BACKFLOW PREVENTION

Backflow preventer shall be Wilkins, as designated on the drawings or as approved by the local governing body and health codes.

G. ELECTRICAL SUPPLY

115 volt electrical service and meter enclosure per servicing company standards for the automatic controllers shall be provided by the Contractor.

The Contractor shall be responsible for the installation cost of the electrical connection for any required electrical supply for the irrigation system.

H. CONTROL WIRING

1. Connections between the automatic controllers and the electric control valves shall be made with direct burial wire AWG-U.F. 600 volt copper. Use black No. 12 for pilot wire, and white No. 10 for common wire. Install in accordance with valve manufacturer's specifications and wire chart.

2. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply lines wherever possible.

3. All wiring shall be installed within pipe sleeving in Schedule 40 PVC under roadways.

4. An expansion curl should be provided within three (3) feet of each wire connection and at least every one hundred (100) feet of wire length on runs more than one hundred (100) feet in length. Expansion curls shall be formed by

wrapping at least five (5) turns of wire around a one-inch pipe or more in diameter, then withdrawing pipe.

5. All splices shall be made with Scotch-Lok No. 3576 Connector Sealing Packs or Rainbird Model ST-03 Snap-Tite wire connectors.

I. FLOW METER

1. The flow meter is installed after the backflow preventer and before the master control valve. Verify distance between flow meter and master valve with Engineer prior to installation.

2. The flow meter shall be installed on the pipe assembly with the intended direction of the flow as indicated by an arrow on top of the flow meter, and per details/plans.

3. There must be free, unrestricted pipe of the same size as the meter for at least 10 flow meter diameters upstream and 5 flow meter diameters downstream of the flow meter tee; or from any valve, fitting, meter, or backflow preventer. Meter size per installation details on plans and notes.

4. The flow meter shall be easily accessible, housed in a valve box specified on plans and marked "F.M." "M.C.V.".

5. Electrical

   a. Wires from the flow meter to the controller shall consist of one (1) black and one (1) red THWN/THHH U.I. approved, AWG number 14 solid strand copper wire.

   b. All wiring to be continuous without splices from the irrigation controller to the flow meter.

   c. All wiring shall be installed in conduit from the flow meter to the controller.

   d. The flow meter runs off of 9 volts DC. The flow meter wires shall be separated from other signal wires when pulled at the controller site. (If 24 volts AC is used to test field wires when determining proper sequencing, and is applied to the flow meter wires, the sensing unit in the flow meter will be damaged.)

   e. It is very important that all splices are dry splices. Any water leaking into a splice will cause flow meter problems. Additionally, there shall never be any buried splices in ground between the flow meter and the controller.

J. MASTER CONTROL VALVE

1. Control valve shall be installed on pipe assembly after the flow meter as shown on the installation detail drawings.

2. Valve size per installation notes and details on plans.

3. Electrical

   a. Wires from the master control valve to the controller shall consist of one (1) purple-coated and one (1) white-coated and color-striped same color as pilot wire THWN/THNN type, U.L. approved, AWG number 14 solid strand copper wire.

   b. All wiring to be continuous without splices from the irrigation controller to the master control valve.

   c. All wiring shall be installed in conduit from the valve to the controller.

4. Control valve to be housed with the flow meter in a common rectangular valve box with locking lid marked "F.M." "M.C.V.".

K. MOISTURE SENSORS

Installation of moisture sensors shall be the responsibility of the Contractor. All sensor locations should be marked on record plans as well as in the field. At each sensor, provide a 1-1/2 inch x 12-inch PVC pipe with a cap within 2 inches of sensor, set flush with finish grade, for future location of unit. Correct sensor placement and installation shall be verified before project is signed off. The Engineer shall call material supplier before project is signed off to verify the proper installation and operation of all moisture sensors.

L. LOCATION OF MOISTURE SENSORS

1. Location decision of the moisture sensors is provided by the material supplier. The Contractor shall contact material supplier in determining sensor placement. However, the Contractor must have the controller installed with field station wires hooked up according to plan. There must be electricity to the controller, as well as lateral lines installed and irrigating respected areas. The Contractor shall contact material supplier 5 working days in advance when scheduling an appointment for sensor flagging.

2. Material supplier field representative shall provide on-site evaluation of the project area. Groups of similar areas are determined and flagged with the Contractor as to where a moisture sensor should be installed. A demonstration on how to install a moisture sensor is also given. By physically viewing coverage, types of heads, soil types, exposure, and varying plant material, proper sensor placement is assured.

M. SENSOR WIRING

1. Wires shall be direct burial from the remote control valve to the moisture sensor. They shall consist of one (1) yellow-coated and one (1) white-coated and color-striped same color as pilot wire U.F. type, U.L. approved, AWG number 14 solid strand copper wire with minimum 4/64" PVC coating, 600 volt, 75ºC.

2. Connections shall be water tight epoxy cast Scotch Pak-3470 or equal.

3. All wiring to be continuous without splices from the remove control valve to the moisture sensor.

4. The moisture sensor shall be wired in parallel with station solenoids so the moisture data is transmitted over the same wires that are used to operate the station solenoids.

5. There shall be no additional wires run from the valve to the irrigation controller.

6. The choice of groups of stations controlled by the same sensor is done solely within the computer program so there is no additional wire run between valves to form station groups.

N. PHONE MODEM

The internal telephone modem shall be 100% Hayes compatible and operate at a 1200 Baud rate. The modem shall be factory modified to provide monitoring of the telecommunication to prevent lock-up "due to power failure." The modem shall be factory-modified to provide electrical power for a line amplifier (Calsense LA-2).

The Contractor shall be responsible for the installation cost of the phone connection for any required phone modem for the irrigation system.

O. AUTOMATIC CONTROLLER

1. Automatic controllers as assembled by Hydroscope shall be of size and type shown on the plans.

2. Install as per manufacturer's instructions. Remote control valves shall be connected to controller in numerical sequence as shown on the drawings.

P. ELECTRICAL CONTROL VALVES

1. Electric control valves shall be as called for on legend.

2. Control valve boxes shall be 9-1/2"x16"x11 rectangular structural plastic box with green bolt-down cover, Carson Industries #1419-12B, or approved equal.

Q. SPRINKLER HEADS

Sprinkler heads shall be of type, size and location as noted and indicated on the drawings.

R. TREE IRRIGATORS

Provide assemblies as indicated on drawings.

S. ENCLOSURES

Materials for enclosures shall conform to Section 206 and fabrication shall conform to Section 304 of the Standard Specifications.

Controller Enclosure: Controller enclosure shall be manufactured of 3/16-inch plate steel and 10-gauge sheet metal, factory primed. Enclosure shall be furnished with break-away base, and a full length stainless steel door hinge hinged on same side as irrigation controller. Enclosure shall be minimum 35 inches high and have sufficient space to mount controller switches, relays, etc. Furnish mounting brackets as required and metal pocket.

EXECUTION:

5.01.06 WORK PROCEDURE

A. PHYSICAL LAYOUT

1. Prior to installation, Contractor shall stake out all pressure supply lines, routing, and location of sprinkler heads.

2. All layouts shall be approved by Engineer prior to installation.

B. WATER SUPPLY

1. Connect sprinkler irrigation system to outlets as indicated on drawings.

2. Connections shall be made at approximate locations shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

C. ASSEMBLIES

1. Routing of sprinkler lines as indicated on drawings is diagrammatic. Install lines (and various assemblies) in such a manner as to conform with details per plans.

2. Install NO multiple assemblies on plastic lines. Provide each assembly with its own outlet.

3. Install all assemblies specified herein in accordance with respective detail. In absence of drawings or specifications pertaining to specific items required to

complete work, perform such work in accordance with best standard practice with prior approval of Engineer.

D. LINE CLEARANCE

All lines shall have a minimum clearance of six (6) inches from each other and from lines of other trades. Parallel lines shall not be installed directly over one another.

E. ADJUSTMENT OF SYSTEM

1. The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent over-spray onto roadways as much as possible.

2. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required.

3. Remote control valves shall be adjusted so that most remote sprinkler heads operate at the pressure recommended by the head manufacturer. Remote control valves shall be adjusted so a uniform distribution of water is applied by the sprinkler heads to the planting areas for each individual valve system.

F. QUICK COUPLING VALVES

Quick coupling valves so indicated to be installed adjacent to curbs and paving shall be within a six (6) inch maximum of same.

G. VALVE BOXES

1. Concrete valve boxes shall be set one (1) inch above the designated finish grade in lawn areas. Where dimensions permit, up to two (2) remote control valves may be installed in each box.

2. Valve boxes located near curbs and paving shall be installed in such a way as to allow for valve boxes to abut those items with top surface matching plane as items listed above.

H. AUTOMATIC CONTROLLER LOCATION AND INSTALLATION

1. Automatic controllers shall be installed at locations shown on plans. All pedestal-mounted controller shall be mounted on a suitable concrete base.

2. All controller locations are essentially diagrammatic, and shall be specifically located by the Engineer.

I. TRENCHING

1. Dig trenches straight and support pipe continuously on bottom of ditch. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on drawings and as noted.

2. Provide minimum cover of twenty-four (24) inches for all pressure supply lines.

3. Provide minimum cover of twelve (12) inches for all non-pressure lines.

4. Provide minimum cover of eighteen (18) inches for all control wiring.

5. Provide minimum cover of twenty-four (24) inches for all piping under paved areas. Provide two (2) inch sand bedding and four (4) inch sand backfill over pipe barrel in paved areas.

J. BACKFILLING

1. Compact backfill for trenching to a dry density equal to adjacent undisturbed soil in planting areas and to 90 percent in paved areas. Conform to adjacent grades without dips, sunken areas, humps or other irregularities.

2. In existing pavement areas backfill shall be one sack sand cement slurry per yard of material.

3. Place initial backfill on all lines of a fine granular material; no foreign matter larger than one-half (1/2) inch in size will be permitted.

4. Flooding of trenches will be permitted only with approval of the Engineer.

5. If settlement occurs and adjustments in pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the Owner.

K. PIPING UNDER PEDESTRIAN AND VEHICULAR PAVEMENT

All piping under pedestrian and vehicular pavement shall be sleeved. Sleeve shall be minimum 2.5 -times the diameter of the irrigation lines. Sleeves shall be of materials and installation methods approved by the local governing body but as a minimum shall be Schedule 80 PVC pipe.

L. TESTING

1. Test all pressure and non-pressure lines under hydrostatic pressure of 125 pounds per square inch, and prove both watertight.

2. Sustain pressure in lines for not less than two (2) hours. If leaks develop, replace joints and repeat test until entire system is proven watertight.

3. Tests shall be observed and approved by Engineer prior to backfill.

4. Upon completion of each phase of work, entire system will be tested and adjusted to meet site requirements.

5. Tests shall be performed with automatic valves in place.

M. INSPECTION OF WORK

Installation and operations must be approved by the Engineer.

N. RECORD DRAWINGS

1. All record drawings shall be "redlined" with any as-built information including the items in this section. Dimension from two permanent points of reference (road intersections, etc.) locations of the following items:

   a. Connection to existing water lines.

   b. Gate valves.

   c. Routing of sprinkler lines.

   d. Sprinkler control valves.

   e. Quick couplers.

   f. Routing of control wiring.

2. Provide and mount a chart of the sprinkler controller including a cover. This shall be a plot plan of areas by controller and show buildings, service drive, walks, walls, sprinkler heads and valves. Number all valves to match operation schedule and drawings. Make a photostatic reduction print of this plan to a size that will fit into controller cover and mount in plastic, hermetically sealed, and securely fasten to cover. All work shall be satisfactory to Engineer. The chart shall be colored with a different color for each controller station.

3. Before the date of the final inspection, the Contractor shall deliver the corrected and completed redlines to the Engineer. Delivery of the redlines will not relieve the Contractor of the responsibility of furnishing required information that may be omitted from the prints.

O. ACCESSORIES

1. Equipment: Supply and deliver to the Owner the following equipment and information:

   a. Six (6) coupler valve keys with hose swivel ell.

b. Two (2) sets of various special wrenches or tools that may be required for adjustment of sprinkler heads or equipment.

2. Maintenance Instruction: Two (2) hard cover binders with 3 rings containing manufacturer's catalog sheets of each and every material and equipment installed under this contract, including guarantee statement. Maintenance information and diagrammatic equipment drawings shall be included when available.

P. COMPLETION CLEANING

Upon completion of work, the Contractor shall remove excess materials, rubbish, debris, etc., and his construction and installation equipment from the premises.

Q. FINAL INSPECTION

1. The Contractor shall show evidence to the Engineer that the Owner has received all accessories, charts, record drawings, etc., as required before final inspection can occur.

2. The final inspection of the work shall be made by the Engineer in the presence of the Contractor at the time the work is completed. Notification shall be made in writing by the Contractor seven (7) days in advance of such inspection.

5.01.07 GUARANTEE

The guarantee for the underground sprinkler system shall be made in accordance with the attached form and shall be filed with the Owner or his representative prior to acceptance of the irrigation system.

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear, unusual abuse or neglect excepted. We agree to repair or replace any defects in material or workmanship, any settling of backfilled trenches which may develop during the period of one year from date of acceptance and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements, including complete restoration of all damaged planting, paving, or other improvements of any kind, within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

Project: _____

Location: _____

Signed: _____
Contractor

Address: _____

_____

_____

Phone: _____

5.02 LANDSCAPING

GENERAL:

5.02.01 RELATED DOCUMENTS

All irrigation work in Section 5.01, Irrigation, of these Special Provisions shall be inspected and approved by the Engineer prior to commencing any landscaping work in Section 5.02, Landscaping, of these Special Provisions. Approval shall be obtained by the Contractor from the Engineer in written form. This should include fully operational controllers verified in writing by a Calsense representative and telephone connections verified by the City.

5.02.02 DRAWINGS AND SPECIFICATIONS

In the event of any changes in locations other than shown, the Contractor shall clearly notify the Engineer and indicate such by signature of Contractor and Engineer such changes on all sets of plans.

5.02.03 SUMMARY

A. Section includes:

1. Soil preparation and fertilization.
2. Planting operations.
3. Landscape planting materials.
4. Imported topsoil and planter mix.
5. Drainage materials in planters.

B. Provide landscape plantings in the areas shown on Drawings with plants in a healthy, vigorous growing condition. Items not specifically shown in drawings or specified, but normally required to conform with such intent, are considered part of the Work.

C. Include labor and equipment required to place, amend and fine grade the soil. Include the cost of fertilizer as specified.

5.02.04 REFERENCES

A. American Joint Committee on Horticulture Nomenclature: Standardized Plant Names, latest edition.

B. AmericanHort: American Standard for Nursery Stock, latest edition.

C. Standard Specifications for Public Works Construction, latest edition.

D. Agricultural Code of California.

5.02.05 SUBMITTALS

A. PRODUCT DATA

Submit complete lists of materials proposed for use, giving the manufacturer's name, catalog number, and catalog cut for each item where applicable within two (2) weeks after award of bid.

B. SUBSTITUTIONS

1. If any plant specified is not obtainable, submit a written substitution request to the Engineer during the bidding period.

2. Substitutions of plant materials will not be permitted unless authorized by the Engineer.

C. SELECTION, TAGGING, AND ORDERING PLANT MATERIAL

1. Submit a request for inspection and documentation to Engineer at least one month prior to start of landscape planting work for which plant material has been ordered. Contractor shall also submit photographs of tagged plant material for the Engineer to review for a preliminary approval prior to nursery inspections.

2. Contractor may exercise on-site option where plants can be delivered, but upon inspection will be subject to approval or rejection at discretion of Engineer.

3. Plants shall be subject to inspection and rejection by Engineer at place of conformity to this Specification.

D. IMPORTED TOPSOIL

1. Furnish the source of imported topsoil to the Engineer for approval.

2. Submit test results and schedule of recommended soil amendment adjustments along with certificate of compliance to Engineer.

E. AGRONOMIC SOILS TEST REPORT

1. In accordance with requirements under Article 2.5 - Source Quality Control, submit report to Engineer prior to preparation of soil amendment or ordering plant material.

F. CERTIFICATES

1. Submit certificates for the following items upon delivery to the job site:

   a. Quantity of commercial fertilizer and organic fertilizer.

   b. Quantity of soil amendments.

   c. Quantity of sodded turf.

   d. Quantity of other soil additives per agronomic soils test report.

   e. Submit Certificate of Delivery of container or bulk materials.

   f. Submit written certificate of soil balance.

   g. Submit written certification of quantity and quality of plant materials.

G. ROOT CONTROL BARRIERS

1. Within 35 days of award of contract, submit one 24-inch by 24-inch sample with joining strip and two copies of manufacturer's technical data for approval.

H. PRE-INSTALLATION CONFERENCE

1. Provide a written projected planting schedule noting the estimated completion date, number of working days required, and special coordination requirements.

5.02.06 QUALITY ASSURANCE

A. Provide for all inspections and permits required by authorities in furnishing, transporting, and installing materials.

B. Test soil samples after grading operations are complete, at Contractor's expense.

C. Materials shall conform to the requirements of this Section.

5.02.07 DELIVERY, STORAGE, AND HANDLING

A. Handling Plants: Handle plants in a manner to avoid any damage to the plant. Protect plants from sun or drying winds. Plants that cannot be planted immediately on delivery shall be kept in the shade, well protected, and adequately watered.

B. Delivery Certification: Furnish a Certificate of Delivery slip with each delivery of material in containers or in bulk. Certificate shall state source, quantity, or weight, type and analysis, and date of delivery.

5.02.08 PROJECT CONDITIONS

A. Prior to excavation for planting or placing of stakes, locate utilities, electric cables, conduits, sprinkler lines, heads, valves, and valve control wires so that proper precautions may be taken not to damage such improvements. In the event of a conflict between such lines and plant locations, promptly notify the Engineer to arrange for relocation of one or the other. Failure to follow this procedure places the responsibility on the Contractor for making repairs at his expense for damages resulting from Work hereunder.

B. Notify Engineer in writing of soil or drainage conditions encountered during planting operations which are detrimental to growth of plant material.

5.02.09 WARRANTY

A. PLANT MATERIAL

1. Trees furnished or relocated under this Section shall be warranted in writing for a period of 3 years from the date of final acceptance against improper installation and against defective, unsound, or diseased conditions that may appear.

2. All other plant materials furnished or relocated under this Section shall be warranted in writing for a period of 1 year from the date of final acceptance against improper installation and against defective, unsound, or diseased conditions that may appear.

3. Plant material shall be guaranteed to live and grow in a healthy condition for the above periods, commencing with the acceptance of the work at the conclusion of the maintenance period. Dead or obviously unhealthy materials shall be replaced without delay. The opinion of the Engineer will be final in determining plant material to be replaced due to an unhealthy condition.

4. Upon receipt of written notice from Owner of the death of any warranted plant materials during the warranty period, the subject plant materials shall be promptly replaced with the same species originally planted, and of a size closely approximating the size of the plant if normal growth had occurred since the original planting. Replacements shall be subject to the requirements of this Specification.

5. When plants are replaced, advise the Owner in writing of the necessary establishment maintenance which must be performed.

6. Contractor may not be held liable for loss of plant materials that have not been maintained properly by the Owner.

7. The expense of replacement shall be the responsibility of the Contractor if replacement is necessary after the maintenance period but during the warranty period.

8. Replacement shall continue to be made until each plant has successfully established itself for the required guaranty period.

PRODUCTS:

5.02.10 MANUFACTURERS

A. Soil Amendments and Fertilizers: Design of soil amendments and fertilizers is based on Gro-Power products manufactured by Southern California Organic Fertilizer Company, (714) 750-3830 or approved equal.

B. Manufacturer: Materials shall be the product of one manufacturer and shall be either the ones upon which the design is based or the products of a manufacturer accepted in advance.

5.02.11 MATERIALS

A. IMPORTED TOPSOIL

1. Provide natural, fertile, friable soil free from stones, noxious seeds, weeds, roots, subsoil or other material detrimental to normal plant growth.

2. Obtain imported topsoil from local sources acceptable to Engineer.

3. Silt plus clay content of soil shall not exceed 15 percent by weight with a minimum 95 percent passing a 2.0 millimeter sieve.

4. Samples of the import soil shall be submitted to the Agency approved soils testing laboratory for analysis, interpretation, and recommendations prior to blending or backfilling.

B. FERTILIZER/SOIL CONDITIONER

1. Provide commercial fertilizer, uniform in composition, free- flowing, suitable for application with approved equipment, and delivered to site in unopened containers, each fully labeled according to applicable fertilizer laws, and bearing the name or mark of the manufacturer. Gro-Power Plus, or equal.

2. Provide 16-6-8, 12-12-12, 12-8-8, and 17-13-5, as indicated on the Agronomy Report.

C. ORGANIC SOIL AMENDMENT

1. Provide nitrogen stabilized organic amendment derived from redwood sawdust, fir sawdust or finely ground bark.

2. Provide organic soil amendments in accordance with the Agronomy Report.

D. Pre-Planting Herbicide: Round-Up, or approved equal.

E. Pre-Emergent Weed Control: Ronstar-G, Treflan, Eptam, Vegitex, or approved equal.

F. Mulch: 3/4 inch size nitrogenized redwood chips, or medium grind bark mulch as produced by Michael Rawls Company, Orange CA (714) 649-2022, or approved equal.

G. Peat Moss: Sphagnum peat moss, Canadian or European variety, free from alkali.

H. Soil Sulfur: First quality commercial grade.

I. Ferrous Iron Sulfate: First quality commercial grade.

J. Agricultural Gypsum: First quality commercial grade.

K. Calcium Carbonate Lime: First quality commercial grade.

L. Root Hormone: Super Thrive.

M. Planting Tablets: Shall be 21 gram tablets as manufactured by Gro-Power or approved equal.

N. Backfill mix for general use shall be in accordance with the planting plan notes on the Drawings.

O. Excess soil shall be removed or redistributed before application of fertilizer. Where soil is to be replaced by plants, allowance shall be made so that when finish grading has begun, there shall be no deficiency in the specified depth of mulched planting beds.

5.02.12 PLANT MATERIAL

A. Identification: Plant material shall be true to type and nomenclature in accordance with the American Joint Committee on Horticulture Nomenclature Standardized Plant Names, and each bundle or plant shall be properly identified with durable, legible labels.

B. Quality and Size of Plants: In accordance with rules and grading of AmericanHort American Standard for Nursery Stock, and as shown on the Drawings.

1. Trees, shrubs, and ground covers shall have a normal habit of growth and shall be sound, healthy, vigorous, and free from insect infestations.

2. Plants that meet the measurements specified, but do not possess a normal configuration or balance of height and spread, will be rejected.

3. Trees and shrubs shall have been grown in containers of the size stated on Drawings, and shall have sufficient roots to hold the root ball together after removal from containers without being rootbound.

4. Trees shall be straight and of uniform shape without damaged, crooked, or multiple leaders. Trees with abrasions of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over 1/2-inch which have not been pruned and painted or completely callused, will be rejected.

5. Date Palm shall be straight and of uniform shape without damaged or crooked. When planted, date palm shall stand straight 90 degree vertically from bottom to top of palm. Date palm shall have a 3 years plant establishment period.

6. Groundcover plants shall be grown in flats or as indicated on the Drawings. Flat grown plants (rooted cuttings) shall remain in original flats until transplanting. Soil shall contain sufficient moisture so that it will not fall apart when lifting the plants.

C. Sod (Type per Drawings)

1. Sod shall be fully mature, well maintained, of the grass variety specified, free of all other grasses or weeds, and shall have been harvested within 24 hours prior to delivery.

2. All sod shall be cut evenly with a conventional sod cutting machine to a thickness of 1-1/2 inches. Sod mat size shall be between 3/8 and 5/8 inches.

3. All sod shall have been treated with appropriate preventative fungicide and insecticides within one week prior to shipment.

4. All sod shall have been inspected by the California Department of Food and Agriculture to ensure conformance with the standards set by the State of California.

5.02.13 ACCESSORIES

A. Wood Tree Stakes: Lodge pole pine, full treated with Coppernapthanate Wood Preservative in strict accordance with Federal Spec. TT-W-572 Type 1 Composition B, 2" (minimum nominal size) diameter x 10' long, no split stakes.

B. Ties: Rigid tie stock as manufactured by V.I.T. Company (714) 871-2309, or approved equal, size as appropriate.

C. Sand: Washed plaster sand.

5.02.14 SOURCE QUALITY CONTROL

A. Agronomic Soils Testing:

1. Take two (2) samples of site soil at a depth of 6 to 12 inches, within proposed planting areas, after completion of grading and prior to weed control and soil preparation.

2. Take samples to an agronomic soil-testing laboratory registered by the State of California and acceptable to the Engineer for soil evaluation.

3. Request two (2) tests for fertility and suitability analysis with written recommendations for soil amendment, fertilizer and chemical conditioners, application rates for soil preparation, planting backfill mix and post-maintenance fertilization programs.

4. Soils report recommendations shall take precedence over the amendment and fertilizer application rates specified in this Section.

B. Testing Laboratory: shall be Soil and Plant Laboratory, Inc., 412 South Lyon, Santa Ana, CA 92701, P.O. Box 11744, Santa Ana, CA 92711 (714) 558-8333. Tests shall be paid for by the Contractor.

C. Soil Analysis (existing on-site soil): Furnish a soils analysis of existing on-site soil. There shall be two (2) sampling areas located throughout the site as selected by Engineer. Suitability and fertility analyses with comments and recommendations shall be provided for each sample.

Submit testing laboratory's interpretation, recommendations, and comments to Engineer within 7 days after the completion of rough grading.

D. Soil Analysis (import soil): Furnish a soils analysis of import soil, lightweight soil mix, camellia/gardenia/azalea mix, and fir sawdust prior to backfill. Submit 2 quarts of fine sand and 2 quarts of nitrogen stabilized fine fir bark for the custom lightweight soil mix for organic and particle size analyses. Do not mix. Submit 1 quart of fir sawdust for organic analysis.

Submit soil testing laboratory's findings to the Engineer within 5 days prior to backfilling.

E. Soil testing shall be conducted for organic suitability after completion of planting in the soil preparation and backfill mix areas. Submit to the testing laboratory the original amendment specification with previously issued bulletins for soil amendments and installation procedures. Provide 3 random samples of planting soil for analysis. Fertility analyses, recommendations, and interpretations shall be furnished by the testing laboratory to ensure all specified amendments made been provided.

F. Import soil mix shall be sampled after mixing and delivery to the site, but prior to filling planters. Provide 1 quart of import soil mix for every 65 cubic yards for organic and fertility analyses. Fertility analysis, recommendations and interpretations shall be furnished by the testing laboratory to ensure all specified amendments made been provided.

G. Samples of materials, including fertilizers, soil conditioners, plants, and other specified materials, shall be submitted for inspection. Delivery may begin upon approval of samples.

H. Samples of the native soil shall be submitted to the soils testing laboratory after rough grading and prior to soil preparation. For bidding purposes, the Contractor shall provide the following soil amendments for soil preparation and backfill mix:

1. Soil preparation per 1,000 s.f. of planting area:

   a. 4 cubic yards Nitrolized Redwood Sawdust

   b. 200 lbs. Gro Power

   c. 20 lbs. Soil Sulphur

2. Backfill Mix:

   a. 6 parts by volume on-site soil

   b. 4 parts by volume Nitrolized Redwood Sawdust

   c. 18 lb. Gro Power per cu. yd. of mix

   d. 2 lbs. Iron Sulphate per cubic yard of mix

   All soil preparation is in addition to any recommendation made by the top soil report.

EXECUTION:

5.02.15 EXAMINATION

A. Verification of Conditions: Inspect and accept the condition of the site relative to this Section before commencing Work. If not acceptable, notify the Owner in writing. By proceeding with the Work of this Section, the Contractor indicates his acceptance of previous related work.

B. Landscape work shall not begin until construction adjacent to planting areas has been completed and irrigation systems have been installed and approved by Engineer.

5.02.16 PREPARATION

A. Protection:

1. Provide necessary safeguards and exercise caution against injury or defacement of existing site improvements.

2. Be responsible for any damage resulting from landscape planting operations. Repair damage and return the area to the previous condition at no cost to the Owner.

5.02.17 WEED CONTROL

A. Apply pre-planting herbicide to visible weeds, before and after soil placement.

B. Pre-emergent Weed Control: Immediately after planting, apply pre-emergent weed control materials to planted areas that will not be seeded.

C. Protect existing plants from damage

D. After application of weed killer, before and during preliminary and finish grading, remaining weeds and grasses shall be dug out by the roots and disposed of off-site. Weeds and grasses not of the perennial type, less than 2-1/2 inches high and not bearing seed, may be turned under. Perennial weeds and grasses to be removed include, but are not limited to the following:

1. Nut Grass.
2. Alfalfa.
3. St. Augustine.
4. Puncture Vine.
5. Kikuya Grass.
6. Mustard Plant.
7. Johnson Grass.
8. Wirewood.
9. Morning Glory.

5.02.18 SOIL PREPARATION

A. Cross-rip on grade planting areas to a depth of 10 to 12 inches in two directions

B. Broadcast the organic soil amendments uniformly over surface of the area to be treated. Roto-till the top 6 inches of planting areas to evenly distribute the amendments and conditioners into the soil.

C. Moisture Content: The soil shall not be worked when the moisture content is so great that excessive compaction will occur, not when it is so dry that dust will form in the air. Water shall be applied, if necessary, to provide ideal moisture conditions.

5.02.19 PLANTING OPERATIONS

A. Finish Grading: Prior to commencement of planting operations, complete finish grading as specified below.

When preliminary grading, including weeding and fertilizing has been completed and the soil has dried sufficiently to be readily worked, planting areas shall be graded to uniform levels or slopes at a minimum of 2 percent. Minor adjustments to finish grades shall be made in the direction of the water. Low spots and pockets shall be graded to drain properly. Finish grade of planting areas shall be one inch below graded to drain properly, Finish grade of planting areas shall be one inch below grade of adjacent pavement. Grading shall be done when soil is at optimum moisture content for working. Planting areas shall be scarified to a depth of 3 inches below grade prior to placing fertilizers. Rock and debris more than 2 inches in diameter shall be removed from the site.

B. General: Prior to installation of irrigation system, specimen trees shall be located as directed by Engineer.

1. Preparation of Lawn Beds: At the time of planting, lawn bed shall be raked lightly to an even surface, removing any deleterious materials. Care shall be taken not to change the drainage pattern. The lawn bed shall be inspected by the Engineer to determine suitability for planting prior to sodding. The Contractor shall obtain such approval before sodding.

2. Watering Basins: Construct a firmly compacted mound of soil around each tree and plant to form a watering basin at the edge of and following the shape of the planting pit area. Mounds for trees and for vines from 5 gallons or larger containers, shall be at least 2 inches high. Excavated earth, if capable of retaining water, may be used. Refill any settlement.

C. Trees and Shrubs:

1. Plant to their normal depth and puddle with a running stream of water from a hose on the same day which they were planted. Prepare three (3) planting holes and stake the trees as shown on the standard tree staking City of Santa Ana Standard Plan Nos. 1124 & 1124A and as shown on the plans.

2. The spacing of trees and shrubs shall be subject to the approval of the Engineer.

3. Root Control Barrier

For median trees, where utilities occur, root control barrier shall be 4-feet wide by 15-feet long by 0.06-inch thick high impact polystyrene sheeting, manufactured for root barrier purposes. Sheeting shall have root deflector ribbing and pre-molded joiner strips of the same material.

For parkway trees, root control barrier shall be 18-inch wide by 0.06-inch thick high impact polystyrene sheeting, manufactured for root barrier purposes. Sheeting shall have root deflector ribbing and pre-molded joiner strips of the same material.

4. Plant Pits: Trees and shrubs shall be installed in round pits with vertical sides, a width equal to twice the diameter, and a depth equal to the height of the root ball or container. Sides and bottom of plant pits shall be scarified.

D. Setting Container and Larger Plants:

1. Plants shall be centered and set on the appropriate native soil that has been puddled and settled.

2. Plants shall be set with the top of root ball level 1/2 inches above finish grade and rotated to give the best appearance in relationship to adjacent structures or surroundings.

3. Use appropriate backfill mix to continue filling plant pits. Set plant plumb and brace rigidly in position until backfill mix has been tamped solidly around rootball. When 1/3 of the pit is backfilled, water thoroughly, saturating the rootball.

4. After water has completely drained, planting tablets shall be placed as indicated below:

   a. One tablet per one-gallon container.

   b. Three tablets per five-gallon container.

   c. Five tablets per fifteen-gallon container.

   d. Five tablets per 24" box.

   e. Six tablets per 30" box.

   f. Six tablets per 36" box.

   g. Seven tablets per 42" box.

   h. Eight tablets per 48" box.

   i. Twelve tablets per 60" box.

   j. Larger containers use two tablets per 1/2" caliper of trunk measured fourteen inches above soil level.

5. Continue filling pit to finish grade with backfill mix and tamp firm.

6. When the plant pit is filled, form saucer berm around plants with backfill material sufficient to hold 2 inches of water. Remove the berm prior to dressing.

7. Apply root hormone at the rate recommended by the manufacturer. Tree balls shall be set before application of root hormone, and shall be mulched immediately after application of root hormone into the root ball.

8. Water plants immediately after planting.

E. Top Soil: Provide on-site or approved imported top soil as necessary for raised planters and bring soil up to required finish grades.

F. Staking and Guying: Immediately after planting, stake 15 gallon and 24-inch box trees. Guy larger trees as detailed on the Drawings.

G. Mulching: Spread mulch 2 inches thick in planter and areas that do not exceed 10 percent slope.

5.02.20 GROUND COVER

A. Spacing: Install plant material in moist soil in the areas and at the spacing indicated on the Drawings, in neat rows, insuring complete coverage of planting areas, including under and around trees and shrubs. Spacing shown in the Plant List or on the Drawings are triangular spacing, unless otherwise noted.

B. Mulching: Install mulching after ground cover rooted cuttings, pots, or flats have been installed.

5.02.21 WEED ERADICATION PROGRAM

A. Fertilize planting areas with urea 46-0-0 commercial fertilizer at the rate of 0.5 pounds per 1000 square feet.

B. Water planting areas thoroughly and continuously for a period of 3 consecutive weeks. A specific watering duration and frequency program designed to germinate all residual weed seeds shall be approved in advance.

C. Discontinue watering process for 2 days. Then apply a non-selective broad spectrum systemic herbicide for perennial weeds. The type of chemical to be used shall be determined by a licensed pest control advisor. If annual weeds are present, use straight contact herbicide in accordance with pest control adviser's recommendations.

D. Allow sufficient period of time to insure that all weeds are dead. Follow herbicide manufacturer's direction.

E. Water planting areas thoroughly and continuously for a period of 3 weeks. A shorter watering period may be permissible at the discretion of the Engineer. Discontinue watering process for 1 day prior to the second application of the herbicide spraying.

Re-apply the spraying operation with a straight contact weed killer according to pest control adviser's recommendations. Avoid irrigation for a minimum of 4 days for effective final weed kill.

F. Clear all desiccated weeds from the area.

5.02.22 SOD PLANTING

A. Preparing the soil: Remove rocks, weeds and debris from area to be sodded. Work up soil to a depth of 6 inches and break up all clods. Soil prep all areas as noted elsewhere in specifications.

B. Grading and Rolling: Carefully smooth all surfaces to be sodded. Roll area to exposed soil depressions or surface irregularities. Regrade as required.

C. Fertilizing: Spread Turf Fertilizer Gro-Power Plus onto the soil evenly at the rate of 200 pounds per 1,000 sq. feet of lawn.

D. Laying sod: Lay first strip of sod slabs along a straight line (use a string in irregular areas). Butt joints tightly, do not overlap edges. On second strip, stagger joints much as in laying bricks. Use a sharp knife to cut sod to fit curves, edges and sprinkler heads.

E. Watering: Do not lay whole lawn before watering. When a conveniently large area has been sodded, water lightly to prevent drying. Continue to lay sod, and to water until installation is complete.

F. Rolling sod: After laying all the sod, roll lightly to eliminate irregularities and to form good contact between sod and soil. Avoid a very heavy roller or excessive initial watering which may cause roller marks.

G. Irrigation: Water thoroughly the completed lawn surface. Soil should be moistened at least 8 inches deep. Repeat sprinkling at regular intervals to keep sod moist at all times until rooted. After sod is established, decrease frequency and increase amount of water per application as necessary.

H. Replacement: Replace all dead or dying sod with equal material as directed by Engineer.

5.02.23 FIELD QUALITY CONTROL

A. General: Notify Engineer at least 48 hours in advance (or as required below) when requesting on-site reviews.

B. Schedule for On-Site Reviews:

1. Pre-job conference - 5 days.

2. At completion of finish grading - 48 hours.

3. At delivery of plant materials - 48 hours.

4. At plant layout prior to excavating pits - 48 hours.

5. Pre-maintenance Walk-through - 5 days.

6. Final Walk-through - 5 days.

C. Pre-Maintenance Review:

1. At the completion of landscape planting operations and prior to the beginning of the formal maintenance period, the Pre-Maintenance Review shall be held.

2. Request on-site review of Engineer five working days prior to the completion of work in order that a mutually agreeable time for review may be arranged.

3. At the time of review, the areas under the Contract shall be free of weeds, dead leaves and trash, neatly cultivated and raked. Stakes, guys and plant basins shall be in good order.

4. If, after the Pre-Maintenance Review, Engineer is of the opinion that the Work has been performed in accordance with the Drawings and Specifications, written notice of preliminary acceptance will be given. This report will note any items which must be corrected, and state the date of commencement and completion of the formal maintenance period.

D. Final Review: Perform Final Review in accordance with Section 5.03, Landscaping & Irrigation Maintenance Period, at completion of 60 calendar day maintenance.

5.02.24 CLEANING

A. Keep all areas of the Work clean, neat and orderly at all times during the period of Contract. Clean construction areas at the end of each day

5.02.25 PROTECTION

A. The Contractor shall adequately protect the work, adjacent property and the public, and shall be responsible for any damage, injury, or loss due to his acts or neglect.

B. The Contractor shall, at all times during construction, maintain safe pedestrian ways around all areas of construction. This may require proper and adequate signs, fences, barricades or other approved devices as required by the Engineer.

5.03 LANDSCAPING & IRRIGATION MAINTENANCE PERIOD

GENERAL:

5.03.01 MAINTENANCE

A. Maintenance Service: After landscape planting and irrigation work have been completed, inspected, and approved by Engineer, provide maintenance of planted areas by means of continuous watering, weeding, rolling, mowing, re-seeding, cultivating, spraying, mulching, trimming, edging, and other operations necessary for care and upkeep for a period of 60 calendar days.

B. Adjustment to Maintenance Period: Improper maintenance or possible poor condition of any planting at the termination of the scheduled maintenance period may cause postponement of the final completion date of the Contract. Maintenance shall be continued by the Contractor until all work is acceptable.

5.03.02 FINAL ACCEPTANCE OF THE PROJECT

A. As Built: Prior to the date of the Final Walk-Through, the Contractor shall acquire from The approved reproducible prints and final record from the job record set of all changes made to all plans during construction, label said prints "As-Builts", and deliver to the Engineer.

B. All turn-over items noted in other Sections shall be delivered prior to the Final Walk-through.

PRODUCTS:

5.03.03 MATERIALS

A. Materials used in conjunction with the maintenance work shall conform to the material requirements originally specified under the landscape planting work

EXECUTION:

5.03.04 EXAMINATION

Verification of Conditions: Prior to Work of this Section, examine the work of other trades and verify that such work is complete or properly corrected to the point where this maintenance work may properly commence.

5.03.05 LANDSCAPE PLANTING

A. Maintenance Summary: Maintenance of new planting shall consist of watering, cultivating, applying pre-emergence weed control, weeding, mulching, re-staking, tightening and repairing of guys, resetting plants to proper grades or upright position, restoration of planting saucers, and furnishing and applying such sprays and

invigorants as are necessary to keep the plants free of insects and disease and in thriving condition.

B. Clean Up and Weeding: All areas shall be kept free of debris, and all planted areas shall be weeded and cultivated at intervals of not more than ten (10) days. Street gutters shall be included within the debris/siltation removal program.

C. Establishment: As it becomes evident that certain lawns and groundcovers have not established uniformly or properly, replant the areas immediately with the same plants and quantity as specified to achieve 100 percent coverage of healthy, actively growing lawn and groundcovers for approval at Final Review.

D. Protection: The Contractor shall be responsible for maintaining adequate protection of the area. Damaged areas shall be repaired at the Contractor's expense.

5.03.06 TREE AND SHRUB CARE

A. Watering:

1. Maintain a large enough water basin around plants so that enough water can be applied to establish moisture through the major root zone. When hand-watering, use a water wand to break the water force. Use mulches to reduce evaporation and frequency of watering.

2. Irrigate planting areas as required to ensure active growth keeping areas moist but not saturated. Regulate irrigation as necessary to avoid erosion and gullying.

B. Pruning:

1. Trees

a. Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached which have vertical spacing of from 18" to 48" and radial orientation so as not to overlay one another; to eliminate diseased or damaged growth; to eliminate narrow V-shaped branch forks that lack strength; to reduce toppling and wind damage by thinning out crowns; to maintain growth within space limitations; to maintain a natural appearance; to balance crown with roots.

b. Under no circumstances will stripping of lower branches ("raising up") of young trees be permitted. Lower branches shall be retained in a "tipped back" or pinched condition with as much foliage as possible to promote caliper trunk growth (tapered trunk). Lower branches can be cut flush with the trunk only after the tree is able to stand erect without staking or other support. Sucker growth shall be removed if deemed appropriate by the Engineer.

c. Evergreen trees shall be thinned out and shaped when necessary to prevent wind and storm damage. The primary pruning of deciduous trees caused by

health or safety reasons shall be pruned at any time of the year as required to eliminate these conditions.

d. Remove damaged or diseased growth from trees and shrubs. Treat cuts larger than 1/2-inch in diameter with tree paint.

2. Shrubs

a. The objective of shrub pruning is the same as for trees. Shrubs shall not be clipped into balled or boxed forms unless such is required by the design and directed by the Engineer.

C. Fertilizing:

1. Apply top-dress fertilizer to groundcover areas at the rate of 50 pounds per 1,000 square feet at 25 days and 50 days after beginning of maintenance period.

2. Gro-Power Plus shall be applied at the rate of 20 pounds per 1,000 square feet to all lawn areas 25 days and 50 days after the maintenance period is initiated.

D. Staking and Guying: Restake, tighten, and repair guys. Reset to proper grades or upright position any plants that are not in their proper growing position. Stakes and guys are to be inspected to prevent girdling of trunks or branches and to prevent rubbing that causes bark wounds. Replace all broken stakes and ties with specified materials.

E. Replacement of Plants: Immediately remove any dead or dying plants not in a vigorous thriving condition. Replacement shall be the same species and size as originally planted.

5.03.07 GROUNDCOVER CARE

A. Weed Control: Control weeds, with chemical systemic spray or by mechanical means so as to cause minimal damage to planted materials.

B. Watering: Water enough that moisture penetrates throughout the root zone and only as frequently as necessary to maintain healthy growth.

C. Fertilizing: Fertilize as specified under Tree and Shrub care

D. Edging: Edge ground cover to keep in bounds and trim top growth as necessary to achieve an overall even appearance.

E. Replacement: Replace dead and missing plants at Contractor's expense.

5.03.08 LAWN AND TURF CARE

A. Mowing and Edging:

1. Mowing of turf will commence when the grass has reached a recommended height for the specified species. Mowing will be at least weekly after the first cut. Turf must be well-established and free of bare spots and weeds to the satisfaction of the Engineer prior to final acceptance.

2. Excess grass clippings as determined by the Engineer shall be picked up and removed from the site and premises.

3. Edges shall be trimmed at least twice monthly or as needed for neat appearance. Clippings shall be removed from walks.

B. Watering: Lawns shall be watered at such frequency as weather conditions require to replenish soil moisture below root zone and maintain healthy growth.

C. Fertilizing: Fertilize as specified under Tree and Shrub Care.

D. Weed Control: If needed, control broad leaf weeds with selective herbicides.

5.03.09 IRRIGATION SYSTEM

A. Summary: Maintenance of irrigation system shall consist of cleaning nozzles, servicing valves, setting controller programs, and other activities required during the landscape maintenance period.

B. Inspection Request: The Contractor shall check weekly all systems for proper operation. Lateral lines shall be flushed out after removing the last sprinkler head or two at each end of the lateral. All heads are to be adjusted as necessary for unimpeded coverage and to prevent overspray on walls, walks, buildings, etc.

C. Programming: Set and program automatic controllers for seasonal water requirements. Give Client a key to controllers and written instructions on how to turn off system in case of emergency.

D. Repair: Repair all damages to irrigation system at Contractor's expense. Repairs shall be made within one watering period.

5.03.10 FINAL REVIEW

A. Conduct Final Review at the completion of the formal maintenance period.

B. Inspection Request: The Contractor shall request the inspection, in writing, to the Engineer 10 working days before the completion of work in order that a mutually agreeable time for inspection may be arranged.

C. Inspection Team: Engineer, Contractor, Owner, and others as Engineer shall direct, shall be present at the Final Review.

D. Corrections: If, after the inspection, the Engineer is of the opinion that all work has been performed in accordance with the Drawings and Specifications, and that all plant materials are in satisfactory growing he will give the Contractor written notice of final acceptance and end of the formal maintenance period.

E. Acceptance: Work requiring corrective action or replacement in the judgment of the Engineer shall be performed within 10 days after the final inspection. Corrective work and materials replacement shall be in accordance with the Drawings and Specifications, and shall be made by the Contractor at no cost to the Owner.

5.03.11 CLEANING

A. During Maintenance Period: Planted areas shall be kept free of debris, and shall be cultivated and weeded at an interval of not more than 14 calendar days.

B. At completion of maintenance period, all areas included in the Contract shall be clean and free of debris and weeds. Plant materials shall be live, healthy, and free of infestation.

5.03.12 PROTECTION

Protect planting areas and plants against damage for duration of maintenance period. Maintenance includes temporary protection fences, barriers, and signs as required for protection. If plants become damaged or injured, treat or replace as directed by the Engineer at no additional cost to Owner.

6.00 SPECIAL PROVISIONS - SANITARY SEWER IMPROVEMENTS

6.01 OPEN TRENCH OPERATIONS, EXCAVATION, BEDDING, AND BACKFILL

Open trench operations, excavation, bedding and backfill shall conform to the applicable provisions of Section 306 of the Standard Specifications and these Special Provisions.

Contractor shall excavate open trench 100 feet ahead of pipe laying operations to allow for any adjustments in grade necessary to resolve unforeseen utility conflicts.

All trenches shall be backfilled and have 3" temporary pavement installed or covered with steel traffic plates recessed and flushed with existing pavement at the end of each working day.

Trenching operations shall not be allowed on more than one street at any time. Work shall not be allowed in more than one intersection at any one time.

The third paragraph of Subsection 306-1.1.1 of the Standard Specifications is hereby deleted and replaced as follows:

> Excavation shall include the removal of all excess excavated materials and all water and materials of any nature which interfere with the construction work.

All pavement removals shall be sawcut unless, approved otherwise by the Engineer prior to commencement of work.

All removed pavement and excess excavated material shall be immediately disposed of off the project site at a legal dumpsite at the Contractor's expense.

Pipe bedding and trench backfill shall be accomplished in accordance with the City of Santa Ana Standard Plan No. 1208 and these special provisions.

Crushed rock products shall be in accordance with subsection 200-1.2 and Table 200-1.2(A) of the Standard Specifications.

The seventh and eighth paragraphs of Subsection 306-1.3.1 of the Standard Specifications are hereby deleted and replaced with the following:

> Rocks greater than 4 inches in any dimension will not be permitted in backfill placed between 1-foot above the top of any pipe and 1-foot below pavement subgrade.
>
> Backfill around sewer manhole and structures shall be sand placed a minimum of 2' laterally around structure and backfilled to subgrade.

The following test methods shall be used for determining relative compaction:

California Test 216	(Sand Cone Method)
California Test 231	(Nuclear Gauge Method)

The Contractor will be provided with compaction test at locations deemed necessary by the Engineer. If compaction fails to meet the contract specifications, then the Contractor shall make the necessary adjustments and is responsible for the cost of additional compaction tests until compaction per the specifications is met.

All trench and structure backfill sand and native material shall be compacted to 90% of maximum density at optimum moisture.

If any trench, through the neglect of the Contractor, is excavated below the grade required by the plans and these Special Provisions, it shall be refilled to grade with additional beddings. This excess excavation and the additional bedding shall be at the Contractor's expense.

Payment for all removals, trenching operations, excavation, backfill and related work as specified herein including furnishing, placing and compacting bedding and backfill shall be considered included in the contract unit prices paid for other items of work and shall be considered full compensation for furnishing all labor, materials, tools, equipment, water for compaction and all incidentals for doing all the work as specified herein and as shown on the plans and no additional compensation will be allowed therefore.

6.02 IMPORT BACKFILL MATERIAL (AS NEEDED)

This item is to be used on an “as needed” basis and only with the prior approval of the Engineer.

Imported backfill shall conform to the applicable provisions of Section 306-1.3.7 of the Standard Specifications and these Special Provisions

Imported backfill material shall be used only if the existing native material is unsuitable and only in the areas where the Contractor is unable to achieve 90% relative compaction.

Imported backfill shall be clean soil, free from organic material, trash, debris, rubbish, broken portland cement concrete, bituminous materials, or other objectionable substances.

The Contractor shall dispose unsuitable material to an approved facility and no additional compensation will be allowed therefore.

6.03 EXISTING UTILITIES AND ADJUSTMENTS IN GRADE

All existing utilities shall be protected in place, unless otherwise noted on the plans. The Contractor shall be responsible for any damage to existing utilities as a result of his operations.

The location of existing utilities as shown on the plans was obtained from a search of available records. It shall be the Contractor's responsibility to notify the respective utility owners and Underground Service Alert (811) to determine the exact field location of all utilities shown or not shown on the plans, which may conflict with his operations. Potholing of existing utilities and service connections to determine exact depth and field locations shall be the responsibility of the Contractor.

The Contractor shall determine the location and depth of all utilities including service connections, which may affect or be affected by its operation, three (3) weeks in advance. In the event of any conflicts the Engineer shall be immediately notified.

City owned utility frames and covers for survey monuments, water meter, water valves, traffic signal and street light pull boxes, and manholes within the area to be paved or graded, shall be set to finish grade by Contractor after construction of new pavement. In portland cement concrete pavement and sidewalk areas, City utility frames and covers shall be adjusted to grade prior to placement of concrete. Contractor shall supply new sewer manhole frame and covers, sewer cleanout frame and covers, concrete rings and water valve pot frame, canister and lids per City of Santa Ana Standard Plans.

Prior to paving, an "I.D. Locator" shall be attached to each valve box or manhole cover. An "ID Locator" is a rubberized marker approximately 4" high that adheres to the utility cover and pops-up after paving for easy identification and location of the respective valve box or manhole. Contractor shall measure and tie-out locations of manholes and water valves prior to paving.

6.04 LANDSCAPING AND IRRIGATION REPAIR

This section shall conform to Sections 212 and 308 of the Standard Specifications and these Special Provisions.

All lawn and landscaped areas disturbed by the Contractor as part of or as a result of the work shall be prepared/brought to adjacent grade and restored to match existing landscaping. If there are any existing sprinkler heads and irrigation lines in the construction areas, whether on public or private property, they shall be replaced or relocated by the Contractor.

The text of Subsection 308-8 of the Standard Specifications is hereby deleted and replaced with the following:

All costs to the Contractor for landscaping and irrigation work in areas disturbed by the Contractor shall be included in other items of work and shall include full compensation for furnishing all materials, labor, equipment, tools and incidentals to perform all work necessary to complete and maintain the landscaping and irrigation work.

6.05 PORTLAND CEMENT CONCRETE (PCC) CROSS GUTTER

This work shall consist of replacing PCC cross-gutter from the spandrel to street centerline (cold joint to cold joint) to facilitate water main construction. All work shall

be accomplished in accordance with City of Santa Ana Standard Plan No. 1109. The replacement areas are clearly indicated on the construction plans.

Concrete shall be high early strength concrete, treated in accordance with section 201-1 to obtain (7) day compressive strength in (3) days.

Payment for constructing Portland Cement Concrete cross gutters replacement shall be included in the unit price bid for other items of work and no additional compensation will be allowed therefore.

6.06 TEMPORARY PAVING

All trenches shall be backfilled and have temporary pavement installed or covered with steel traffic plates at the end of each working day.

Within four consecutive calendar days following installation of the conduit, or after compaction is approved by the Engineer, whichever comes first, steel traffic plates shall be removed and three inches of temporary pavement installed.

Cross streets are to be paved with temporary pavement on the same day that excavation and backfill are completed. Temporary pavement shall be maintained so that a smooth traversable surface is available at all times for vehicular traffic, free from ruts, depressions, and holes and loose gravel. Temporary paving shall be removed and disposed of by the Contractor before the permanent resurfacing is placed.

Payment for construction and maintaining temporary pavement shall be included in the price bid for other items of work, and no additional allowance will be made therefore.

6.07 PERMANENT ASPHALT CONCRETE TRENCH PAVEMENT REPLACEMENT

This work shall consist of constructing permanent asphalt concrete pavement replacement and shall be accomplished in accordance with the details shown on the Plans, these Special Provisions and the street work permit.

Asphalt concrete construction shall conform to Section 400, 200, 203, and 302 of the Standard Specifications and these Special Provisions.

Tack coat is required and shall be applied and conform to Section 302 of the Standard Specifications. The Contractor shall prevent the tack coat to be applied outside the pavement area.

Course aggregate shall consist of material with at least 75% by weight be crushed particles in lieu of the requirements of Section 400-2.3.

The asphalt concrete trench pavement replacement for each street shall consist of an asphalt concrete base course and a 2" thick asphalt concrete surface course. The asphalt concrete trench pavement replacement shall be adjusted to match existing street section. Recommendations are as follows:

Arterial Streets:

Deep lift asphalt concrete pavement consisting of an asphalt concrete Base Course and 2" asphalt concrete Surface Course. Thickness of entire section and base course shall be as shown on plans. In the absence of a detail on the plans, a 12" thick deep lift asphalt concrete pavement consisting of 10" thick asphalt concrete Base Course and 2" asphalt concrete Surface Course shall be constructed

Local Streets:

Deep lift asphalt concrete pavement consisting of an asphalt concrete Base Course and 2" asphalt concrete Surface Course. Thickness of entire section and base course shall be as shown on plans. In the absence of a detail on the plans, a 6" thick deep lift asphalt concrete pavement consisting of 4" thick asphalt concrete Base Course and 2" asphalt concrete Surface Course shall be constructed.

The required asphalt concrete mix designs shall be as follows:

Base Course	III-B3-AR-4000 or PG64-10
Overlay/Surface Course	III-C3-AR-4000 or PG64-10
Crack Filler	III-F-AR-4000 or PG64-10

Payment for constructing permanent asphalt concrete replacement shall be included in the unit price bid for other items of work and no additional compensation will be allowed therefore.

6.08 PERMANENT PORTLAND CEMENT CONCRETE (PCC) TRENCH PAVEMENT AND BUS PAD REPLACEMENT

PCC pavement replacement shall be at least 6 inches thick and shall be 1 inch thicker than the existing pavement.

Existing concrete pavement adjacent to trench operations shall be sawcut and drilled with #4 dowel bars epoxy coated and or approved.

Construction and installation of dowels shall be per City of Santa Ana Standard Plan No. 1428A, the construction plans, and these specifications.

PCC pavement replacement and bus pad replacement shall conform to Sections, 400, 200, 201, and 302 of the Standard Specifications and these Special Provisions.

PCC used for street pavement and bus pad construction shall be minimum class 560-A-3250. In addition to these minimum requirements, the concrete shall possess the following characteristics:

- Flexural strength at 28 days: 550 p.s.i. min.
- Flexural strength at 7 days: 430 p.s.i. min.
- Compressive strength at 7 days: 2500 p.s.i. min.

All cement to be used or furnished on this Project shall be Type II low alkaline Portland cement conforming to ASTM C150.

Prior to the start of construction, the Contractor shall furnish to the Engineer laboratory test data for the particular mix design he will use. The data will include the following:

A. A detailed concrete mix design including the type and amount of cement used; complete gradation and source of the aggregate used; the amount of water used; and any proposed admixtures.

B. Flexural strength test data for the same batch of concrete used in A above showing the compressive strength of the concrete at 3, 7, and 28 days.

Section 302-6.4.2 entitled "Tamping" of the Standard Specifications shall be modified by adding the following:

> The outer edge of the gutter shall not be used as a side form for the mechanical tamper except where existing gutter is to remain as shown on the construction plans.
>
> Concrete pavement for bus pads shall be installed monolithic with the curb and gutter and shall be accomplished in accordance with City of Santa Ana Standard Plan No. 1108. Payment for the curb and gutter is included in the unit price for bus pad replacement.

Section 302-6.4.4 entitled "Final Finishing" of the Standard Specifications shall be modified as follows:

> Delete all reference to wetted burlap. Final finish of the surface shall be textured by stiff broom process that will produce scoring perpendicular to the centerline of the street, performed at a time and in a manner to produce a hardened surface have a coefficient of friction of not less than 0.38 as determined by California Test 342. Curing to be applied immediately following broom process.

Joints in the concrete pavement shall be constructed as described in Section 302-6.5 of the Standard Specifications except as modified herein. Sawing of the joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, usually 4 to 24 hours per Engineer's directions. If necessary, the sawing operations shall be carried on both day and night, regardless of weather conditions.

All joints shall be sawed before uncontrolled shrinkage cracking occurs. A standby saw shall be available in the event of breakdown. All weakened plane joints shall be saw cut to a depth equal to one fourth of the pavement thickness. Longitudinal joint spacing shall be at 10' minimum and 15' maximum on either side of centerline joint. Transverse joint spacing shall be at 10' minimum and 15' maximum for pavement, curb and gutter. Longitudinal joints shall be aligned such that they will cross manholes and water valves at centerline if possible. Transverse construction joints within 1' shall cross all manholes and water valves. Provide a weakened plane joint around the perimeter of all utility vaults.

Payment for cold joint construction or weakened plane saw cutting shall be included in other bid items of work and no additional compensation shall be allowed therefore.

The Cleanness Value requirement of Section 200-1.4 shall be replaced with the following:

Tests	Test Method	Requirements
Cleanness Value	California 227	
Individual Test		70 min
Moving Average		75 min

The Sand Equivalent requirement of Section 200-1.5.3 shall be replaced with the following:

Tests	Test Method	Requirements
Sand Equivalent	California 227	
Individual Test		70 min
Moving Average		75 min

Evaluation of Sand Equivalent and Cleanness Value results shall conform to the provisions of Standard Specifications Subsection 400-1.4.

Concrete shall be high early strength concrete, treated in accordance with section 201-1 to obtain (7) day compressive strength in (3) days.

Traverse joints shall match those of the adjacent pavement. The concrete pavement shall be immediately barricaded upon its installation and no vehicular traffic will be permitted until and after 3-days of placement and with the approval of the Engineer.

Payment for constructing permanent PCC concrete trench pavement replacement and bus pad replacement shall be included in the unit price bid for other items of work and no additional compensation will be allowed therefore.

6.09 VITRIFIED CLAY PIPE (VCP) SEWER MAIN

Where indicated on the plans, sanitary sewer pipe shall be extra strength vitrified clay pipe (VCP) with compression joints conforming to Subsection 207-8 of the Standard Specifications.

Underground conduit construction shall conform to all applicable Subsections of Section 306 of the Standard Specifications, the Standard Plans and these Special Provisions.

Potholing shall be considered as part of the excavation necessary for the work and no additional compensation will be made therefore. The Engineer shall be given the opportunity to inspect the existing improvement when it is exposed.

Any adjustments in line or grade which will be necessary to accomplish the intent of the plans shall be made. In the event obstructions are encountered during the progress of the work which will require alterations to the plans, the Engineer shall have the authority to change the plans and order the necessary deviation from the line or grade. Contractor shall not make any deviation from the specified line or grade without approval by the Engineer.

Pipe sections shall not be deflected at any joint, either vertically or horizontally, beyond the limits specified by the manufacturer.

The pipe and fittings shall be lowered into the trench. Do not throw the pipe or fittings into the trench.

The Contractor shall provide a bypass line for the effluent during the construction of sewer main between manholes. The inlet of the downstream manhole and the outlet of the upstream manhole shall be plugged. A portable pump shall be installed in the upstream manhole to discharge the effluent from the upstream manhole to the downstream manhole through the bypass line.

The sewage bypass and pumping plans shall be conforming to section 7-8.5.2 of the Standard Specifications.

Provision shall be made by the Contractor for the collection of sewage from cutoff lateral sewers. Lateral sewers shall be reconnected to the main before the termination of every working day.

The text of Subsection 306-1.6 of the Standard Specifications is hereby deleted and replaced with the following:

> Pipe shall be measured along the longitudinal axis between the ends as laid and shall include the actual pipe in place.

When it is necessary to lower the invert elevation of a pipe by one foot or less or raise the invert elevation any amount, no increase or decrease in the unit price bid for such pipe will be made. Where it is necessary to lower the invert elevation of a pipe more than one

foot, the price paid for such pipe will be established in accordance with Section 3-3 of the Standard Specifications.

6.10 POLYVINYL CHLORIDE (PVC) SEWER PIPE

Installation and construction of PVC sewer main shall conform to all applicable provisions of the ASTM D2321-05 (or later) "Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications," Standard Specifications and these Special Provisions and the construction plans.

Where indicated on the plans, sanitary sewer pipe shall be Polyvinyl Chloride (PVC) sewer pipe with compression joints conforming to Subsection 207-8 of the Standard Specifications.

Underground conduit construction shall conform to all applicable Subsections of Section 306 of the Standard Specifications, the Standard Plans and these Special Provisions.

PVC sewer pipe shall be manufactured by JM Eagle or approved equivalent.

PVC gravity sewer pipe and fittings shall conform to ASTM D3034 for diameters from 4" - 15", and ASTM F679 for 18" - 24", with integral bell gasket joints. Rubber gaskets shall be factory installed and conform to ASTM F477.

Pipe shall be made of PVC plastic having a cell classification of 12454B or 12364B as defined in ASTM D1784 and shall have SDR of 26 and minimum pipe stiffness of 115 psi according to ASTM Test D2412.

Pipe shall be installed in compliance with ASTM D2321. Bedding material shall provide adequate and uniform support under the pipe.

Pipe shall not be stored in direct sunlight. Pipe stored outdoors shall be protected from the natural elements by covering it with opaque material such as canvas. The covering shall be placed in such a way as to allow adequate air circulation between the cover and the pipe. Discolored pipe will not be allowed. Individual pipe sections shall not be stacked in piles higher than five feet. The pipe shall not be stored next to heat sources or engine exhausts. All gaskets should be protected from heat, oil and grease.

Field cutting of PVC pipe shall be square cut and bevel the end with a beveling tool. Remove all burrs and raised edges prior to assembly.

Potholing shall be considered as part of the excavation necessary for the work and no additional compensation will be made therefore. The Engineer shall be given the opportunity to inspect the existing improvement when it is exposed.

Any adjustments in line or grade which will be necessary to accomplish the intent of the plans shall be made. In the event obstructions are encountered during the progress of the work which will require alterations to the plans, the Engineer shall have the authority to change the plans and order the necessary deviation from the line or grade. Contractor

shall not make any deviation from the specified line or grade without approval by the Engineer.

Pipe sections shall not be deflected at any joint, either vertically or horizontally, beyond the limits specified by the manufacturer.

The pipe and fittings shall be lowered into the trench. Do not throw the pipe or fittings into the trench.

The Contractor shall provide a bypass line for the effluent during the construction of sewer main between manholes. The inlet of the downstream manhole and the outlet of the upstream manhole shall be plugged. A portable pump shall be installed in the upstream manhole to discharge the effluent from the upstream manhole to the downstream manhole through the bypass line.

The sewage bypass and pumping plans shall be conforming to section 7-8.5.2 of the Standard Specifications.

Provision shall be made by the Contractor for the collection of sewage from cutoff lateral sewers. Lateral sewers shall be reconnected to the main before the termination of every working day.

The text of Subsection 306-1.6 of the Standard Specifications is hereby deleted and replaced with the following:

> Pipe shall be measured along the longitudinal axis between the ends as laid and shall include the actual pipe in place.
>
> When it is necessary to lower the invert elevation of a pipe by one foot or less or raise the invert elevation any amount, no increase or decrease in the unit price bid for such pipe will be made. Where it is necessary to lower the invert elevation of a pipe more than one foot, the price paid for such pipe will be established in accordance with Section 3-3 of the Standard Specifications.

All new constructed PVC sewer mains shall be tested for deflection and ovality using laser profile technology and or with an electronic deflect-o-meter. The deflection and or ovality shall not exceed (5%) of the inside diameter of the pipe. If the pipe exceeds this tolerance, it is the responsibility of the contractor to replace and re-test the newly constructed pipe for deflection and ovality at no cost to the City.

The contractor shall submit all laser profile documents to the Engineer for review and approval no later than (10) days after the test.

6.11 NEW MANHOLE STRUCTURES

Construction of new concrete manhole structures shall be done in accordance with City of Santa Ana Standard No. 1201, details as shown on the plans, the applicable provisions of Sections 201, 303, and 306 of the Standard Specifications and these Special

Provisions. This work shall also include the removal and/or modification of any interfering portions of existing manholes, sewer pipes, drop inlets, PCC encasements, etc., necessary to construct each manhole structure complete in place.

Concrete for manhole structures shall be Class 560-C-3250. All reinforcing steel used in these structures shall be Grade 40 minimum. Fly ash additives and/or substitutes shall not be permitted.

The following is hereby added to Subsection 201-4.1, of the Standard Specification:

> Concrete curing compound shall be Type 2.

The following is hereby added to Subsection 303-1.1, of the Standard Specification:

> Once any excavation for the construction of a manhole structure is commenced, the Contractor must diligently pursue the completion of the structure, including structure backfill, compaction, and restoration of surface improvements and temporary paving. Open excavations shall be properly barricaded, backfilled or covered with steel traffic plates to the satisfaction of the Engineer at the end of each workday.

The following are hereby added to Subsection 303-1.11, of the Standard Specifications:

> When it is necessary to increase the depth of a manhole structure by one foot or less or decrease the depth any amount, no increase or decrease in the unit price bid for such manhole structure will be made. Where it is necessary to increase the depth of a manhole structure more than one foot, the price paid for such manhole structure will be established in accordance with Subsection 3-3.

6.12 REMOVE EXISTING MANHOLE STRUCTURES

Removal of existing manholes shall be accomplished in accordance with the project plans, City of Santa Ana Standards and Design Criteria, the applicable provisions of Section 306 of the Standard Specifications, and these Special Provisions.

The following is added to the third paragraph of Subsection 306-5 of the Standard Specifications:

> The top six inches of backfilled subgrade shall be compacted to a relative compaction of 90%.

The first sentence of the fifth paragraph of Subsection 306-5 of the Standard Specifications is amended to read as follows:

> The manhole rim and cover shall be salvaged and delivered to the City of Santa Ana Water Resources Division at 215 S. Center Street.

6.13 ABANDON EXISTING SEWER MAIN

The contactor shall abandon existing pipes per Section 306-5 of the Standard Specifications, as specified herein, and as shown on the construction plans and per City of Santa Ana Standard Plan No. 1209.

The contractor shall provide traffic control as required and approved by the agency having jurisdiction. Under no circumstances shall the abandonment take place before existing sewers and manholes are out of service and all flow directed to the new or alternate pipes.

The abandon pipes shall be filled with sand cement slurry 1-sack (941bs) of concrete. In lieu of slurry, the contractor may use low density cellular concrete, Elastizell (EF) or approved equal.

The contractor shall demonstrate that the pipe to be abandoned has been completely filled, without voids, by providing volume calculations for each placement of grout and materials strength tests as required by the City.

The contractor is responsible for the selection methods and material to be used. Pipe abandonment shall be coordinated with the construction sequence. Appropriate plugs shall be installed by the contractor, and grout shall be injected in an upslope manner to remove trapped air. Samples of the outgoing water (at the exit end) shall be made until the existing grout mix is observed to be similar to the grout being injected at the inlet end. The grouting plan, and grout mix design shall be submitted to the Engineer for review and approval prior to commencement of work.

The payment for abandonment of existing sewer mains and related work as specified herein and including labor, materials, tools, equipment, and testing shall be included in other items of work. No additional compensation will be allowed.

6.14 ABANDON EXISTING MANHOLE STRUCTURES

The contractor shall abandon existing manhole structures in conformance to the Standard Specifications Section 306-5, as specified herein, and as shown on the construction plans and per City of Santa Ana Standard Plan No. 1209.

The contractor shall provide traffic control as required and approved by the agency having jurisdiction. Under no circumstances shall the abandonment take place before existing sewers and manholes are out of service and all flow directed to the new or alternate pipes.

The manhole wall shall be removed to 18-inches below finished surface and be completely removed and properly disposed of, unless otherwise shown.

The manhole base shall be perforated or cored through and filled with sand (SE 30 minimum).

The manhole rim and cover shall be salvaged and delivered to the City of Santa Ana Water Resources Division at 215 S. Center Street.

Existing pipe ends within manholes to be abandoned shall be plugged with concrete and bricks per section 306-5. Concrete shall be Class C and bricks shall be a manhole brick as specified in Section 202-1 of the Standard Specifications.

The contractor shall remove and replace all asphalt, concrete pavement, earthwork, landscaping, or other surface damaged by the abandonment operations per an in conformance with these provisions.

6.15 CONSTRUCT 4" OR 6" HIGH DENSITY POLYETHYLENE (HDPE) SEWER LATERALS AND CLEANOUTS (PIPE BURST)

This work involves the installation of HDPE Pipe. Method of construction shall be via trenchless pipe replacement installations.

The contractor shall connect to the new sewer main and to the existing sewer lateral pipe at the property line. It is the contractor's responsibility "The contractor shall locate all points of connection for each new sewer lateral at the both: the wye at the public sewer main and the private connection point at property line where lateral cleanout will be constructed." All locations points shall be marked in the field prior to installation and construction of new sewer lateral.

Underground conduit construction shall conform to all applicable Subsections of Section 306 and Section 500 of the Standard Specifications, the Standard Plans and these Special Provisions.

High density polyethylene pipe in accordance with these specifications shall be used in pipe bursting or trenchless pipe replacement installations. All piping system components shall be the products of one manufacturer and shall conform to the latest edition of ASTM D1248, ASTM D3350, and ASTM F714.

The HDPE pipe shall be a minimum of SDR 17 or as specified on the plans.

The HDPE pipe shall provide a structurally sound, impermeable, jointless pipe. It shall be the Contractor's responsibility to comply with OSHA Standards and Regulations pertaining to all aspects of the work.

The HDPE pipe shall be chemically resistant to internal exposure to sewage containing small quantities of hydrogen sulfide, carbon dioxide, methane, mercaptans, kerosene, moisture and diluted sulfuric acid. It shall also be chemically and physically resistant to external exposure of soil, bacteria, roots and chemical attack due to material in the surrounding ground.

The polyethylene resin shall meet or exceed the requirements of ASTM D3350 for PE 3408 material with a cell classification of 345464C, or better.

The maximum allowable hoop stress shall be 800 psi at 73.4 degrees F.

The Hydrostatic Design Basis (HDB) shall be 1600 psi per ASTM D2837.

Material designation shall be PE 3408 following ASTM F412.

Pipe shall be assembled in accordance with ASTM D2657 or as otherwise approved by the Engineer.

Sanitary Sewer pipe shall be green in color or contain green striping. Sanitary Sewer pipe interior shall have a reflective coating for CCTV inspection.

Contractor shall video laterals prior to pipe bursting in order to identify any features that would disrupt the pipe bursting procedure.

Construction of sewer lateral and cleanout shall be done in accordance with City of Santa Ana Standard Plan No. 1204A.

Insertion rate of HDPE pipe shall not exceed pipe tolerances any given time. Contractor shall maintain logs verifying pipe tolerances do not exceed pipe limitations. Any HDPE pipe stretched beyond its elastic limit or damaged in any way will be rejected.

Any defect which will affect the integrity or strength of the pipe discovered during the warranty period shall be repaired at the Contractor's expense.

The text of Subsection 306-1.6 of the Standard Specifications is hereby deleted and replaced with the following:

> Pipe shall be measured along the longitudinal axis between the ends as laid and shall include the actual pipe in place.

Joining of HDPE pipe shall be performed by thermal butt-fusion in accordance with the manufacturer's recommendations. Internal weld beads formed by the thermal butt-fusion method shall be removed on the bottom 120 degrees of the pipe, minimum. The bead shall be removed to the pipe's surface, but under no circumstances shall it be below it. The joint must sufficiently cool to ambient temperature before the bead is removed.

Butt-fused joint strength shall be equal to or greater than the strength of the pipe.

Threaded or solvent-cement joints and connections shall NOT be permitted.

A "Y" Branch fitting shall be installed on the sewer main at each lateral connection per City of Santa Ana Standard Plan No. 1204A. In the case where the lateral is to be connected to a sewer main that has been lined, a "Y" Saddle fitting shall be installed. The connection shall conform to the size and shape of the inside diameter of the new connection. Service connection openings shall be free from rough edges or protrusions. **CORING OF NEW SEWER MAIN TO ACCOMMODATE LATERAL CONNECTION SHALL NOT BE ALLOWED.**

At all locations where more than one (1) lateral serves a single parcel, Contractor shall expose existing lateral connection to the existing sewer main and verify that the lateral is active by CCTV inspection. If CCTV investigation is inconclusive, lateral shall be treated as active and shall be constructed per plan. If lateral is determined to be dead, lateral shall be plugged and abandoned in place. This work shall be included in the unit price for sewer lateral construction and no additional compensation will be made.

The Contractor shall connect to the new sewer main and to the existing sewer lateral pipe at property line. This work shall be included in the unit price for sewer lateral, and cleanouts no additional compensation will be made.

During construction, the Contractor shall make provisions for the collection of sewage from cutoff laterals. All sewer laterals shall be reconnected to the main before the termination of each working day.

The Contractor shall submit all material information for sewer lateral cleanout connections and appurtenances prior to commencing work. The Engineer shall review and upon approval notify the Contractor by a memorandum. Non-approved materials shall not be used.

New submittals shall be required for material substitutions. The Engineer shall review and upon approval notify the Contractor by a memorandum.

All fittings shall be pressure rated and classified the same as adjoining pipe. The inside diameter shall match inside diameter of adjoining pipe and shall be designed for pipe bursting or pipe jacking applications.

Metal in saddles, clamps and appurtenances shall be 302 or 304 stainless steel following ASTM A240.

Elastomeric materials, gaskets, clamps and connectors shall be oil resistant and manufactured following ASTM F477.

The Contractor shall submit certification by the manufacturer of the pipe bursting system to have successfully completed training in operating the bursting head, installing proposed replacement pipe and operation and maintenance of all equipment to be used. The Contractor shall submit certification by the manufacturer of the fusing equipment having successfully completed training in handling replacement of pipe materials, butt-fusion of pipe joints and saddle fusion of fittings for service laterals, and operation and maintenance of all equipment to be used. The Certificate of Training includes at a minimum: Installer's name, date of issuance and process or product the person/s is/are certified to install. These certifications of training and operation of pipe bursting system shall be submitted prior to commencing pipe bursting work.

The curb and gutter shall be protected in place. If the Contractor damages curb, gutter, it shall be removed and replaced to match existing in accordance with City of Santa Ana Standard Plan No. 1101. This work shall also include removal and replacement of PCC sidewalk, driveway panels and landscaping to facilitate construction of sewer laterals.

PCC sidewalk and driveway approach panels shall be replaced to match existing in accordance with City of Santa Ana Standard Plan Nos. 1104 and 1112. Landscaping shall be replaced in-kind. No additional compensation will be made.

6.16 CONSTRUCT 4" OR 6" POLYVINYL CHLORIDE (PVC) SEWER LATERALS AND CLEANOUTS (OPEN TRENCH)

PVC sewer pipe shall be as manufactured by JM EAGLE or approved equivalent.

PVC gravity sewer pipe and fittings shall conform to ASTM D3034 for diameters from 4" - 15", and ASTM F679 for 18" - 24", with integral bell gasket joints. Rubber gaskets shall be factory installed and conform to ASTM F477.

Pipe shall be made of PVC plastic having a cell classification of 12454B or 12364B as defined in ASTM D1784 and shall have SDR of 26 and minimum pipe stiffness of 115 psi according to ASTM Test D2412.

Pipe shall be installed in compliance with ASTM D2321. Bedding material shall provide adequate and uniform support under the pipe.

Underground conduit construction shall conform to all applicable Subsections of Section 306 of the Standard Specifications, the Standard Plans and these Special Provisions.

There shall be no pipe joints from the sewer lateral cleanout connection to 20 feet into street right away. No pipe joints shall be allowed in the parkway.

Pipe joints shall not be deflected at any joint, either vertically or horizontally, beyond the limits specified by the manufacturer.

Construction of sewer lateral and cleanout shall be done in accordance with City of Santa Ana Standard Plan No. 1204, the contract plans and these Special Provisions.

A "Y" Branch fitting shall be installed on the sewer main at each lateral connection per City of Santa Ana Standard Plan No. 1204. In the case where the lateral is to be connected to a sewer main that has been lined, a "Y" Saddle fitting shall be installed. The connection shall conform to the size and shape of the inside diameter of the new connection. Service connection openings shall be free from rough edges or protrusions. **CORING OF NEW SEWER MAIN TO ACCOMMODATE LATERAL CONNECTION SHALL NOT BE ALLOWED.**

At all locations where more than one (1) lateral serves a single parcel, Contractor shall expose existing lateral connection to the existing sewer main and verify that the lateral is active by CCTV inspection. If CCTV investigation is inconclusive, lateral shall be treated as active and shall be constructed per plan. If lateral is determined to be dead, lateral shall be plugged and abandoned in place. This work shall be included in the unit price for sewer lateral construction and no additional compensation will be made therefore.

The contractor shall connect to the new sewer main and to the existing sewer lateral pipe at the property line. It is the contractor's responsibility "The contractor shall locate all points of connection for each new sewer lateral at the both: the wye at the public sewer main and the private connection point at property line where lateral cleanout will be constructed." All locations points shall be marked in the field prior to installation and construction of new sewer lateral. This work shall be included in the unit price for sewer lateral cleanouts and no additional compensation will be made therefore

The Contractor shall perform pipeline testing as directed by the Engineer in accordance with the applicable provisions of Subsection 306-1.4 of the Standard Specifications.

The Contractor shall submit all material information for sewer lateral cleanout connections and appurtenances prior to commencing work. The Engineer shall review and upon approval notify the Contractor by a memorandum. Non-approved materials shall not be used.

New submittals shall be required for material substitutions. The Engineer shall review and upon approval notify the Contractor by a memorandum.

During construction, the Contractor shall make provisions for the collection of sewage from cutoff laterals. All sewer laterals shall be reconnected to the main before the termination of each working day.

The curb and gutter shall be protected in place. If the Contractor damages curb, gutter, it shall be removed and replaced to match existing in accordance with City of Santa Ana Standard Plan No. 1101. This work shall also include removal and replacement of PCC sidewalk, driveway panels and landscaping to facilitate construction of sewer laterals. PCC sidewalk and driveway approach panels shall be replaced to match existing in accordance with the City of Santa Ana Standard Plan No. 1104 and 1112. Landscaping shall be replaced in-kind. No additional compensation will be made.

6.17 CONNECT SEWER LATERALS

This work shall include reconnecting existing sewer lateral to the new sewer main. This work shall include locating all existing laterals and pipe connection points, furnishing and installing new pipe and connections to the new main in accordance with City of Santa Ana Standard Plan Nos. 1204 and 1204A, replacement of street surface over trench as shown on drawings.

At all locations where more than one (1) lateral serves a single parcel, Contractor shall expose existing lateral connection to the existing sewer main and verify that the lateral is active by CCTV inspection. If CCTV investigation is inconclusive, lateral shall be treated as active and shall be constructed per plan. If lateral is determined to be dead, lateral shall be plugged and abandoned in place.

During construction, the contractor shall make provisions for the collection of sewage from cutoff laterals. All sewer laterals shall be reconnected to the main before the termination of each working day.

This work shall be included in the unit price for sewer lateral construction and no additional compensation will be made.

6.18 CLOSED CIRCUIT TELEVISION (CCTV) INSPECTION OF SEWER MAIN AND LATERALS

Following installation of pipe, CCTV inspection shall be performed on all newly constructed sewer mains and sewer laterals. This work shall also include cleaning of sewer main prior to videoing in accordance with section 500-1.1.4 of the Standard Specifications.

The scope of work includes the cleaning and videoing by means of remote CCTV. If a blockage in the pipe hampers the CCTV work, then the contractor shall attempt to complete the CCTV work by televising from the opposite manhole (upstream or downstream) of the location. The operator immediately shall notify the contractor. Then, the contractor shall notify the Engineer.

CCTV inspections shall be delivered in an electronic format (CD/DVD) to the Engineer for review and approval.

A. All Pipe Assessment & Certification Program (PACP) header information shall be completed in accordance with the PACP Guidelines.

B. The documentation for the work shall consist of CCTV reports, database, logs, electronic reports, etc. noting important features during the inspection. The speed of travel during the inspection shall not exceed at any time more than 30 feet per minute, except noted otherwise.

C. The camera must be centered to provide accurate distance measurements and locations of features in the sewer main. All observations shall be displayed and documented on the video and identified by audio on the PACP log. All video must be continuously metered from the manhole.

D. All lengths of installed sewer main and sewer laterals shall be documented by footage or stationing in the video. Sewer laterals shall be videoed up to the property line. The pipe shall be clean to ensure all defects and observations are logged and documented.

E. During inspection, the operating technician shall, in addition to his/her video (with audio) record of conditions, log in writing the location of all laterals, defects, misalignments, and other conditions and data pertinent to the physical condition and operation of the sewer main and sewer laterals.

Cleaning of the sewer main and laterals shall include removal of debris or foreign objects introduced during construction. Such debris shall be vacuumed from the system and shall not be washed or otherwise deposited downstream. Cleaning apparatus shall be removed prior to insertion of the video camera. Under no circumstances shall cleaning apparatus be used in direct conjunction with video operations.

Under no circumstances will plugging and/or bypassing be permitted without prior approval and presence of the engineer. If plugging and/or bypassing are deemed necessary, the Contractor shall be responsible for plugging manhole outlets and/or providing a bypass line for the effluent during videotaping. The sewer mains will be "in service" at the time of the video inspection.

The video technician shall hold a current National Association of Sewer Service Companies (NASSCO) certification. Provide operator certification to the engineer for review and approval.

All CCTV work shall conform to the current NASSCO-PACP Standards for sewer main, and sewer lateral and these Special Provisions.

6.19 SEWER FLOW LEVEL MONITORING & ALARMING DEVICE

Contractor shall supply and install a Smart Cover® sewer flow level monitoring and alarming device as manufactured by Hadronex (760-291-1980). The flow level monitoring and alarming system shall be compatible with the existing sewer flow level and monitoring system utilized by the City's Water Resources Division. Included in this item will be the first year maintenance fee assessed by the alarming company for all sewer flow level monitoring & alarming devices installed.

6.20 SUBMITTALS

Sewer main pipe and appurtenance submittals shall include, but not limited to the following manufacturer information:

1. SDR-26 PVC pipe, VCP pipe, and or other as approved by the Engineer
2. Fittings and Bends
3. Sewer Main Encasement Materials
4. Adapters/Couplings/Gaskets

Sewer manhole structures shall be in conformance with all City of Santa Ana Standard Plans, the Standard Specifications, and these Special Provisions and not limited to the following manufacturer information:

1. Sewer Manhole Structure- Material composition, frame and cover
2. Terminal Cleanout Structure- Material composition, frame and cover
3. Sewer Flow Monitoring and Alarming Device

Sewer laterals shall be in conformance with all City of Santa Ana Standard Plans, the Standard Specifications, and these Special Provisions and not limited to the following manufacturer information:

1. SDR-26 PVC pipe, VCP pipe, HDPE pipe, and or other as approved by the Engineer
2. Cleanout Structure- Material composition, frame and cover
3. Fittings

4. Adapters/Couplings/Gaskets

7.00 SPECIAL PROVISIONS - WATER MAIN IMPROVEMENTS

7.01 GENERAL

All equipment and materials used installed in the water system shall meet all state and federal standards. All products in contact with drinking water shall be tested and certified to meet NSF/ANSI standard 60 (Drinking Water Treatment Chemicals-Health Effects) and NSF/ANSI 61 (Drinking Water System Components-Health Effects)

All materials coming in contact with potable water shall be lead free per California Health & Safety Code Section 116875.

7.02 OPEN TRENCH OPERATIONS, EXCAVATION, BEDDING, AND BACKFILL

Open trench operations, excavation, bedding and backfill shall conform to the applicable provisions of Section 306 of the Standard Specifications and these Special Provisions.

Contractor shall excavate open trench 100 feet ahead of pipe laying operations to allow for any adjustments in grade necessary to resolve unforeseen utility conflicts.

All trenches shall be backfilled and have 3" temporary pavement installed or covered with steel traffic plates recessed and flushed with existing pavement at the end of each working day.

Trenching operations shall not be allowed on more than one street at any time. Work shall not be allowed in more than one intersection at any one time.

The third paragraph of Subsection 306-1.1.1 of the Standard Specifications is hereby deleted and replaced as follows:

> Excavation shall include the removal of all excess excavated materials and all water and materials of any nature, which interfere with the construction work.

All pavement removals shall be sawcut unless, approved otherwise by the Engineer prior to commencement of work.

All removed pavement and excess excavated material shall be immediately disposed of off the project site at a legal dumpsite at the Contractor's expense.

Pipe bedding and trench backfill shall be accomplished in accordance with the City of Santa Ana Standard Plan No. 1150 and these contract documents. All material tickets (i.e. Sand, Asphalt, Concrete, etc.) shall be given to the City Inspector on a daily basis.

Sand for bedding and backfill shall be manufactured or naturally produced by the disintegration of rock and shall be sufficiently free of organic material, mica, loam, clay and other deleterious substances and shall have a minimum sand equivalent of 30. A sample shall be submitted for Engineer's approval prior to commencement of work.

The following test methods shall be used for determining relative compaction:

California Test 216	(Sand Cone Method)
California Test 231	(Nuclear Gauge Method)

The Contractor will be provided with compaction test at locations deemed necessary by the Engineer. If compaction fails to meet the contract specifications, then the Contractor shall make the necessary adjustments and is responsible for the cost of additional compaction tests until compaction per the specifications is met.

All trench and structure backfill sand shall be compacted to 90% of maximum density at optimum moisture.

If any trench, through the neglect of the Contractor, is excavated below the grade required by the plans and these Special Provisions, it shall be refilled to grade with additional bedding. This excess excavation and the additional bedding shall be at the Contractor's expense.

Payment for all removals, trenching operations, excavation, shoring, backfill and related work as specified herein including furnishing, placing and compacting bedding and backfill shall be considered included in the contract unit prices paid for other items of work and shall be considered full compensation for furnishing all labor, materials, tools, equipment, water for compaction and all incidentals for doing all the work as specified herein and as shown on the plans and no additional compensation will be allowed therefore.

Any increase in the depth of excavation of 18 inches or less shall be considered to be included in the contract unit price for said work and no additional compensation will be allowed.

7.03 EXISTING UTILITIES AND ADJUSTMENTS IN GRADE

All existing utilities shall be protected in place, unless otherwise noted on the plans. The Contractor shall be responsible for any damage to existing utilities as a result of his operations.

The location of existing utilities as shown on the plans was obtained from a search of available records. It shall be the Contractor's responsibility to notify the respective utility owners and Underground Service Alert (811) to determine the exact field location of all utilities shown or not shown on the plans, which may conflict with his operations. Potholing of existing utilities and service connections to determine exact depth and field locations shall be the responsibility of the Contractor.

The Contractor shall determine the location and depth of all utilities including service connections, which may affect or be affected by its operation, three (3) weeks in advance. In the event of any conflicts the Engineer shall be immediately notified.

City owned utility frames and covers for survey monuments, water meter, water valves, traffic signal and street light pull boxes, and manholes within the area to be paved or graded, shall be set to finish grade by Contractor after construction of new pavement. In Portland cement concrete pavement and sidewalk areas, City utility frames and covers shall be adjusted to grade prior to placement of concrete. Contractor shall supply new sewer manhole frame and covers, sewer cleanout frame and covers, concrete rings and water valve pot frame, canister and lids per City of Santa Ana Standard Plans.

Prior to paving, an "I.D. Locator" shall be attached to each valve box or manhole cover. An "ID Locator" is a rubberized marker approximately 4" high that adheres to the utility cover and pops-up after paving for easy identification and location of the respective valve box or manhole. Contractor shall measure and tie-out locations of manholes and water valves prior to paving.

7.04 LANDSCAPING AND IRRIGATION REPAIR

This section shall conform to Sections 212 and 308 of the Standard Specifications and these Special Provisions.

All lawn and landscaped areas disturbed by the Contractor as part of or as a result of the work shall be prepared/brought to adjacent grade and restored to match existing landscaping. If there are any existing sprinkler heads and irrigation lines in the construction areas, whether on public or private property, they shall be replaced or relocated by the Contractor.

The text of Subsection 308-8 of the Standard Specifications is hereby deleted and replaced with the following:

> All costs to the Contractor for landscaping and irrigation work in areas disturbed by the Contractor shall be included in other items of work and shall include full compensation for furnishing all materials, labor, equipment, tools and incidentals to perform all work necessary to complete and maintain the landscaping and irrigation work.

7.05 PORTLAND CEMENT CONCRETE (PCC) CROSS GUTTER

This work shall consist of replacing PCC cross-gutter from the spandrel to street centerline (cold joint to cold joint) to facilitate water main construction. All work shall be accomplished in accordance with City of Santa Ana Standard Plan No. 1109. The replacement areas are clearly indicated on the construction plans.

Concrete shall be high early strength concrete, treated in accordance with section 201-1 to obtain (7) day compressive strength in (3) days.

Payment for constructing Portland Cement Concrete cross gutters replacement shall be included in the unit price bid for other items of work and no additional compensation will be allowed therefore.

7.06 TEMPORARY PAVING

All trenches shall be backfilled and have temporary pavement installed or covered with steel traffic plates at the end of each working day. All steel plates shall be set flush with adjacent pavement.

Within four consecutive calendar days following installation of the conduit, or after compaction is approved by the Engineer, whichever comes first, steel traffic plates shall be removed and three inches of temporary pavement installed.

Cross streets are to be paved with temporary pavement on the same day that excavation and backfill are completed. Temporary pavement shall be maintained so that a smooth traversable surface is available at all times for vehicular traffic, free from ruts, depressions, and holes and loose gravel. Temporary paving shall be removed and disposed of by the Contractor before the permanent resurfacing is placed. Payment for construction and maintaining temporary pavement shall be included in the price bid for other items of work, and no additional allowance will be made therefore.

The contractor shall construct temporary asphalt concrete with a slope of 1:1 at the edge of open excavation (remove and reconstruct section) if all the following occur:

1. Clearance between travel lane and open excavation is less than five (5) feet
2. Excavation depth is four (4) inches or deeper, and
3. If open excavation will last more than 24 hours

Payment for construction and maintaining temporary pavement shall be included in the price bid for other items of work, and no additional compensation will be made therefore.

7.07 PERMANENT ASPHALT CONCRETE TRENCH PAVEMENT REPLACEMENT

This work shall consist of constructing permanent asphalt concrete pavement replacement and shall be accomplished in accordance with the details shown on the Plans, these Special Provisions and the street work permit.

Asphalt concrete construction shall conform to Section 400, 200, 203, and 302 of the Standard Specifications and these Special Provisions.

Tack coat is required and shall be applied and conform to Section 302 of the Standard Specifications. The Contractor shall prevent the tack coat from being applied outside the pavement area.

Course aggregate shall consist of material with at least 75% by weight be crushed particles in lieu of the requirements of Section 400-2.3.

The asphalt concrete trench pavement replacement for each street shall consist of an asphalt concrete base course and a 2" thick asphalt concrete surface course. The asphalt

concrete trench pavement replacement shall be adjusted to match existing street section. Recommendations are as follows:

Arterial Streets:

Deep lift asphalt concrete pavement consisting of an asphalt concrete Base Course and 2" asphalt concrete Surface Course. Thickness of entire section and base course shall be as shown on plans. In the absence of a detail on the plans, a 12" thick deep lift asphalt concrete pavement consisting of 10" thick asphalt concrete Base Course and 2" asphalt concrete Surface Course shall be constructed

Local Streets:

Deep lift asphalt concrete pavement consisting of an asphalt concrete Base Course and 2" asphalt concrete Surface Course. Thickness of entire section and base course shall be as shown on plans. In the absence of a detail on the plans, a 6" thick deep lift asphalt concrete pavement consisting of 4" thick asphalt concrete Base Course and 2" asphalt concrete Surface Course shall be constructed.

The required asphalt concrete mix designs shall be as follows:

Base Course	III-B3-AR-4000 or PG64-10
Overlay/Surface Course	III-C3-AR-4000 or PG64-10
Crack Filler	III-F-AR-4000 or PG64-10

Payment for constructing permanent asphalt concrete replacement shall be included in the unit price bid for other items of work and no additional compensation will be allowed therefore.

7.08 PERMANENT PORTLAND CEMENT CONCRETE (PCC) TRENCH PAVEMENT REPLACEMENT AND BUS PAD REPLACEMENT

PCC pavement replacement shall be at least 6 inches thick and shall be 1 inch thicker than the existing pavement.

Existing concrete pavement adjacent to trench operations shall be sawcut and drilled with #4 dowel bars epoxy coated and or approved.

Construction and installation of dowels shall be per City of Santa Ana Standard Plan No. 1428A, the construction plans, and these specifications.

Portland cement concrete pavement replacement and bus pad replacement shall conform to Sections, 400, 200, 201, and 302 of the Standard Specifications and these Special Provisions.

PCC used for street pavement and bus pad construction shall be minimum class 560-A-3250. In addition to these minimum requirements, the concrete shall possess the following characteristics:

- Flexural strength at 28 days: 550 p.s.i. min.
- Flexural strength at 7 days: 430 p.s.i. min.
- Compressive strength at 7 days: 2500 p.s.i. min.

All cement to be used or furnished on this Project shall be Type II low alkaline Portland Cement conforming to ASTM C150.

Prior to the start of construction, the Contractor shall furnish to the Engineer laboratory test data for the particular mix design he will use. The data will include the following:

A. A detailed concrete mix design including the type and amount of cement used; complete gradation and source of the aggregate used; the amount of water used; and any proposed admixtures.

B. Flexural strength test data for the same batch of concrete used in A above showing the compressive strength of the concrete at 3, 7, and 28 days.

Section 302-6.4.2 entitled "Tamping" of the Standard Specifications shall be modified by adding the following:

> The outer edge of the gutter shall not be used as a side form for the mechanical tamper except where existing gutter is to remain as shown on the construction plans.
>
> Concrete pavement for bus pads shall be installed monolithic with the curb and gutter and shall be accomplished in accordance with City of Santa Ana Standard Plan No. 1108. Payment for the curb and gutter is included in the unit price for bus pad replacement.

Section 302-6.4.4 entitled "Final Finishing" of the Standard Specifications shall be modified as follows:

> Delete all reference to wetted burlap. Final finish of the surface shall be textured by stiff broom process that will produce scoring perpendicular to the centerline of the street, performed at a time and in a manner to produce a hardened surface have a coefficient of friction of not less than 0.38 as determined by California Test 342. Curing to be applied immediately following broom process.

Joints in the concrete pavement shall be constructed as described in Section 302-6.5 of the Standard Specifications except as modified herein. Sawing of the joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, usually 4 to 24 hours per Engineer's directions. If necessary, the sawing operations shall be carried on both day and night, regardless of weather conditions.

All joints shall be sawed before uncontrolled shrinkage cracking occurs. A standby saw shall be available in the event of breakdown. All weakened plane joints shall be saw cut to a depth equal to one fourth of the pavement thickness. Longitudinal joint spacing shall be at 10' minimum and 15' maximum on either side of centerline joint. Transverse joint spacing shall be at 10' minimum and 15' maximum for pavement, curb and gutter. Longitudinal joints shall be aligned such that they will cross manholes and water valves at centerline if possible. Transverse construction joints within 1' shall cross all manholes and water valves. Provide a weakened plane joint around the perimeter of all utility vaults.

Payment for cold joint construction or weakened plane saw cutting shall be included in other bid items of work and no additional compensation shall be allowed therefore.

The Cleanness Value requirement of Section 200-1.4 shall be replaced with the following:

Tests	Test Method	Requirements
Cleanness Value	California 227	
Individual Test		70 min
Moving Average		75 min

The Sand Equivalent requirement of Section 200-1.5.3 shall be replaced with the following:

Tests	Test Method	Requirements
Sand Equivalent	California 227	
Individual Test		70 min
Moving Average		75 min

Evaluation of Sand Equivalent and Cleanness Value results shall conform to the provisions of Standard Specifications Subsection 400-1.4.

Concrete shall be high early strength concrete, treated in accordance with section 201-1 to obtain (7) day compressive strength in (3) days.

Traverse joints shall match those of the adjacent pavement. The concrete pavement shall be immediately barricaded upon its installation and no vehicular traffic will be permitted until and after 3-days of placement and with the approval of the Engineer.

Payment for constructing permanent PCC concrete trench pavement replacement and bus pad replacement shall be included in the unit price bid for other items of work and no additional compensation will be allowed therefore.

7.09 DUCTILE IRON WATER MAIN PIPE AND APPURTENANCES

Underground conduit construction shall conform to all applicable Subsections of Section 306 of the Standard Specifications, and with City of Santa Ana Design Criteria, Standard Plans and these Special Provisions.

Installation shall be in conformance with American Water Works Association (AWWA) Standard C151 and the Ductile Iron Pipe Research Association (DIPRA) "Guide for the Installation of Ductile Iron Pipe" and the manufacturer's recommendations.

All ductile iron pipe and fittings shall be manufactured in accordance with all applicable requirements of ASTM, ANSI/AWWA Standards and Specifications.

Ductile iron fittings shall conform to AWWA C110 or C153. All pipe and fittings shall have a bituminous coating in accordance with AWWA C151 and C110.

Ductile iron pipe section shall be (18') and or (20') sections, except where shorter lengths are required to fit horizontal or vertical alignment. Pipe sections shall not be deflected at any joint, either vertically or horizontally, beyond the limits specified by the manufacturer.

All pipe segments shall be sound and clean before laying. Ductile iron pipe cutting shall be done with a machine at right angles to the axis of the pipe. Cut end to be joined with a bell shall be beveled to conform to the spigot end.

All fittings shall be push-on-joint, (P.J.), or flanged (FLG) except where noted otherwise. All valves to fitting connections shall be flanged. Valves for lateral lines, hydrant leads and service lines shall be bolted directly to main line tee. Where it is necessary to install a reducer or other type of fitting between the lateral valve and main line, said fitting shall be flanged at both ends.

No mechanical joint fittings or connections shall be allowed unless specifically approved by the Engineer.

All flanged fittings and connections shall comply with the applicable provisions of AWWA C110. The bolt circle and bolt holes of these flanges shall match those of the Class 125 flanges shown in ANSI B16.1.

The Contractor shall coordinate the flange requirements with the connecting pipe and valve manufacturers.

Contractor shall provide flange to connecting pipe adaptors as needed. Adaptors may be flange by connecting pipe fittings (e.g. FLG x P.J.) or Megaflange-Flange adapter. "E-Z Flange" and similar set screw type adaptors are not acceptable.

Concrete thrust blocks shall be provided at all valves, fittings and hydrants in accordance with AWWA Standards and City of Santa Ana Standard Plan Nos. 1412 and 1420.

The minimum cover to top of pipe shall be 36" to finished surface except as noted on the plans and with the approval of the Engineer.

The pipe and fittings shall be lowered into the trench. Do not throw the pipe or fittings into the trench.

All buried ductile iron pipe and metallic fittings shall be encased in conformance with ANSI/AWWA C105-A21.5 Standard and these Special Provisions.

All ductile iron pipe, fittings, valves, appurtenances, blowoffs, air valves, and service taps buried underground shall be encased or wrapped with 8-mil linear low-density (LLD) polyethylene film. Any existing or connecting pipe and appurtenances that are exposed as a result of this pipe installation shall be cleaned and wrapped with polyethylene tubing and or sheeting per ANSI/AWWA C105-A21.5. Method- B for ductile iron encasement installation will not be allowed.

All nuts and bolts shall be zinc, cadmium plated and shall have **NON-OXIDE GREASE** or mastic such as EC244, or Koppers Bitumastic 505 applied to the threads prior to installation and reapplied prior to wrapping.

Hydrostatic testing pressure and leakage tests shall be in accordance with the applicable provisions of AWWA Standard C600-05. The line shall be tested at a pressure of 200 psi.

All new pipelines and appurtenances shall be chlorinated and disinfected in accordance with AWWA Standard C651-99 and shall meet all health department standards.

Connection to existing water main facilities shall be made only after the successful completion of pressure test, disinfection and flushing procedures.

7.10 POLYVINYL CHLORIDE (PVC) WATER MAIN PIPE AND APPURTENANCES

Underground conduit construction shall conform to all applicable Subsections of Section 306 of the Standard Specifications, the American Water Works Association (AWWA) Standards, the City of Santa Ana Standard Plans and these Special Provisions.

Installation shall be in conformance with AWWA Manual (M23) "PVC Pipe Design and Installation" and the manufacturer's recommendations. Pipe sections shall not be deflected at any joint, either vertically or horizontally, beyond the limits specified by the manufacturer.

This work shall include constructing AWWA C900-97, Class 200 DR14, PVC Water Main, and appurtenances complete and in place, of the size and class, and to the alignment and grade as indicated on the plans. Fittings shall be gray or ductile iron conforming to AWWA Standards and shall be push-on-joint (P.J.), mechanical joint (M.J.) or flanged (FLG) except where noted otherwise.

All valves to fitting connections shall be flanged. Valves for lateral lines, hydrant leads and service lines shall be bolted directly to main line tee, unless otherwise noted on plans.

Where it is necessary to install a reducer or other type of fitting between the lateral valve and main line, said fitting shall be flanged at both ends.

All ductile iron pipe and fittings shall be manufactured in accordance with all applicable requirements of ASTM, ANSI/AWWA Standards and Specifications.

Ductile iron fittings shall conform to AWWA C110 or C153. All pipe and fittings shall have a bituminous coating in accordance with AWWA C151 and C110.

All flanged fittings and connections shall comply with the applicable provisions of AWWA C110. The bolt circle and bolt holes of these flanges shall match those of the Class 125 flanges shown in ANSI B16.1.

The Contractor shall coordinate the flange requirements with the connecting pipe and valve manufacturers.

Contractor shall provide flange to connecting pipe adaptors as needed. Adaptors may be flange by push on fittings (FLG x P.J.) or flange by mechanical joint (FLG x M.J.) adaptor. "E-Z Flange" and similar setscrew type adaptors are not acceptable. Grip rings for PVC pipe restraint, such as Romac RomaGrip is acceptable.

Concrete thrust blocks shall be provided at all valves, fittings and hydrants in accordance with AWWA Standards and City of Santa Ana Standard Plan Nos. 1412 and 1420.

The minimum cover to top of pipe shall be 36" to finished surface except as noted on the plans and with the approval of the Engineer.

The pipe and fittings shall be lowered into the trench. Do not throw the pipe or fittings into the trench.

All buried ductile iron pipe and metallic fittings shall be encased in conformance with ANSI/AWWA C105-A21.5 Standard and these Special Provisions.

All ductile iron pipe, fittings, valves, appurtenances, blowoffs, air valves, and service taps buried underground shall be encased or wrapped with 8-mil linear low-density (LLD) polyethylene film. Any existing or connecting pipe and appurtenances that are exposed as a result of this pipe installation shall be cleaned and wrapped with polyethylene tubing and or sheeting per ANSI/AWWA C105-A21.5. Method- B for ductile iron encasement installation will not be allowed.

All nuts and bolts shall be zinc, cadmium plated and shall have **NON-OXIDE GREASE** or mastic such as 3M EC244, or Koppers Bitumastic 505 applied to the threads prior to installation and reapplied prior to wrapping.

When crossing existing water main or service line, Contractor shall adjust grade as necessary to install the new main beneath the existing facility, unless otherwise directed by the Engineer.

When making connections to existing water main or service line, Contractor shall provide all fittings necessary (i.e. tees, bends, adaptors, etc.) to adjust the grade and alignment as needed to facilitate the connection. The cost of this work shall be included in the unit price for PVC water main and no additional compensation will be allowed.

When there are specific locations indicated on the plans where it is known that additional excavation will be required to avoid conflicts with other utilities, these locations and required depths are clearly noted on the plans. The Contractor shall include any associated cost for this work in unit price per linear foot for PVC water main bid items and no additional compensation will be allowed.

PVC pipe shall be marked with the following information

- Manufacturer and Trade Name
- Nominal Size and DR Rating/Pressure Class
- [NSF-61]
- Hydrostatic Proof- Test Pressure
- Manufacturing Date

Pipe shall not be stored in direct sunlight. Pipe stored outdoors shall be protected the natural elements by covering it with opaque material such as canvas. The covering shall be placed in such a way as to allow adequate air circulation between the cover and the pipe. Discolored pipe will not be allowed. Individual pipe sections shall not be stacked in piles higher than five feet. The pipe shall not be stored next heat sources or engine exhausts. All gaskets should be protected from heat, oil and grease.

All pipe segments shall be sound and clean before placed in the ground. PVC pipe cutting shall be done with a machine at right angles to the axis of the pipe. Cut end to be joined with a bell shall be beveled to conform to the spigot end.

Hydrostatic testing: pressure and leakage tests shall be in accordance with the applicable provisions of AWWA Standard C600-05. The line shall be tested at a pressure of 200 psi.

Hydrostatic pressure testing of the main shall not be performed directly against a valve. A steel test plate shall be inserted between the valve and main when performing hydrostatic pressure testing.

All new pipelines and appurtenances shall be chlorinated and disinfected in accordance with AWWA Standard C651-99 “Disinfecting Water Mains” and shall meet all health department standards.

Connection to existing water main facilities shall be made only after the successful completion of pressure test, disinfection and flushing procedures.

7.11 BORE AND JACK, INSTALL STEEL CASING AND CARRIER PIPE

This section describes Bore and Jack Casing with Carrier pipe at approved locations as shown on plans. Bore and Jack operations including the installation of carrier pipe shall conform to the applicable provisions of Section 306 of the Standard Specifications, these Special Provisions, as directed by the Engineer and as shown on the Contract Documents.

1. All work shall be as set forth in the rules and regulations of the division of Occupational Safety and Health of the state of California.

2. It is the contractor's responsibility to be thoroughly familiarized with the project area. There is no warrantee or guarantee either expressed or implied that the conditions indicated by the Construction Documents or records are representative of the existing field conditions throughout the project area. Investigating the site and determination of the site soil conditions prior to bidding is the sole responsibility of the contractor. Any subsurface investigation by the bidder or contractor must be approved by the City of Santa Ana.

3. Casing and carrier pipe installation shall be performed in a way that will not interfere with, interrupt or endanger roadway surface, median landscaping, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the bore. The contractor shall be responsible for all settlement resulting from boring operations and shall repair and restore damaged property to its original or better condition at no additional cost to the owner.

4. The face of the excavation shall be protected from the collapse of the soil into the pipe or casing.

5. Design of the jacking/receiving pit and required bearing loads to resist jacking forces are the responsibility of the contractor. The excavation method selected shall be compatible with expected ground conditions. The lengths of the bore shown on the contract documents are not representative of required boring. It is the contractors responsibility to develop working drawings detailing the bore and jack process.

6. Contractor shall comply with all manufacturers' specifications and recommendations for the approved products.

A. CASING

Submit manufacturer's mill specification sheet listing diameter, thickness, and class of steel used in making the casing, and the mill certification for Engineer's approval prior to commencement of work.

The Contractor's attention is called to the fact that the casing pipe must be installed such that the carrier pipe grade line matches surrounding proposed water main. Tolerances shall not exceed allowable deflections stipulated in manufacturer's specifications.

Casing pipe shall not be dropped in the trench.

Steel casing shall be ASTM A 283, Grade C, ASTM A 570 Grade 30, 33, and ASTM A-36 unless noted otherwise and have a minimum yield strength of 35,000 psi. The minimum size and thickness of casing pipe shall be per City of Santa Ana Standard Plan No. 1429. Greater casing thickness and diameter may be used as convenient for the method of work and loadings involved, as suitable for the site and as limited by possible interferences, but at no additional cost to the City. The exterior of the pipe shall be coated with coal tar epoxy or bituminous asphalt. Minimum wall thickness shall be as shown on City of Santa Ana Standard Plan No. 1429.

Casing sections shall be joined by full circumference butt welding in the field. Prepare ends of casings for welding by providing 1/4-inch X 45-degree chamfer on outside edges.

B. CARRIER PIPE

The carrier pipe shall be PVC unless otherwise indicated on the plans. All pressure carrier pipe shall have restrained joints inside the casing.

C. GROUT HOLES

Grout holes shall be per City of Santa Ana Standard Plan No. 1429.

D. WELDING OF CASING PIPE

Welding requirements shall be in accordance with ANSI/AWWA C206. Welding procedures shall be required for longitudinal and girth or special welds for pipe cylinders, casing joint welds, reinforcing plates, and grout coupling connections.

Welding shall be done by skilled welders, welding operators, and tackers who have had adequate experience in the type of materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local, approved testing agency not more than 6 months prior to commencing work on the casing or pipeline. Machines and electrodes similar to those used in the Work shall be used in qualification tests. The contractor shall bear the expense of qualifying welders. Welder's certification shall be submitted for approval prior to commencement of work.

E. CASING SPACERS

Casing spacers shall be sized sufficiently to provide a minimum clearance of two (2) inches between outside of carrier pipe bells or couplings and inside of casing. The spacers shall be PSI Model C8G-2 or approved equal and consist of the following components:

1. Spacer Band Material: Minimum 14-gauge steel band of either Type T-304 stainless steel or Carbon steel coated with fusion bonded epoxy or PVC coating.

2. Spacer Liner Material: Ribbed liner of PVC or EPDM rubber designed to overlap the edges of the upper spacer band and prevent slippage. Liner shall have a minimum thickness of 0.090 inches and a hardness of 85-90 durometer "A".

3. Spacer Width: As recommended by the spacer manufacturer for the specific application. Minimum width shall be 8 inches. Manufacturer's approval in writing shall be required for installations exceeding 300 feet in length, carrier pipes in excess of 48 inches in diameter or multiple carrier pipes in casing.

4. Spacers Risers and Runners must be:

   a. Risers must be minimum 10-gauge steel risers of same material and requirements as spacer band. Risers shall be MIG welded to spacer band prior to coating. Risers must be suitable for supporting the weight of the carrier pipe.

   b. Risers shall be manufactured of an abrasion resistant material having a low coefficient of friction (0.1 to 0.6) and designed to support the carrier pipe without damage or excessive wear. Runner material shall be of glass reinforced polyester or nylon and have a minimum compressive strength of 18,000 psi (ASTM D 695).

5. All hardware and fasteners shall be stainless steel.

6. Hardwood skids shall NOT be used in place of manufactured casing spacers.

7. Fill material shall be grout, unless otherwise specified and with the approval of the Engineer.

F. CASING END SEALS

End seals shall be PSI Model C or approved equal and be made of synthetic rubber, conical shape, pull on or wrap-around style with type 304 stainless steel bands.

G. PREPARATION

Confirm location of all known existing utilities prior to start of jacking/receiving pit excavation and pipe installation. The contractor shall provide the detailed layout required to keep the bore on grade. Notify the Engineer no less than (10) working days before beginning shaft excavation. Before beginning construction of jacking/receiving pit, adequately protect existing structures, utilities, trees, shrubs, and other existing facilities. Place fencing, gates, lights, and signs, as necessary around shafts and staging areas to provide for public safety. When preparing to install casing pipe, verify casing pipe minimum wall thickness is adequate for anticipated jacking loads.

H. INSTALLATION

Jacking and receiving pit construction shall be such as to ensure the safety of the work, contractor's employees, the public, existing utilities, and adjacent property and improvements, whether public or private and shall comply with the State of California requirements and Section 306 of the Standard Specifications and these Special Provisions. Provide complete groundwater control for excavations at all times. Perform jacking and receiving pit excavations using appropriate excavation or large hole drilling methods, as required. Inspect shaft and pit excavations daily to check the safety of excavation and structural integrity of support system. Open excavations shall conform to all federal, state, and local requirements. Once initiated jacking operations shall continue without interruption, to prevent the pipe from becoming firmly set in the embankment.

I. LUBRICATION OF EXTERIOR OF PIPE AND/OR CASING

Bentonite slurry may be used to lubricate exterior of pipe and/or casing during installation. Use of water to facilitate removal of spoil is permitted; however, water jetting is not allowed.

J. JACKED AND BORED STEEL CASING

Bore hole diameter shall not exceed outside diameter of casing by more than one (1) inch. When unstable soil conditions are found to exist, conduct boring operations in a manner that will not be detrimental to facility being crossed. Horizontal line tolerance is two (2) inches, maximum. Vertical line tolerance is two (2) inches, maximum. A means of steering the pipe or casing must be provided to ensure allowable tolerances will not be exceeded. The contractor must measure and record progress at all times to confirm that horizontal and vertical lines are within allowable tolerances. For casing: Weld sections of casing pipe together to provide water tight joints by operators qualified in accordance with the American Welding Society Standard Procedures. These welds shall be continuous, complete joint penetration butt joint welds as required for rigid and watertight connections. If the removal of casing is permitted, make proper provisions to prevent caving in of the earth surrounding the casing. If it is necessary to abandon a bore hole, remedial measures shall be taken by the contractor, subject to review by the Engineer. If required grade tolerance has not been achieved, corrections in grade are to be made using casing spacers of varying height per manufacturer's recommendations.

K. MONITORING OF SURFACE MOVEMENT

Perform a pre-construction survey of road surface and landscaped median. Contractor shall record horizontal coordinates and elevations. Document and record the location of field measurements. Monitor movement of road surface and landscaped median on a daily basis and provide results to the Engineer. Stop operations if movement exceeds ¼ inch and immediately notify the Engineer.

L. GROUTING JACKED AND BORED STEEL CASING

Overcutting in excess of one (1) inch shall be remedied by pressure grouting the entire length of the installation. Should appreciable loss of ground occur during jacking or boring operations, contractor shall backpack all voids promptly. Fill all remaining voids upon completion of operations: such filling or backpacking shall be with grout unless otherwise approved.

M. CARRIER PIPE INSTALLATION

Entire length of casing shall be installed complete, inspected, and approved by Engineer before any carrier pipe is placed therein. Repair defects in casing pipe or leakage at joints. Casing spacers shall be installed per manufacturer's recommendations and in such a manner that electrical continuity will not occur between casing pipe and carrier pipe. Check each joint makeup and pipe segment prior to pushing carrier pipe segments into casing. Carrier pipe shall be PVC pipe unless otherwise specified and approved by the Engineer, mechanical joints shall have restraints. Casing end seals shall be provided at the end of the casing pipe after installation of the carrier pipe. Casing end seals shall be installed per manufacturer's recommendations.

N. ANNULAR SPACE

The annular space shall be grout unless otherwise specified and approved by the Engineer.

The annular space shall be completely grouted to support the carrier pipe and provide long time stability. Grout shall consist of Portland cement, fly ash, and/or additives. Mix design shall be approved by the Engineer and conform to Section 201 of the Standard Specifications.

O. REMOVAL OF JACKING AND RECEIVING PIT SUPPORTS

Remove support elements except those required by Engineer to remain in place, from excavation. In addition, remove support elements as needed to install carrier pipe. Removal of support system shall be performed in a manner that will not disturb or harm adjacent construction or facilities. Fill voids created by removal of support system with clean sand, flowable fill, or similar fill material approved by Engineer.

P. BACKFILLING OF JACKING AND RECEIVING PIT

Seal jacking and receiving pit opening and backfill at shafts. Backfill shall be gunite sand, gunite concrete or pressure concrete and the process shall conform to the applicable provisions of Section 306-2.3 of the Standard Specifications, these Special Provisions, as directed by the Engineer and as shown on the Contract Documents.

7.12 TRACE WIRE

Installation of trace wire shall be a continuous single wire, except where using connectors. The trace wire shall be performed and allow for proper access for connection of line tracing equipment, proper wire locating shall be without loss and distortion of signal for distances in excess of 1,000 linear feet. Trace wire shall by-pass around the outside of valves and fittings.

Installation of trace wire shall be in accordance with these special provisions and as detailed on the City of Santa Ana Standard Plan No. 1405.

All trace wire for open trench shall be #12 AWG copper clad steel, high strength, insulated with high molecular weight polyethylene (HMWPE) specifically for use in direct burial applications. The color shall per AWWA standards for potable water.

No looping or coiling of wire is allowed.

Trace wire shall be secured to the top of the pipe at 5-foot intervals or less to ensure that the wire remains (top of pipe) at the same location as the PVC pipe being laid.

A. ACCESS/TERMINATION

Trace wire on all fire hydrants/stubs must terminate on an approved tracer wire access box located directly and next to the hydrant barrel and per City of Santa Ana Standard Plan Nos. 1405 and 1407 for the parkway (if necessary).

Where the anode wire will be connected to the trace wire access box, a 2ft. minimum excess/slack wire is required.

Access boxes shall be installed within a 500ft. radius of each other.

The grounding anode wire shall be connected to the identified terminal on all access boxes

B. CONNECTORS

Direct bury wire connectors shall be specifically manufactured for underground trace wire installation. Connectors shall be dielectric and filled with silicon to seal out moisture and corrosion.

All splices of the wire shall be made securely and covered thoroughly with a Direct Bury Splice Kit, 3M DBY/DBR or approved equal.

All mainline trace wires must be interconnected at intersections and at fire hydrant tees. At tees, the connections and splices shall be accomplished using a direct burial connectors and splice kits with single 3-way lockable connector and or 4-way lockable connector.

Non-locking friction fit, taped and twist on connectors are not allowed.

C. GROUNDING

At all dead-ends, trace wire shall go to ground using an approved connection to a drive- in magnesium grounding anode rod with a minimum of 20ft of #14 red HDPE insulated copper clad steel wire connected to the anode. In occurrences where trace wire is encountered on an existing utility that is being extended or tied into, the new trace wire and the existing wire shall be connected using approved splice connectors.

When grounding the trace wire, the grounding anode shall be installed in a direction 180 degrees opposite to the trace wire. Do not coil excess wire from grounding anode. The grounding anode wire shall be trimmed to an appropriate length before connecting to the trace wire with a mainline to lateral connector.

D. TESTING

The Contractor shall schedule and conduct a conductivity test on completion of the water main installation and prior to placement final pavement.

All trace wire installations shall be located using low frequency line tracing equipment. If the conductivity test fails, the Contractor shall be responsible for making the necessary repairs, including but not limited to excavation, repair and re-test passing results are achieved and satisfactory to the Engineer.

Continuity test in lieu of actual line testing will not be accepted.

Installation, and testing of trace wire shall be included in other items of work and no additional compensation will be allowed.

7.13 RESILIENT WEDGE GATE VALVES

This work shall consist of furnishing and installing gate valves, including risers with valve boxes, and PCC collars where indicated on the plans. All work shall conform to City of Santa Ana Standard Plan No. 1410.

Gate valves shall be of the size and configuration as indicated on the plans and shall be AWWA and UL/FM tested, resilient wedge with operating nuts and non-rising stems, and shall be designed for a minimum working pressure of 150 psi and be tested at 200 psi. Valves shall be bubble-tight at the working pressure. Gate valves shall be Clow, Mueller, Renselear, or approved equivalent. Valves shall have all stainless steel nuts and bolts and shall be manufactured in accordance with AWWA C509 Standards. Valve linings and coatings shall be made in accordance with AWWA C-550.

All valves to fitting connections shall be flanged. Valves for lateral lines shall be bolted directly to main line tee, unless otherwise noted on the plans. Where it is necessary to install a reducer or other type of fitting between the lateral valve and main line, said fitting shall be flanged at both ends.

All valve box frame and covers shall require PCC collars and shall be adjusted to finished grade following paving operations.

Portland cement concrete pavement for gate collars shall conform to Sections, 400, 200, 201, and 302 of the Standard Specifications and these Special Provisions.

PCC used for gate collars construction shall be minimum class 560-A-3250. In addition to these minimum requirements, the concrete shall possess the following characteristics:

- Flexural strength at 28 days: 550 p.s.i. min.
- Flexural strength at 7 days: 430 p.s.i. min.
- Compressive strength at 7 days: 2500 p.s.i. min.

All cement to be used or furnished on this Project shall be Type II low alkaline Portland Cement conforming to ASTM C150.

Prior to the start of construction, the Contractor shall furnish to the Engineer laboratory test data for the particular mix design he will use. The data will include the following:

A. A detailed concrete mix design including the type and amount of cement used; complete gradation and source of the aggregate used; the amount of water used; and any proposed admixtures.

B. Flexural strength test data for the same batch of concrete used in A above showing the compressive strength of the concrete at 3, 7, and 28 days.

Section 302-6.4.4 entitled "Final Finishing" of the Standard Specifications shall be modified as follows:

> Delete all reference to wetted burlap. Final finish of the surface shall be textured by stiff broom process that will produce scoring perpendicular to the centerline of the street, performed at a time and in a manner to produce a hardened surface have a coefficient of friction of not less than 0.38 as determined by California Test 342. Curing to be applied immediately following broom process.

Concrete shall be high early strength concrete, treated in accordance with section 201-1 to obtain (7) day compressive strength in (3) days.

The concrete shall be immediately protected upon its installation and no vehicular traffic will be permitted thereon for the next (3) days

7.14 BUTTERFLY VALVES

Butterfly valves shall conform to the City's Standard Specifications and AWWA C504. Butterfly valves shall be rated at 150 psi working pressure and hydrostatically tested at 200 psi. All valves shall be factory epoxy lined and coated. Epoxy lining shall be 15 mils of keysite 740. All work shall conform to City of Santa Ana Standard Plan No. 1411.

All butterfly valves shall be rubber seated in accordance with ANSI/AWWA C504-87. Valve shafts shall be stainless steel ASTM 276, Type 304. All buried valves shall have operators specifically designed for buried service. These operators shall be lubricated for the life of the valve. Buried valves shall be installed in accordance with City of Santa Ana Standard Plan No. 1411. Butterfly valves shall be Pratt, Mueller, M & H or approved equivalent.

All valve box frame and covers shall require PCC collars and shall be adjusted to finished grade following paving operations.

Portland cement concrete pavement for gate collars shall conform to Sections, 400, 200, 201, and 302 of the Standard Specifications and these Special Provisions.

PCC used for gate collars construction shall be minimum class 560-A-3250. In addition to these minimum requirements, the concrete shall possess the following characteristics:

- Flexural strength at 28 days: 550 p.s.i. min.
- Flexural strength at 7 days: 430 p.s.i. min.
- Compressive strength at 7 days: 2500 p.s.i. min.

All cement to be used or furnished on this Project shall be Type II low alkaline Portland Cement conforming to ASTM C150.

Prior to the start of construction, the Contractor shall furnish to the Engineer laboratory test data for the particular mix design he will use. The data will include the following:

A. A detailed concrete mix design including the type and amount of cement used; complete gradation and source of the aggregate used; the amount of water used; and any proposed admixtures.

B. Flexural strength test data for the same batch of concrete used in A above showing the compressive strength of the concrete at 3, 7, and 28 days.

Section 302-6.4.4 entitled "Final Finishing" of the Standard Specifications shall be modified as follows:

> Delete all reference to wetted burlap. Final finish of the surface shall be textured by stiff broom process that will produce scoring perpendicular to the centerline of the street, performed at a time and in a manner to produce a hardened surface have a coefficient of friction of not less than 0.38 as determined by California Test 342. Curing to be applied immediately following broom process.

Concrete shall be high early strength concrete, treated in accordance with section 201-1 to obtain (7) day compressive strength in (3) days.

The concrete shall be immediately protected upon its installation and no vehicular traffic will be permitted thereon for the next (3) days.

7.15 WATER SERVICE

All work shall conform to City of Santa Ana Standard Plans and meet all AWWA Specifications.

All ductile or cast iron pipe, fittings, valves, and appurtenances buried underground shall be encased or wrapped with 8-mil linear low-density (LLD) polyethylene film. Any existing or connecting pipe and appurtenances that are exposed as a result of this pipe installation shall also be wrapped with polyethylene sheeting.

Service laterals shall be installed in a perpendicular direction to the centerline of the water main.

Removal and replacement of sidewalk, driveway approach as necessary to facilitate water service meter installation, shall be included as part of this work. All work shall conform to City of Santa Ana Standard Nos. 1104, 1112, 1401, and 1402.

The City shall furnish and install the water meter after all other work is complete.

Note: Angle meter stops are not acceptable. The connection to the meter coupling shall be a curb stop with locking wing nut as noted on the Standard Plans.

For all water service relocations and installations, Contractor shall notify residents a minimum of 48- hours prior to any interruption in service. Every effort shall be made to minimize the inconvenience to the customer. Contractor shall coordinate these activities with the City of Santa Ana Water Resources Division a minimum of four (5) working days prior to beginning work on services. When necessary, such work shall be performed after-hours or on weekends as directed by the Engineer. In no case shall any property be without service for more than four (4) hours. In special circumstances, emergencies, or when directed by the Engineer, Contractor shall provide temporary service lines to prevent any interruption in service. All piping and associated equipment used in temporary service connections shall be flushed and disinfected. All hoses shall be NSF approved.

All fittings and appurtenances for water service and fire lines shall conform to AWWA Standard C800 “Underground Service Line Valves and Fittings” and the California Health and Safety Code 116875.

A. 1” & 2” NEW WATER SERVICE CONSTRUCTION

This work shall consist of constructing a complete new water service where indicated on the plans, and shall include service saddle, corporation stop, curb stop, copper tubing, meter box, and appurtenances all in accordance with City of Santa Ana Standard Plan Nos. 1401 and 1402.

B. 3", 4", AND 6" WATER SERVICE CONSTRUCTION

This work shall consist of constructing a complete new water service of the size and type indicated on the plans. All work shall conform to City of Santa Ana Standard Plan No. 1403A, B, or C as applicable. The contractor shall furnish and install the water meter, as well as all valves, piping fittings and appurtenances, including meter vault for the complete installation of these services. The meter vault for these services shall be constructed in accordance with City of Santa Ana Standard Plan No. 1403D.

C. 3" AND GREATER RELOCATION OF WATER SERVICES

Relocation of these facilities may be accomplished by installing new portions of pipe as necessary to complete the relocation and connecting back to the existing service line. Pipe may be either ductile iron or PVC C-900.

If relocation requires an increase in depth or horizontal realignment of the pipe, 45˚ Bends shall be used to re-route the pipe.

Thrust blocks shall be required in accordance with City of Santa Ana Standard Plan Nos. 1403A, 1403B, 1403C, and 1412. All pipe trenches shall have 6" minimum of sand bedding beneath the pipe and sand backfill over the pipe compacted to 90% relative compaction.

7.16 FIRE LINE SERVICES

This work shall consist of constructing a complete new fire service of the size and type indicated on the plans. All work shall conform to City of Santa Ana Standard Plan No. 1417. The contractor shall furnish and install the water meter, as well as all valves, piping fittings and appurtenances, including meter vault for the complete installation of these services.

The meter vault for these services shall be constructed in accordance with City of Santa Ana Standard Plan No. 1403D.

A. RELOCATION OF FIRE LINES

Relocation of these facilities may be accomplished by installing new portions of pipe as necessary to complete the relocation and connecting back to the existing service line. Pipe may be either ductile iron or PVC C-900.

All ductile or cast iron pipe, fittings, valves, and appurtenances buried underground shall be encased or wrapped with 8-mil linear low-density (LLD) polyethylene film. Any existing or connecting pipe and appurtenances that are exposed as a result of this pipe installation shall also be wrapped with polyethylene sheeting.

If relocation requires an increase in depth or horizontal realignment of the pipe, 45˚ Bends shall be used to re-route the pipe.

Thrust blocks shall be required in accordance with City of Santa Ana Standard Plan Nos. 1403A, 1403B, 1403C, and 1412. All pipe trenches shall have 6" minimum of sand bedding beneath the pipe and sand backfill over the pipe compacted to 90% relative compaction.

Relocation of fire line construction shall be included in other items of work. No additional compensation will be allowed.

7.17 FIRE HYDRANT ASSEMBLY

This work shall consist of furnishing and installing fire hydrants and bury assemblies (including spools if required) in the locations indicated on the plans. **Hydrant lateral pipe, gate valves and appurtenances are included as part of this work.**

Fire Hydrant assembly shall be installed in accordance with AWWA C502, City of Santa Ana Standard Plan Nos. 1405 & 1408 (if applicable), and these provisions.

Hydrants shall be either Clow, Model Medallion; Kennedy Guardian, Model K81D; or Mueller Super Centurion 250. Contractor shall install drain valve plugs on fire hydrant assembly per City of Santa Ana Standard Plan No. 1405.

The contractor shall install trace wire in accordance with and per Section 7.12, Trace Wire, of these special provisions and City Standard Plan No. 1405.

All hydrant exposed metal exterior coatings shall be in conformance with City of Santa Ana Standard Plan No. 1405, and these special provisions.

Fire Hydrant Coating (exposed exterior above ground)

- Type- Gloss synthetic enamel OSHA white
- Prime Coat: Apply a one coat, 4-mil
- Finish Coat: Apply two coats of (OSHA White), 6-mil for each coat

Each coat shall be applied evenly and with the use of mechanical devices. Allow sufficient time between successive coats. The use of rollers and brushes is not allowed.

All ductile or cast iron pipe, fittings, valves, and appurtenances buried underground shall be encased or wrapped with 8-mil linear low-density (LLD) polyethylene film. Any existing or connecting pipe and appurtenances that are exposed as a result of this pipe installation shall also be wrapped with polyethylene sheeting.

Where necessary, Contractor shall saw-cut, remove and replace sidewalk to facilitate hydrant installation. Sidewalk shall be replaced per City of Santa Ana Standard Plan No. 1104.

All removed/abandoned fire hydrants and related components shall be transported by the Contractor to the City Corporate Yard (120 S. Center Street, Santa Ana, CA 92703). It is the Contractor's responsibility to coordinate this task with the Engineer prior to delivery

of the hydrants. Proper care and protection of the salvaged fire hydrant and related components is required (dumping or dropping of hydrants will not be allowed). If damage to any salvaged fire hydrant is caused by Contractor negligence, a charge of $1,000 per damaged hydrant will be applied and withheld from any pending payments.

7.18 HOT TAP CONNECTION

This section consists and describes materials, requirements and procedures for hot tap (system under pressure) connections to existing distribution system.

All approved manufactures and materials shall comply with City Standard No.1408, the engineering plans and these special provisions.

Tapping sleeves shall be epoxy coated fabricated steel with stainless steel nuts and bolts. The tapping sleeve shall be installed in accordance with manufacturer's instructions and to the satisfaction of the Water Engineer. The pipe barrel shall be thoroughly cleaned with a wire brush to provide a smooth, hard surface for the sleeve. The sleeve shall be supported independently of the pipe during the hot tap operation and shall be pressure tested prior to the hot tap in the presence of the Water Engineer. Thrust blocks shall be provided at the tapping location per City of Santa Ana Standard Plan No. 1412.

The tapping valve shall be a resilient wedge as described on the City of Santa Ana Standard Plan No. 1408.

The hot tap into the existing pipe shall be made using the appropriate type of cutting machine and shell cutting bit for material being tapped. Tapping machine must be operated per manufacturer's instructions. Proper care shall be taken to prevent cutting material from entering the pipeline and the tapping coupon must be extracted.

Concrete cylinder hot tapping shall be made by International Flow Technologies, Inc. (IFT), KOPPL Pipeline Services, Inc. all others shall be approved by the Engineer prior to commencement of work.

The interior of the tapping valve and connecting piping shall be sprayed with a sodium hypochlorite solution prior to connection.

All nuts and bolts shall be stainless steel and shall have mastic such as 3M EC244, or Koppers Bitumastic 505 applied to the threads prior to installation and reapplied prior to wrapping.

All ductile or cast iron pipe, fittings, valves, and appurtenances buried underground shall be encased or wrapped with 8-mil linear low-density (LLD) polyethylene film. Any existing or connecting pipe and appurtenances that are exposed as a result of this pipe installation shall also be wrapped with polyethylene sheeting.

All tapping sleeves must be a minimum of 24" from the nearest joint or service.

7.19 COMBINATION AIR VALVES (AS NEEDED)

This item is to be used on an "as needed" basis and only with the prior approval of the Engineer.

This work shall consist of furnishing and installing air and vacuum release valve assemblies per City of Santa Ana Standard Plan No. 1415. All work shall be in conformance with AWWA C512 and these special provisions.

Main line taps and copper pipe line runs for 1" air and vacuum release valves shall be constructed per the applicable provisions pertaining to water services and fire lines of these Special Provisions.

Air and vacuum release valves shall be field located by the Engineer or as noted on the construction plans.

7.20 VERTICAL OFFSET (AS NEEDED)

This item is to be used on an "as needed" basis and only with the prior approval of the Engineer.

This work shall consist of furnishing and installing a vertical offset per City of Santa Ana Standard Plan No. 1413B. All work shall conform to applicable AWWA standards as necessary.

7.21 DISINFECTION AND FLUSHING PLAN

All disinfection and flushing tasks shall be completed per AWWA C651 and these special provisions.

Prior to start of construction, the Contractor shall submit to the City for review and approval a water line "Disinfection and Flushing Plan" prepared by a D3 or T3 Operator Certified with California Department Health Services, or a Registered Civil Engineer practicing in the field of water resources, indicating the following as a minimum:

- Phasing of disinfection and flushing
- Source of flushing water
- Type and configuration of connection required to introduce flushing water into the propose water main
- Method of disposal of flushed water
- Total number and locations of sampling points
- Types of testing to be performed
    - Acceptable Bacteriological:
        - Total Coliform = Negative
        - Fecal Coliform = Negative
        - Heterotrophic Plate Count Less than 150 CFU per 1 ml
        - Chlorine Residual: Free or Total

- Company performing sampling and testing

Discharge from flushing of pipelines shall be routed to the sanitary sewer system.

Disinfection and Flushing shall be performed under the supervision of a D3 or T3 Certified Operator and or a Registered Civil Engineer practicing in the field of water resources.

7.22 WATER MAIN TIE-INS, SHUTDOWN, AND ABANDONMENT

The following is the procedure for water main shut down to facilitate tie-ins or abandonment of existing mains:

1. Contractor to pot hole and expose existing connection.
2. Engineer to verify existing conditions. Excavation shall be plated, not backfilled.
3. Prior to any shutdown of existing water system, the Contractor shall have all necessary fittings and equipment on site to complete the water main tie-in or abandonment.
4. Shut down shall be scheduled within the allowable working hours.

Contractor shall notify residents and businesses 48- hours in advance of shutdown. Water shall not be shut off outside of times listed above except in an emergency.

All work necessary to shutdown an existing public water main shall be coordinated by the Water Resources Division. Under no circumstances shall the Contractor operate valves, hydrants, and other appurtenant equipment on the existing public water system. It shall be the Contractor's responsibility to coordinate the necessary shutdown schedules through the Construction Inspector assigned to the project. Scheduled shutdowns shall require sufficient time to allow water maintenance personnel to review, approve, and develop an appropriate Operation Program. Contractor shall coordinate shut down activities with the City of Santa Ana Water Resources Division a minimum of four (5) working days prior to any water main shutdown. The Contractor shall be responsible for maintaining all schedules current and coordinating all deviations, which may occur from time to time with the Construction Inspector. When necessary, such work shall be performed after-hours or on weekends as directed by the Engineer.

The City will make a concerted effort to isolate the system as planned with the Contractor. However, due to the age of the pipe and valves the Contractor should not expect an absolute shutdown and shall be prepared to employ pumping equipment in the event that an absolute shutdown cannot be achieved. The Engineer shall judge the shutdown to be adequate for the tie-in to proceed as indicated on the plans and specified here in. The City will not be responsible for any delays due to system shutdown and isolation when an adequate shutdown can be achieved and no additional compensation will be allowed.

When an extensive water main shutdown is required and cannot be achieved adequately, the Water Resources Division will determine what temporary service connections may be required. The Contractor shall furnish all necessary appurtenances (i.e. hose, piping, valves, and water trucks) and associated labor required to provide such temporary service. All piping and associated equipment used in temporary service connections shall be flushed and disinfected. All hoses shall be NSF approved.

Water main and services abandonment shall be per the engineering plans and these Special Provisions. Any deviations shall require prior approval by the Engineer.

Payment for constructing water main tie-ins, shutdown and abandonment shall be included in the unit price bid for other items of work and no additional compensation will be allowed therefore.

7.23 SUBMITTALS

Water main pipe and appurtenance submittals shall include, but not be limited to the following manufacturer information:

1. C900 PVC pipe, Ductile Iron pipe and or other as approved by the Engineer
2. Gate Valves
3. Fittings and Bends
4. Air Vacuum and release Valves
5. Valve Box Frames and Covers
6. Polyethylene Sheeting
7. Trace Wire and Appurtenances
8. Ductile Iron Spools
9. Steel Casing
10. Polyethylene casing insulators
11. Blind Flanges
12. Mechanical Joint Caps
13. Disinfection and Flushing Plan

Fire Hydrant submittals shall be in conformance with City of Santa Ana Standard Plan Nos. 1405, 1407, 1407A, and 1408 (if applicable), and shall include, but not be limited to, manufacturer information from the following:

1. Fire Hydrant Assembly
2. Drain Valve Plugs

Water Service submittals shall be in conformance with all City of Santa Ana Standard Plans for Water Services and shall include, but not be limited to, manufacturer information from the following:

1. Service Saddles
2. Corporation stops
3. Copper tubing
4. Polymer meter box with lid

5. Meter coupling
6. Flanged coupling
7. Bronze elbows
8. Brass elbows
9. Brass nipples
10. Brass plugs
11. Curb stop
12. Compression bend
13. Jumpers (if planned for use)
14. Suction Strainer
15. Pre-cast Concrete Service Vault Box and cover
16. Adaptors/Coupling Gaskets

Jack and bore equipment, appurtenance, and process submittals shall include, but not be limited to the following manufacturer information:

1. Casing pipe and carrier pipe material including the standard to which it is manufactured, outside diameter, wall thickness, joint configuration, and certificate of compliance certifying that the pipe meets these specifications.
2. Details of casing spacers, including manufacturer's recommended spacing.
3. Details of end seals for casing.
4. Working drawings of jacking pit and receiving pit
5. Details of jacking pit bracing, casing, jacking head, concrete support blocks, bracing to prevent pipe shifting or floatation.
6. Concrete mix design. Concrete placement method and equipment.
7. As-built drawings to include both alignment and profile. Drawings should be constructed from actual field measurements. Raw data shall be submitted as part of the As-built document. Contractor shall stipulate the tracking method to ensure the data was captured.
8. Adaptors/Couplings/Gaskets

8.00 SPECIAL PROVISIONS - STORM DRAIN CONSTRUCTION

8.01 CONCRETE STRUCTURES

Concrete structures shall conform to Subsection 303-1 of the Standard Specifications and these Special Provisions.

Once any excavation for the construction of structures is commenced the Contractor must diligently pursue the completion of the structure, including structure backfill, compaction and restoration of surface improvements and temporary or finish paving. Open excavations shall be properly barricaded per traffic control plans, or backfilled or covered with steel traffic plates to prevent the entrance of pedestrian or vehicular traffic at the end of each workday.

When it is necessary to increase or decrease the depth of junction structure or the V-depth of a catch basin by one foot or less, no increase or decrease in the unit price bid for such structure will be made. Where such increase or decrease is greater than one foot, the increase or decrease in unit price paid shall be established in accordance with Subsection 3-3 of the Standard Specifications.

The unit price for each catch basin includes constructing local depression, temporary resurfacing and removing existing curb and gutter, and sidewalk.

8.02 MASONRY CONSTRUCTION

Masonry construction shall conform to Subsection 303-4 of the Standard Specifications and these Special Provisions.

Payment for brick and mortar bulkheads for junction structures and pipes shall be included in the price paid for other items of work involved and no separate payment shall be made therefore.

8.03 OPEN TRENCH OPERATIONS

This section shall conform to Subsection 306-1 of the Standard Specifications and these Special Provisions.

When the actual elevation or portion of any existing pipe, conduit or other underground appurtenances cannot be determined without excavation, the Contractor shall excavate and expose the existing improvement (pothole) at the location shown on the Plans and any other locations deemed necessary by the Engineer. The pothole shall be done at least 2 weeks in advance of the pipe installation to identify any potential conflicts so that the necessary adjustments can be made.

The first sentence of the first paragraph of Subsection 306-1.1.2 of the Standard Specifications is hereby deleted and replaced with the following:

> Except by permission of the Engineer, the maximum length of open trench where prefabricated pipe is used shall be the distance necessary to accommodate the amount of pipe installed in a single day. All trenches shall be backfilled or covered with steel traffic plates at the end of each working day.

If, in the opinion of the Engineer, the trench subgrade is wet, contaminated or contains unsuitable material due to no fault of the Contractor, the Contractor shall over excavate to a depth determined by the Engineer and place aggregate base as directed by the Engineer. Payment shall be made in accordance with Sub-Section 3-3 of the Standard Specifications.

The last two paragraphs of Subsection 306-1.1.3 of the Standard Specifications are hereby deleted.

The seventh and eighth paragraphs of Subsection 306-1.3.1 of the Standard Specifications are hereby deleted and replaced with the following:

> Rocks greater than 4 inches in any dimension will not be permitted in backfill placed between 1 foot above the top of any pipe or cast- in-place structure box and 1 foot below pavement subgrade.

Installation of storm drain pipe shall be according to Sub-Section 306-1.2 and City of Santa Ana Standard Plan No. 1150C.

Subsection 306-1.3.3 is hereby deleted and replaced with the following:

Compaction of backfill by flooding or jetting will not be allowed.

The second, fourth and fifth paragraphs of Subsection 306-1.5.1 of the Standard Specifications are hereby deleted and replaced with the following:

> Payment for all materials used by the Contractor or ordered to be placed by the Engineer, including that used to maintain the temporary resurfacing until the permanent resurfacing is placed, will be considered to be included in the other items of work.

The text of Subsection 306-1.6 of the Standard Specifications is hereby deleted and replaced with the following:

> Pipe and conduit shall be measured along the longitudinal axis between the ends as laid and shall include the actual pipe in place and shall not include the inside dimensions of structures. Catch basin lateral shall be measured from the inside to the inside face of conduit or structure to which connection is being made.

A copy of core logs for ……. is shown in Appendix X. The cores are provided for reference purposes only and are not part of the contract documents. The Agency will not be held responsible for existing conditions that differ from the core logs. It is the Contractor's option to take his own core samples to verify the existing conditions.

The price per linear foot for pipe and conduit in place shall be considered full compensation for all materials, labor, equipment, tools and incidentals for doing all the work including the removal of interfering portions of existing storm drains and improvements; the closing or removing of abandoned conduit and structures; the excavations of the trench including bituminous pavement; the control of ground and surface waters; the preparation of subgrade; potholing; placing and joining pipe; bedding and backfill; temporary resurfacing; deep lift asphalt concrete pavement for permanent resurfacing; clean up; providing as-built plans and all other work necessary to install the pipe or conduit, complete in place and no additional compensation will be allowed therefore.

8.04 T.V. INSPECTION

For storm drain pipes 36" diameter and smaller, T.V. inspection shall be performed on the newly constructed pipes.

The scope of work includes the recording images, Digital Versatile Disc (DVD) format, all connections and lateral locations by footage or stationing, and providing the AGENCY with a hard copy of the findings. Contractor's proposed log format shall be approved by the Engineer.

During inspection, the operating technician shall provide, in addition to his/her image recording (with audio), record of conditions, log in writing the location of all defects, misalignments, and other conditions and data pertinent to the physical condition and operation of the storm drain. Conditions, defects and laterals shall be located by footage counter.

At all points within the storm drain where defects are shown, the Contractor shall stop the camera, rotate (up to 360°), and/or tilt the camera lens to ensure adequate video coverage.

The camera shall be stopped and/or backed up to view and analyze conditions that appear unusual or uncommon to a storm drain in good condition. There shall be no loss of video quality at any time.

The contract unit price per linear foot for T.V. inspection shall be considered full compensation for doing all appurtenance work, including furnishing all materials, labor, equipment, tools, traffic control and incidentals to accomplish the work, and no additional compensation will be allowed therefore.

8.05 REINFORCED CONCRETE BOX STORM DRAIN

Cast-in-place concrete shall conform to the provisions of Section 201 and Section 303-1 of the Standard Specifications and these Special Provisions.

PCC for the concrete box shall be Class 565-C-3250P.

Testing of the concrete shall be done in accordance with Section 201-1.1.4 of the Standard Specifications. The result of any testing that does not meet the requirements shall be the rejection of the structure by the AGENCY, and the structure shall be reconstructed by the Contractor at no cost to the AGENCY.

Reinforced concrete box conduit and bedding shall be constructed in accordance with referenced Standard Plans and the plans. The unit price per linear foot for box conduit in place shall be include full compensation for furnishing all materials, labor, equipment, tools and incidentals for the concrete, reinforcing steel, shop drawings, providing as-built plans, excavation of the trench, including bituminous pavement, the control and removal of ground and surface waters, the preparation of subgrade, bedding, structural backfill, form work, shoring, potholing, temporary resurfacing, deep lift asphalt concrete pavement for permanent resurfacing, clean-up and all other works necessary to construct the conduit, complete in place and no additional compensation will be allowed therefore.

8.06 DEWATERING

The Contractor shall provide and maintain at all times during construction ample means and devices with which to promptly remove and properly dispose of all water from any source entering the excavations or other parts of the work. Dewatering shall be accomplished by methods, which will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. The methods may include sump pumps, deep wells, well points, suitable rock or gravel placed below the required bedding for draining and pumping purposes, temporary pipelines, and other means. The Contractor shall protect all trench work, storm drain construction and sub-surface structures from rain damage and surface runoff.

The Contractor shall dispose of the water from the work in a suitable manner without damage to adjacent property.

Conveyance of the water shall be such as to not interfere with traffic flow or treatment facility operations. No water shall be drained into work complete or under construction without prior consent of the Engineer.

Payment for complying with all provisions of this section shall be considered to be included in the various items of work involved and no additional compensation will be allowed therefore.

9.00 SPECIAL PROVISIONS - ELECTRICAL SYSTEM

9.01 SCOPE OF WORK

The following is a brief list of the electrical work to this Contract for the installation of equipment as listed below. The work shall be complete as described in the specifications and shown on the drawings, and shall result in a complete operating electrical system for the purpose intended.

Furnish and install all material, labor, and equipment necessary for complete, operating systems, except as noted complete and detailed list of work and materials to be supplied, but shall be used as a guide:

- Distribution and control equipment.
- Underground distribution conduit, cable and pull boxes.
- Pole foundations and concrete work.
- Poles.
- Branch circuit panels.
- Branch circuit wiring and miscellaneous work.
- Light fixture and lamps.
- Spare parts.
- Shop drawings, material submittals, and work schedule.
- Record drawings, material submittals, and work schedule
- Record drawings and guarantees.
- Excavation for pole foundations.
- Excavation, backfill and compaction for trenches and pullboxes.
- Disposal of excess earth.
- Approved shoring, lights, and barricades.
- Bore under existing walks, walls, and pavement.
- Sod all trenches, and repair all damage to existing facilities caused by this work.
- Apply for and obtain all necessary permits, building department inspections, and service connections.
- Temporary power and associated fees and charges will be obtained and paid for r by the Contractor; Fees and hookup charges for permanent power will be paid by the City.

9.02 SCHEDULE OF WORK

The Contractor shall schedule his work and shall coordinate with the City and all other contracts in progress on the site at all times. Necessary coordination will be specified during the construction conference.

Contractor shall submit a complete work schedule at the pre-construction conference.

9.03 INSPECTIONS

At the time of electrical inspections, the Contractor shall make available a complete set of working drawings showing progress to date and detail variations from the plans. All variations must have prior approval of the Engineer.

9.04 MATERIALS AND WORKMANSHIP

Materials and workmanship, unless indicated or specified otherwise, shall be in strict conformity with standards of the latest editions including revisions of the Electrical Code of the County, National Electric Code (2010) of the National Board of Fire Underwriters, CAL/OSHA, Electrical Safety Orders, and the Standards of the National Electrical Manufacturers Association. Nothing in these plans or specifications shall be construed to permit work bellow the standards of these ordinances and those of OSHA. After acceptance of the contract, all work found which does not conform or comply with the applicable code shall be brought into conformance at no cost to the Agency.

9.05 PROPOSED SUBSTITUTIONS AND "OR EQUAL"

Equipment and wiring shown on the Plans is for materials as specified. Should equipment of other manufacturers be approved for use, the Contractor shall make all changes in other equipment, conduit, wiring, or location of equipment that may be required due to design or space allotment, as approved by the Engineer, without charge to the Agency.

It is the Contractor's responsibility to show that all products proposed for substitution are equal to the specified item by submitting sufficient information to permit a comparative check. The term "equal" shall mean that the product or material offered shall have equivalent or more value to the Agency based on the value of the item set forth in the specifications or on the Plans, and then only after the Contractor's written submittal has been approved in writing. If, after installation, substituted equipment is found to be not equal to that specified, that equipment shall be replaced with approved item(s) at no cost to the Agency.

9.06 DRAWINGS PERFORMANCE

All scale dimensions are approximate. Before proceeding with any work, the Contractor shall check and verify all locations and dimensions of equipment at the site of work.

All work specified, but not clearly defined by the drawings, must be installed as directed by the Engineer in a manner satisfactory to him. Work covered by notes on drawings must be furnished and installed, whether or not it is specifically mentioned in these specifications.

The contract Drawings indicated the extent and general arrangement of the new existing equipment, conduit and wiring systems, and essentially diagrammatic. The drawings indicate the required sizes and points of termination of conduits and wires and routes to to avoid obstructions and provided clearance; necessary offsets, etc., and t shall be the

responsibility of the contractor to install all of his work to specific conditions found the site.

All changes from the drawings necessary to make the work conform to existing structures or substructures, or to fit the work of other trades, or to conform to laws and ordinances; of equipment, etc., prior to the installation, shall be made at no additional expense to the Agency.

9.07 SUBMITTALS, SHOP DRAWINGS, AND RECORD DRAWINGS

A. MATERIAL LIST

Five copies of a complete materials list with brochures showing all equipment indexed with job title, date, etc., shall be submitted to the Engineer after the award of the contract. Submitting a catalog number and manufacturer's name, and stating that the material or item to be furnished will meet the specifications will not be acceptable.

List the following items by make and number in the submittal: Underground conduit, rigid galvanized steel conduit, cable, wire, pull boxes, main switchboard, poles, fixtures, lamps, control equipment, panels, outlets, boxes, etc.

B. POLE SHOP DRAWINGS

Submit 6 copies with structural calculations prepared by a registered structural engineer.

C. MAIN METERING AND DISTRIBUTION SWITCHBOARD AND CONTROL SECTION

Submit 6 sets of shop drawings for approval.

D. RECORD DRAWINGS ("AS-BUILTS")

Record drawings shall be prepared by the Contractor and maintained in the field. All changes in the work shall be recorded daily, accurately, on a set of blue line prints.

The location of all underground conduits and stub-outs shall also be shown, fully dimension to two points of architectural reference such as buildings, walks, walls, curbs, paving monuments, etc., record junction and pull boxes not shown on the drawings.

Upon completion of each increment of the work, immediately transfer all such record information to the prints. All changes and dimensions shall be recorded legibly with a red ballpoint pen to the satisfaction of the Engineer. Data shall be recorded daily and shall be subject to inspection at all times.

Upon completion of the work and final inspections, one mylar and two blueprints of the record (As-Built) information shall be delivered to the Engineer. The Engineer's approval of record drawings is a condition of approval of final payment.

9.08 COVERING OF UNINSPECTED WORK-NOTIFICATIONS FOR INSPECTIONS

The Contractor shall notify Engineer 48 hours (two working days) prior to required inspections. No work shall be covered prior to inspections.

9.09 CLEANING EQUIPMENT AND MATERIALS

The Contractor shall thoroughly clean all fixtures, exposed piping, apparatus and equipment installed under its Contract. Parts which are to be painted shall be thoroughly cleaned of cement, plaster, etc., brushed with steel brush to remove rust, etc. cleaned and painted.

All dirt, rubbish, paint spots, or grease on walls, walks, poles, equipment, or fixtures, for which the Contractor is responsible, shall be removed by the Contractor and the premises left in first-class condition.

All rubbish resulting from work shall be cleaned up and removed daily from the site by the Contractor; also from time to time during construction, and when so directed by the Engineer.

9.10 TESTS

This Contractor shall make all tests required by the Engineer, the Electrical Inspection Department of the Agency, or other authorities having jurisdiction.

The cost of all tests, repairing of all damage resulting from these tests, replacement of equipment and materials including labor and other necessary work, due to nonconformance with the Electrical Ordinances, Safety Orders, these specifications and accompanying drawings, shall be borne by the Contractor.

Should the Contractor refuse or neglect to make any tests necessary to satisfy the Engineer that the work has been performed in accordance with the true intent and meaning of the contract documents, the Agency may make such tests and charge the expense to the Contractor, and retain the cost of testing from the final payment to the Contractor.

All wiring and connections shall be tested for continuity, grounds and short circuits before the devices and equipment are connected. Upon completion of the work, the Contractor shall demonstrate to the Engineer the satisfactory operation of the entire electrical systems(s). At the time of the final inspection, the Contractor shall have a qualified electrician at the job site to make all required tests or demonstrate operation of electrical equipment and lighting system(s).

9.11 PROTECTION OF EXISTING SITE IMPROVEMENTS

Restore disturbed turf areas, irrigation systems, concrete, etc. Repair damaged park equipment and turf caused by the Contractor to new condition, including backfill and sodding of trench surface to the Engineer's satisfaction.

9.12 GUARANTEE

The Contractor shall guarantee all work under this Contract to be free from defects in material and workmanship for a period of one (1) year from the date of acceptance of the work for filing of the Notice of Completion.

The Contractor shall repair or otherwise make good at its own expense all defects developed during the guarantee period. The Agency may notify the Contractor by the telephone or in wiring, and all the guarantee work shall be performed within 48 hours after receiving notice from the Agency.

The Contractor's general guarantee shall be on their letterhead, and shall include the foregoing provisions and emergency telephone numbers. Together with the required manufacturer's guarantees, the Contractor's guarantee shall be bound and furnished to the Engineer in at least three (3) copies. Lamps shall be guaranteed as follows:

Lamps – 5,000 hours.
Ballasts shall be guaranteed for a minimum of one year.

9.13 MATERIALS

A. GENERAL

All materials and equipment shall be new and bear the label of or be listed by the Underwriter's Laboratories or the National Fire Protection Association, where applicable. All materials shall be the standard products of manufacturers regularly engaged in the production of such material and shall be the latest improve design. All materials of the same type of one system shall be supplied by the same manufacturer.

In no case shall conduits, wires, etc. be smaller in size or less in number than that shown on plans or called for in these specifications, even though codes may accept otherwise.

Exposed conduit shall be hot dipped galvanized rigid steel conduit. All ells shall be factory made rigid galvanized steel conduit. No PVC ells shall be used unless noted on drawings. All ells 45 degrees and larger shall be sweep bends. All rigid steel conduits exposed to earth 12" above finished grade shall be wrapped with 20 mil PVC tape. Scotchrap No. 40 (green) or equal. PVC conduits shall be U.L. listed Schedule 40 with properly cemented fittings. All underground shall be the PVC Schedule 40. PVC conduit shall contain a green grounding conductor. All stub ups into switchboard shall be green grounding conductor. All stub ups into switchboards

shall be rigid galvanized steel conduit with ground bushing properly grounded. All stud outs shall be equipped with non-cemented approved PVC pipe caps.

B. BUSHINGS, LOCKNUTS, AND CONDUIT FITTINGS

Boxes, bushings, locknuts and similar devices shall be galvanized cast steel or cast iron, malleable iron, or galvanized steel. Aluminum die case or pot metal fittings or boxes are not approved. Conduit fiber lined bushings are required to be used with locknuts at cabinets, switchboards, housing and pull boxes, etc. All conduit with cable shall be sealed at each end. Grounding bushings shall be provided on underground rigid conduits.

C. WIRE AND CABLE

Branch conduit wire shall be copper type THW-75 degrees or THHN/THWN in conduit and light poles, as manufactured by General Electric, Paranite, General, Circle, Cirro or Anaconda, 600 v. Ground wire shall be color coded for each let. Neutral shall be white THW or THWN. Identify cable by circuit number in each pull box by W.P. Tag. No. 6 and larger cable shall be THW-75 degrees stranded copper. Approved manufacturers: General Electric, Paranite, Okonite, Anaconda, General. Cable underground shall be color coded by phase. Stranded wire shall be used in poles from pull boxes to fixtures. Provide manufactured cable grips in poles to support cables.

D. PULL BOXES

Pull boxes shall be as specified on plans.

When precast concrete pull boxes are used, covers shall be cast iron, bolted down with tamperproof screws, and marked “Electrical”.

E. TIME CONTROL CLOCKS

Time control clocks shall be 120v or 208v with 2 or 4 channels required on the drawings and in these specifications. The clock shall be solid state digital type with battery backup. Set clock for proper day, month and hour and set trip elements as directed by the City. Clocks shall be Paragon #EC72ST or equal. Clocks shall be in NEMA 1 housing.

F. SWITCHES AND RECEPTACLES

Receptacles shall be a 20A ground duplex in switchboard and mounted separate from the panel front. Receptacle shall be equal to A-H Specification Grade #5262-1 with stainless steel plate.

Receptacles for special housing and plates shall be as noted on drawings and shall be A-H Safety Receptacle 6352-1.

Switches shall be 20A-AC. Specification grade equal to AH-1991-1. Provide stainless steel cover in switchboard. Mount switch separate from panel front.

Hand-off auto switches shall be SPDT and be heavy duty oil light with contacts open in center position and one pair closed in left position and other pair closed in rigid position. Switches shall be equal to Square D Class 9001-Type T and K. Provide legend plate and nameplate.

G. PANEL BOARDS

Branch circuit panelboards shall be of the dead front safety type equipped with thermal magnetic bolt-on Type 40 degrees C circuit breakers. Bus shall be copper. Circuit breakers shall be rated for interrupting capacity as noted on the drawings or as required and shall be the number of poles and current capacity as indicated on the panel schedule. Branch circuit panelboards shall be Square "“"”or approved equal with separate isolated ground bus, Type NQO or NEHB. All breakers shall be lockable in “OFF” position. Trims shall have doors equipped with flush type combination lock and catch, two milled type keys supplied with each panel. All locks shall be alike and each door shall have a plastic covered directory frame with a typed identification card of all circuit and panel numbers for branch circuit panelboards and engraved lamicoid nameplates for power distribution panelboards.

Provide nameplates for all panelboards, 1/8” thick, micarta or phenolic plate of approved size, with beveled edges and engraved white letters on black background and laced together. Wireways shall be 4” sides and 5-3/4” top and bottom.

All circuit breakers shall conform to Federal Specifications W-C-375, Class 2b or 2c for 120/240 volt and shall be provided with a device for locking circuit breaker in “OFF” position.

H. CONTACTORS AND RELAYS

Contactors shall be designed for 600 volts AC mechanically or electrically held as noted and be rated for tungsten, mercury arc or other reactive lighting loads and shall be equal to Square D-Type M. Clas 8903 in NEMA 1 housing.

Electrically held coil voltage as noted.

Relays shall be 120-v AC coil, 10 amp contacts housed in NEMA 1 housing. Relays shall be of the latching where noted. Relays shall be equal to Square D Class.

I. LIGHT FIXTURES

Light fixtures shall be as noted on plans.

J. LAMPS

Provide each lighting fixture furnished under this contract with lamps as indicated. Sylvania, G.E., Westinghouse, or approved equal.

9.14 EXECUTION

A. GENERAL

All materials and equipment shall be installed din a secure, neat and workmanlike manner by competent workmen, and any item not so installed shall be corrected to meet the complete approval of the Agency. If, at any time, the Contractor believes that he cannot secure proper results through use of the materials and procedure specified, he shall immediately notify the Engineer and the Agency in writing setting forth his reasons.

The Contractor assumes all responsibility for materials, storage, damage to equipment and safety for all personnel and the public, until final acceptance by the Agency. Sensitive electrical equipment should not be installed until major construction work is completed. During and after installation, equipment shall be protected from damage by water, dust, paint, wet concrete, plaster, etc. Adequate barricades and lighting shall be provided for all open trenches and excavations.

B. TRENCHING AND CONDUIT WORK

Trenching shall be coordinated with the existing irrigation system and underground utilities on site.

All irrigation lines damaged using prosecution of the work of the work shall be repaired in compliance with the standards in Section 212 and 308 of the Standard Specifications.

Provide plastic marking tape continuously in trench at 12 inches below grade.

PVC conduit shall be 24 inches below grade. Backfill shall be placed in 6 inch layer, hand or mechanically tamped to 90% compaction. Flooding will not be permitted without the specific approval of the Engineer, and then only for the area approved. Backfill shall contain no rocks, broken concrete or trash.

Trenches shall be backfilled level with surrounding grades when fully compacted. Trenches in lawn areas shall be sodded in accordance with Section 308-4.8.3 of the Standard Specifications.

All empty conduits for future use shall be identified with a conduit marker tag at both ends. The identification number shall be shown on the record drawings. Tags shall be 1 inch diameter, 20 gauge brass or 12 gauge plastic and shall have stamped numbers/letters ¼ inch high. Use brass or copper 12 gauge wire to connect tag to conduit.

C. PULL BOXES

Install pull boxes where noted on drawings. No pull box shall be located in an athletic field area, or where it will pose a hazard to the using public.

Boxes shall be set flush with a sidewalk or other paving. In lawn areas, set boxes one inch above finish grade or at lawn level, or as noted on plans. Notes on plan govern.

When precast concrete boxes are used, they shall be made in sections, and grouted or cemented together to form a watertight seal. Boxes shall have a 6 inch drain hole in the bottom. Boxes shall sit on crushed clean 1 inch rock. The drain hole shall be sealed after inspection, and the entire box made watertight.

D. SPLICING AND CABLE IDENTIFICATION

No splices are permitted except in pull boxes, above grade junction boxes, or in pole base at hand hole.

All cable splices hall be made with Hi Press compression type connectors (not bolted mechanical compression type).

All joints shall be made waterproof by several layers of rubber tape followed by two layers of ½ lap friction tape, covered by underground boxes shall be made with splice kits as manufactured by General Electric or #M.

Branch circuit splices in fixture shall be soldered and taped as noted above. Compression fittings (uninsulated "Scotchlok") may be substituted for solder, but must be taped, dipped in waterproof compound and made waterproof. Insulating "Scotchlok" may be used, but only with waterproof Unipack Scothtchcast resin.

All cable shall be identified with a punched plastic tag such as color coded Dymo tags, in each pull box by circuit number, voltage and phase.

E. GROUNDING

Do not use water pipe as a ground; water pipe system is non-metallic. All fixtures shall be connected to system ground. Neutral to ground shall not exceed five ohms. Connect fixture to be properly grounded. Use proper ground clamps and conduit fittings to ground cable and conduit to ground rods. Size as required by code.

F. FOUNDATIONS

Contractor shall excavate and install foundations for each pole as noted on drawings. All concrete shall be poured against undisturbed soil. Backfilling and compacting will not be approved.

Foundation dimensions are based on the poles and fixtures specified. Place foundation reinforcing steel as noted on drawings. Reinforcing steel shall be ASTM A605, Grade 60; test is required. Call for steel placement inspection when ready.

Foundation holes shall be inspected by Engineer prior to pouring concrete. Structural notes on drawings govern over these specifications.

Concrete: All concrete shall be per Section 1.12, Portland Cement Concrete (PCC), of these Special Provisions.

Aggregates: Aggregates shall be per Section 1.01, Rock Products, of these Special Provisions.

Transit-Mixed Concrete: The Contractor may use transit-mixed concrete in lieu of concrete manufactured on the site, provided the materials used in its manufacture comply with the requirements of these specifications.

The manufacturer of the transit-mixed concrete shall deliver to the Inspector on the work, a certificate with each mixer truck stating the quantity of cement, water, fine and coarse aggregate. Certificate shall be certified at batch plant that it meets these requirements.

Transit-mixed concrete shall not be delivered to the work with the total specified amount of water incorporated; two and one-half gallons of water per cubic yard shall be withheld, and may be incorporated before the concrete is discharged under the supervision of the Engineer.

The Contractor shall not re-temper any concrete or use any concrete that has stood more than 15 minutes after leaving the mixer.

Grout: Use non-shrink structural grout under pole bases and to form pole cap.

10.00 SPECIAL PROVISIONS - BRIDGE CONSTRUCTION.....NOT USED

11.00 SPECIAL PROVISIONS - MISCELLANEOUS CONSTRUCTION.....NOT USED

11.01 HEADING

Text.

11.02 HEADING

Text.

11.03 HEADING

Text.

11.04 HEADING

Text.

11.05 HEADING

Text.

11.06 HEADING

Text.

11.07 HEADING

Text.

11.08 HEADING

Text.

11.09 HEADING

Text.

11.10 HEADING

Text.

DEFINITION OF BID ITEMS

DEFINITION OF BID ITEMS

The unit prices paid for the items listed in the Contractor's Proposal as defined herein shall be considered full compensation for furnishing all labor, materials, tools, and equipment, and doing all work involved in furnishing and installing the materials complete and in place, in accordance with the details shown on the Plans, as specified herein, and as directed by the Engineer.

All incidental work which is neither shown on the Plans nor otherwise specified, and which is necessary to complete the improvements as shown on the Plans and as specified in the Contract Documents (defined in the Contract/Agreement), shall be furnished and installed as though such work were shown on the Plans or specified in the Contract Documents, and no additional compensation shall be allowed therefore.

The scope of work includes, but is not limited to, each bid item listed in the Contractor's Proposal and as described in the following.

GENERAL

Bid Item No. 1 - Mobilization

Payment for Mobilization shall be at the contract lump sum bid listed in the Bid Proposal, and shall include full compensation for mobilizing the Contractor's workforce (including additional mobilizations), labor, equipment, and materials; providing bonds, insurance, and license; videotaping of the project job site; demobilizing; and performing final cleanup, all to the satisfaction of the Engineer and no additional compensation will be allowed therefore. Payment for mobilization shall not exceed five (5) percent of the total project bid.

STREET IMPROVEMENT ITEMS

Bid Item No. 2 - Unclassified Excavation

Payment for Unclassified Excavation shall be at the contract unit price bid per cubic yard listed in the Bid Proposal, and shall include full compensation for doing all work, including furnishing all materials, labor, equipment, tools, and incidentals as required and no additional compensation will be allowed therefor.

Payment for unclassified fill, if any, is considered as included in the unit price paid for unclassified excavation.

Payment for over-excavation shall be paid for at the unit price for unclassified excavation.

Bid Item No. 3 - Cold Milling

Payment for Cold Milling shall be at the contract unit price bid per square foot listed in the Bid Proposal, and shall include full compensation for doing all work, including furnishing all materials, labor, equipment, tools, disposal of all removed materials, and incidentals as required and no additional compensation will be allowed therefor.

Bid Item No. 4 - Asphalt Concrete

Payment for Asphalt Concrete shall be at the contract unit price bid per ton listed in the Bid Proposal, and shall include full compensation for doing all work, including furnishing all materials, labor, equipment, tools, and incidentals as required and no additional compensation will be allowed therefor.

Payment for asphalt concrete pavement used in areas of over-excavation to mitigate unsuitable subgrade materials shall be paid for at the contract unit price bid per ton.

Bid Item No. 5 - Rubberized Emulsion Aggregate Slurry (REAS), Type II

Payment for Rubberized Emulsion Aggregate Slurry (REAS), Type II shall be at the contract unit price bid per ton listed in the Bid Proposal, and shall include full compensation for doing all work, including furnishing all materials, labor, equipment, tools, and incidentals as required and no additional compensation will be allowed therefor.

Bid Item No. 6 - Traffic Loop

Payment for Traffic Loops shall be at the contract unit price bid per each unit listed in the Bid Proposal, and shall include full compensation for doing all work, including furnishing all materials, labor, equipment, tools, disposal of all removed materials, and incidentals as required and no additional compensation will be allowed therefor.

Bid Item No. 7 - Temporary Construction Sign

Payment for Temporary Construction Signs shall be at the contract unit price bid per each unit listed in the Bid Proposal, and shall include full compensation for doing all work, including furnishing all materials, labor, equipment, tools, disposal of all removed materials, and incidentals as required and no additional compensation will be allowed therefor.

Bid Item No. 8 - Crack Sealing

Payment for Crack Sealing shall be at the contract lump sum bid listed in the Bid Proposal, and shall include full compensation for furnishing all materials, labor, equipment, tools, and incidentals as required and no additional compensation will be allowed therefor.

Bid Item No. 9 - Protection of Surface Utility Frames and Covers

Payment for Protection of Surface Utility Frames and Covers shall be at the contract lump sum bid listed in the Bid Proposal, and shall include full compensation for furnishing all materials, labor, equipment, tools, disposal of all removed materials, and incidentals as required and no additional compensation will be allowed therefor.

Bid Item No. 10 - Signing & Striping

Payment for Signing & Striping shall be at the contract lump sum bid listed in the Bid Proposal, and shall include full compensation for furnishing all materials, labor, equipment, tools, disposal of all removed materials, and incidentals as required and no additional compensation will be allowed therefor.

Bid Item No. 11 - Traffic Control

Payment for Traffic Control shall be at the contract lump sum bid listed in the Bid Proposal, and shall include full compensation for furnishing all materials, labor, equipment, tools, disposal of all removed materials, and incidentals as required and no additional compensation will be allowed therefor.

Bid Item No. 12 - Labor Agreement Oversight

Contractor shall hire an independent Consultant from a list of City provided pre-qualified consultants to oversee the Community Workforce Agreement (CWA) labor relations policies and procedures. The Consultant shall work as the Prime Contractor's subcontractor, but shall submit and report directly to the city's CWA Administrator throughout the construction period. The amount bid shall be an allowance used by the Prime Contractor to pay Consultant for Labor Agreement Oversight at the Consultant's hourly rate. Payment for the work shall include, but not limited to oversee, review, report, and monitor the CWA to ensure the Contractor adheres to the policies and procedures required in the CWA, and no additional compensation will be allowed therefor.

CONSTRUCTION CONTRACT AGREEMENT

CITY OF SANTA ANA
CONSTRUCTION CONTRACT AGREEMENT
PROJECT NO.: XX-XXXX
PROJECT TITLE

This CONSTRUCTION CONTRACT is made and entered into this _____ day of _____, 20___, by and between the CITY OF SANTA ANA, CALIFORNIA, a charter city and municipal corporation organized and existing under the Constitution and laws of the State of California, hereinafter referred to as "CITY" and _____, hereinafter referred to as "CONTRACTOR".

WITNESSETH:

The CITY and the CONTRACTOR, for the consideration hereinafter named, mutually agree as follows:

1. CONTRACTOR agrees to perform all the work and furnish all the materials at its own cost and expense necessary to construct and complete in a good and workmanlike manner and to the satisfaction of the City Engineer of the CITY, the _____ _____ Project, hereinafter referred to as the "Work of Improvement" identified in and in accordance with the Contract Documents prepared by the City's Public Works Agency and approved by the City Council.

2. The complete Construction Contract consists of the "Contract Documents" as defined by the Standard Specifications for Public Works Construction and which include the following:

   - Notice Inviting Bids
   - Information to Bidders
   - Bid Proposal
   - Bid Bond
   - Contract Form
   - Contract Bonds
   - General Provisions
   - Special Provisions
   - Technical Provisions and Project Plans
   - Community Workforce Agreement
   - Appendices

   In case of conflict between the Contract Documents, the precedence of documents shall be as established in the Standard Specifications for Public Works Construction.

3. CITY agrees to pay and CONTRACTOR agrees to accept in full payment to complete the Work of Improvement the sum total amount not to exceed $_____ _____, as set forth and identified in the BID PROPOSAL, which is attached hereto and incorporated herein as Exhibit "A".

   The BID PROPOSAL contains a schedule of unit price(s) or lump sum(s) based on approximate quantities only, and the City does not expressly or by implication agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or portion of the work or to omit portions of the work as may be deemed necessary or advisable.

4. CONTRACTOR agrees to complete the Work of Improvement within the time specified in the Time for Completion of Improvements section of the BID PROPOSAL (Exhibit "A") including commencing construction within the timeframe therein specified after issuance of a Notice to Proceed.

5. The CONTRACTOR will pay, and will require all subcontractors to pay, all employees on the Work of Improvement a salary or wage at least equal to the prevailing salary or wage established for such work as set forth in the wage determinations for this work in accordance with applicable State and Federal law.

6. If applicable, the CONTRACTOR shall adhere to the CITY'S Community Workforce Agreement (CWA), a pre-hire collective bargaining agreement, which establishes the labor relations policies and procedures for CONTRACTOR to follow in the crafts persons employed to complete the WORK OF IMPROVEMENT as more fully described in the CWA. The CWA may be found on the City's website at:

   http://www.santa-ana.org/pwa/documents/CWA.pdf

7. CONTRACTOR shall, after award of this Contract, furnish two bonds to be approved by the CITY, one in the amount of One Hundred Percent (100%) of the Contract price, to guarantee the faithful performance of the work (Performance Bond), and one in the amount of One Hundred Percent (100%) of the Contract price to guarantee payment of all claims for labor and materials furnished (Payment Bond). This Contract shall not become effective until such bonds are supplied to and approved by the CITY.

8. CONTRACTOR shall, prior to the release of the performance and payment bonds or the retention payment, furnish a warranty performance and payment bond (Warranty Bond). Said Warranty Bond shall also be required as a condition of project acceptance. For projects up to $500,000, the Warranty Bond amount shall be the greater of $10,000 or 20% of the final contract price. For project above $500,000, the Warranty Bond amount shall be the greater of $100,000 or 10% of the final contract price.

9. CONTRACTOR shall, after award of this Contract, furnish Certificates of Liability Insurance and Worker's Compensation Insurance as outlined in the General Provisions, to be approved by the CITY. //

//

CITY OF SANTA ANA
CONSTRUCTION CONTRACT AGREEMENT
PROJECT NO.: XX-XXXX
PROJECT TITLE

IN WITNESS WHEREOF, the parties hereto have executed this Construction Contract on the day and year first above written.

ATTEST:

MARIA D. HUIZAR
Clerk of the Council

CITY OF SANTA ANA:

RAUL GODINEZ II
City Manager

APPROVED AS TO FORM:

SONIA R. CARVALHO
City Attorney

By:
JOHN FUNK
Assistant City Attorney

CONTRACTOR:

By:
Title:

RECOMMENDED FOR APPROVAL:

EDWIN "WILLIAM" GALVEZ, P.E.
Acting Executive Director
Public Works Agency

BONDS

CITY OF SANTA ANA
BONDS
PROJECT NO.: XX-XXXX
PROJECT TITLE

FAITHFUL PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS that _____, as CONTRACTOR, and _____, a corporation, organized and existing under the laws of the State, and duly authorized to transact business under the laws of the State of California, as SURETY, are held and firmly bound unto the City of Santa Ana, as AGENCY, in the penal sum of _____ _____ Dollars ($_____), which is 100 percent of the total contract amount for the above stated project, for the payment of which sum, CONTRACTOR and SURETY agree to be bound, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION ARE SUCH that, whereas CONTRACTOR has been awarded and is about to enter into the annexed Contract Agreement with AGENCY dated _____ for _____, if CONTRACTOR faithfully performs and fulfills all obligations in the performance of the Work of Improvement to be done under said Contract Agreement in the manner and time specified therein, then this obligation shall be null and void, otherwise it shall remain in full force and effect in favor of AGENCY; provided that any alterations in the obligations or time for completion made pursuant to the terms of the contract documents shall not in any way release either CONTRACTOR or SURETY, and notice of such alterations is hereby waived by SURETY.

IN WITNESS WHEREOF the parties hereto have set their names, titles, hands, and seal this _____ day of _____, 20___.

CONTRACTOR*_____
_____

SURETY*_____
_____

Subscribed and sworn to before me, _____, this _____ day of _____, 20___.

Signature: _____

Notary Public in and for the County of _____, State of _____

Rate of premium on this bond is $ _____ per thousand.
Total amount of premium charge is $ _____. ***To be filled in by Surety***

**Provide CONTRACTOR / ADMITTED SURETY name, address, and telephone number and the name, title, address, and telephone number of authorized representative.*

CITY OF SANTA ANA
BONDS
PROJECT NO.: XX-XXXX
PROJECT TITLE

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS that _____,
as CONTRACTOR, and _____,
a corporation, organized and existing under the laws of the State, and duly authorized to transact business under the laws of the State of California, as SURETY, are held and firmly bound unto the City of Santa Ana, as AGENCY, in the penal sum of _____
_____ Dollars
($_____), which is 100 percent of the total contract amount for the above stated project, for the payment of which sum, CONTRACTOR and SURETY agree to be bound, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION ARE SUCH that, whereas CONTRACTOR has been awarded and is about to enter into the annexed Contract Agreement with AGENCY dated _____ for _____,
if CONTRACTOR or any subcontractor fails to pay for any labor or material of any kind used in the performance of the Work of Improvement to be done under said Contract Agreement, or fails to submit amounts due under the State Unemployment Insurance Act with respect to said labor, SURETY will pay for the same in an amount not exceeding the sum set forth above, which amount shall insure to the benefit of all persons entitled to file claims under the State Code of Civil Procedures; provided that any alterations in the work to be done, materials to be furnished, or time for completion made pursuant to the terms of the contract documents shall not in any way release either CONTRACTOR or SURETY, and notice of said alterations is hereby waived by SURETY.

IN WITNESS WHEREOF the parties hereto have set their names, titles, hands, and seal this _____ day of _____, 20___.

CONTRACTOR*_____
_____

SURETY*_____
_____

Subscribed and sworn to before me, _____, this _____ day of _____, 20___.

Signature: _____

Notary Public in and for the County of _____, State of _____

Rate of premium on this bond is $ _____ per thousand.
Total amount of premium charge is $ _____. ***To be filled in by Surety***

**Provide CONTRACTOR / ADMITTED SURETY name, address, and telephone number and the name, title, address, and telephone number of authorized representative.*

CITY OF SANTA ANA
BONDS
PROJECT NO.: XX-XXXX
PROJECT TITLE

WARRANTY PERFORMANCE AND PAYMENT BOND

(To be submitted upon project completion as a condition of project acceptance)

KNOW ALL MEN BY THESE PRESENTS that _____, as CONTRACTOR, and _____, a corporation, organized and existing under the laws of the State, and duly authorized to transact business under the laws of the State of California, as SURETY, are held and firmly bound unto the City of Santa Ana, as AGENCY, in the penal sum of _____ _____ Dollars ($_____), which is 25 percent of the final contract amount for the above stated project, for the payment of which sum, CONTRACTOR and SURETY agree to be bound, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION ARE SUCH that, whereas CONTRACTOR has been awarded and is about to enter into the annexed Contract Agreement with AGENCY dated _____ for _____, if CONTRACTOR faithfully warrants the work done under said Contract Agreement against material or quality defects for a period of one year after acceptance by the AGENCY, then this obligation shall be null and void, otherwise it shall remain in full force and effect in favor of AGENCY; provided that any alterations in the obligations or time for completion made pursuant to the terms of the contract documents shall not in any way release either CONTRACTOR or SURETY, and notice of such alterations is hereby waived by SURETY.

IN WITNESS WHEREOF the parties hereto have set their names, titles, hands, and seal this _____ day of _____, 20___.

CONTRACTOR*_____
_____

SURETY*_____
_____

Subscribed and sworn to before me, _____, this _____ day of _____, 20___.

Signature: _____

Notary Public in and for the County of _____, State of _____

Rate of premium on this bond is $ _____ per thousand.
Total amount of premium charge is $ _____. ***To be filled in by Surety***

**Provide CONTRACTOR / ADMITTED SURETY name, address, and telephone number and the name, title, address, and telephone number of authorized representative.*

CERTIFICATE OF INSURANCE

CONSTRUCTION SIGNAGE AND NOTICES

STANDARD PLANS

http://www.ci.santa-ana.ca.us/pwa/EngineeringServices.asp

APPENDIX G

APPENDIX H

City of Westminster

Special Provisions and Standard Drawings

SPECIAL PROVISIONS

SECTION 1 APPLICABILITY OF STANDARD PROVISIONS

The work shall be performed in accordance with "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" (Green Book), latest edition, including any supplements, hereinafter referred to as 'Standard Specifications', City Standard Drawings and Plans, and in accordance with these Special Provisions. Traffic signal, striping, pavement markers, signing, construction signing and striping and General Provisions shall be in accordance with "STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION STANDARD PLANS AND SPECIFICATIONS," latest edition, hereinafter referred to as "Caltrans Plans and Specifications" and these Special Provisions, unless if otherwise stated in the "Additions to Special Provisions" section and the latest edition of the "California Manual on Uniform Traffic Control Devices" (California MUTCD).

In case of conflict between the Standard Specifications and these contract specifications, the contract specifications shall take precedence.

SECTION 2 PROSECUTION AND PROGRESS

2.01 Time of Completion

Attention is directed to the provision in section 6-2, "Prosecution of Work" and 6-7 "Time of Completion" of the Standard Specifications and these special provisions. The Contractor shall not perform any work at the site of the project until notified by the City. The Contractor shall notify the City Engineer, in writing, of the date when materials will be available.

The Contractor shall diligently prosecute the work to completion before the expiration of eighty (80) working days from the date of the Notice to Proceed. The work required by the City's punch list must be completed within ten (10) working days after the Contractor has been notified.

2.02 Partial and Final Payment

Add the following to Subsection 9-3.2 "Partial and Final Payment" of the Standard Specification:

At the request and expense of the Contractor, 5% retention of the progress payment can be substituted by securities equivalent to the amount withheld and shall be deposited with the City, with a Federally-chartered bank as the escrow agent who shall pay such monies to the Contractor upon satisfactory completion of the contract. The Contractor shall be the beneficial owner of any securities substituted for monies withheld and shall receive any interest on the monies.

When the Contractor decides to avail itself of the above provision, said securities shall be submitted together with the first request of progress payment, the amount of said securities to equal 10% of the project cost.

2.03 Liquidated Damages

Reference Section 6-9 "Liquidated Damages" of the Standard Specifications. The Contractor agrees to the assessment of liquidated damages in the amount of Five Hundred Dollars ($500.00) for each calendar day that the work remains incomplete beyond the expiration of the above completion date.

2.04 Contract Bonds

At the time of execution of the contract, the Contractor will be required to furnish surety company bonds for faithful performance and labor and materials, in the sum of not less than One Hundred Percent (100%) of the total amount of the contract in accordance with the provisions of State laws. Alterations, extensions of time, extra and additional work, and changes authorized by these specifications or any part of the contract may be made without securing the consent of the surety or sureties on the contract bond.

Contract Bonds from offshore insurance companies and non-registered California State insurance companies will not be accepted. The contract bonds shall be duly executed by a responsible corporate surety, authorized to issue such bonds in the State of California and secured through an authorized agent with an office in California. The Contractor shall pay all bond premiums, costs, and incidentals. Each bond shall be signed by both the Contractor and surety, and the signature of the authorized agent of the surety shall be notarized.

The prescribed time for the performance bond shall be for the duration of the work under the contract until the work is accepted and retention is paid to the Contractor.

2.05 Excerpts from State Labor Code

A copy of the prevailing wage determination for each work classification employed on this project shall be posted, at all times, in a conspicuous area at the site. As per Section 1776 of the State Labor Code, this notice hereby informs the Contractor that accurate payroll records shall be kept by both the Contractor and all Sub-contractors showing the name, address, social security number, work classification, and straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by him or her in connection with the public work.

The payroll records shall be certified and shall be available for inspection, and/or made available and furnished to the City within ten days after receipt of a written request. Failure to provide the certified payrolls in a timely manner may result in a Twenty-Five Dollar ($25.00) penalty, per calendar

day, per employee. This amount will be withheld from any progress payments due the Contractor.

NOTE: ***If your company will pay a portion of wages as contributions to a pension plan, attach the Plan Document and Trust Agreement. Only bona fide plans are acceptable. For example, some plans provide that administrators and fiduciaries have no duty to require that contributions be made, to determine what amounts are payable, or to see that the proper amounts are received. Such plans are inconsistent with ERISA because they improperly exonerate administrators and fiduciaries.***

In addition, as per Section 1775 of the State Labor Code, this notice hereby informs the Contractor that if it is determined that any worker is paid less than the prevailing wage rates as determined by the Director for the work or craft in which the worker is employed for any public work done under this contract, by either the Contractor or any of the Contractor's Sub-contractors, a penalty in the amount of Fifty Dollars ($50) per calendar day, per employee, may result. This amount will be withheld from any progress payments due the Contractor.

In accordance with Section 1777.5 of the State Labor Code, this notice hereby informs the Contractor that apprenticeship stipulations shall be complied with for this public work. The payment of travel and subsistence payments to each workman needed to execute the work as travel and subsistence payments, shall be defined in the applicable collective bargaining agreements filed in accordance with Section 1773.8 of the State Labor Code.

Eight hours labor constitutes a legal day's work in all cases where the same is performed under the authority of any law of this State, or under the direction, or control, or by the authority of any officer of the City.

In accordance with provisions of Section 3700 of the State Labor Code, every contractor will be required to secure the payment of compensation to his/her employees.

2.06 Preconstruction Meeting

A mandatory preconstruction meeting will be held with the successful bidder after an award is made by the City Council. The City strongly urges that the prime Contractor's Sub-contractors attend this meeting.

2.07 Progress Payments and Certified Payrolls

The Contractor may invoice the City on a monthly basis for work completed

by the Contractor and accepted by the City; however, no progress payments will be accepted if the Contractor lacks any paperwork that should have been submitted to the City. Such paperwork includes, but is not limited to, certified payrolls and related documents which may be requested. It is the responsibility of the Contractor to ensure that all its Sub-contractors are paying prevailing wages as required by State law.

2.08 Unlawful Conduct

It is prohibited for the Contractor and/or any of the Contractor's Sub-contractors to influence or attempt to influence an officer or employee of any Federal, State, or local agency in connection with the awarding of any contract.

2.09 Drug Free Workplace

Contractor and its Sub-contractors shall comply with the Drug-Free Workplace Act of 1990, California Government Code Section 8350, et seq., and each shall provide to City the certification required by California Government Code Section 8355 within ten (10) days of execution of the Contract or any subcontract thereof and prior to commencement of work.

2.10 Equal Employment Opportunity

During the performance of the Contract, the Contractor and its Sub-contractors shall not unlawfully discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, age, marital status, medical condition, or mental or physical disability. Contractor and its Sub-contractors will ensure that applicants are employed and that employees are treated during employment without regard to their race, color, religion, sex, national origin, age, marital status, medical condition, or mental or physical disability. Such actions shall include, but not be limited to the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation and selection for training, including apprenticeship. Contractor and its Sub-contractors shall comply with the provision of the Fair Employment and Housing Act (California Government Code Section 12900, et seq.), the applicable regulations promulgated thereunder (California Code of Regulations, Title 2, Section 7285.0 et seq.), and Title VII of the Civil Rights Act of 1964 (42 U.S.C. section 2000e), the Age Discrimination in Employment Act and the Americans with Disabilities Act. The applicable regulations of the Fair Employment and Housing Commission implementing Government Code section 12921 set forth in Chapter 5 of Division 4 of Title 2 of the California Code of Regulations are incorporated into this contract by reference and made a part hereof as if set forth in full. Contractor and its Sub-contractors shall post in conspicuous places, available to employees and applicants for employment, a notice setting forth provisions of this non-discrimination clause. Contractor and its

Sub-contractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement. Contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the contract.

SECTION 3 DESCRIPTION OF WORK

The work consists of furnishing all labor, equipment, and materials for the construction of the concrete sidewalk, wheel chair ramps with detectable warning surface, conduits, pull boxes, traffic signal poles, video imaging detection systems (VIDS), striping and all appurtenant work in connection therewith, as shown on the drawings and in accordance with these specifications.

The work also includes all miscellaneous work as shown on the plans and described in the specifications. Any temporary wiring of the traffic signal system and the safety lighting and temporary traffic signal system shall be provided and installed by the Contractor without additional compensation.

SECTION 4 CONSTRUCTION DETAILS

It is the intent of this contract to obtain a finished workmanlike job, complete-in-place. The contract includes all miscellaneous work required to complete the project. Full compensation for conforming to all the requirements in this section shall be considered to be included in the lump sum price for the various contract items of work, and no additional compensation will be allowed unless otherwise specifically provided.

The Contractor shall notify the Project Engineer forty-eight (48) hours in advance of the time and date that the work will begin on this project. In addition, the Contractor shall give twenty-four (24) hour notice when they will require the services of the Project Engineer.

4.01 Utilities

The City has endeavored to locate and show on the plans approximate locations of all private and public utilities and facilities to be encountered during construction. However, Contractor shall exercise reasonable care to protect existing utilities whether shown on the plans or not. The Contractor shall promptly notify the City of any utility lines which contractor locates during the course of the work which may require protection or relocation.

It shall be the responsibility of the Contractor to notify and coordinate the work with any utility companies concerned. The Contractor shall ascertain the existence of any underground facilities or improvements which may be subject to damage by reason of construction operations. The Contractor shall arrange a compatible work schedule with all utility companies involved.

Where facilities shown on plans are to be relocated by the utility owner, City will issue the utility owner a Notice to Relocate or, by agreement with owner,

require the owner to relocate. In the event difficulties, which in the judgment of the Engineer cannot reasonably be foreseen, delay relocation and require a delay in the Contractor's completion date after all reasonable remedies for keeping contract on schedule have been exhausted by Contractor, including but not limited to flowcharts and critical path scheduling, work simplification and alternative construction methods, the Engineer may allow extra time to the Contractor.

Contractor shall protect facilities shown on the plans as, "To be relocated," both prior to and after the relocation work, and any damage to such facilities shall be immediately repaired to the City's or owner's satisfaction, at no cost to the City.

All utilities designated on the plans to be protected in place shall be carefully uncovered if located within the lines of excavation and time shall be allowed for the Engineer to field-check the location of such utilities to make certain that they will not interfere with construction. In the event a utilities conflict exists, the City will either arrange for utility owner to relocate the utility or adjust grade and/or alignment of the proposed improvement. In the event any such facility should be disturbed or damaged, the Contractor shall at once make repairs to the satisfaction of the owner, or arrange with the owner to make repairs at no cost to City.

The Contractor shall have the following City utilities located, and shall contact the responsible agency at least 48 hours prior to construction in the immediate vicinity of the utilities:

WATER: CITY OF WESTMINSTER
(714) 548-3698
Dave Silvas

SEWER: MIDWAY CITY SANITARY
(714) 893-3553
Kenny Robbins

Contractor is required to contact the Underground Service Alert (USA) organization at telephone number (800) 422-4133 a minimum of forty-eight (48) hours or two (2) working days prior to performing any construction on the project.

Contractor shall locate, verify and protect all existing utility facilities in the immediate vicinity of the work as stated. The following utility companies may have facilities located within the construction area and are members of USA:

- Orange County Transportation Authority (714) 560-5912
  (Contact: Bill Batory)
- Southern California Edison Co (714) 895-0614
  Office
  (Contact: Deandra Wright) (714) 943-7948 Cell

- Southern California Gas Co (714) 634-3038
  (Contact: Richard Tyrie)
- AT&T California (714) 237-6207
  (Contact: Valentina Gipson)
- Time Warner Communications (714) 903-8323
  (Contact: John Manaro) (714) 719-2032 Cell
- Westminster School District (714) 894-7311, ext. 493
  (Contact: Donna Rivard)
- Verizon Telephone Co (714) 375-6720
  (Contact: Mike Madrid)
- Orange County Sanitation District (714) 962-2411
  (Contact: Lynn Elliot)
- Midway City Sanitation District (714) 893-3553
  (Contact: Kenny Robbins)
- Clear Channel Communications (213) 305-0045
  (Contact: Dana Oullette or Kevin Kocic) (310) 755-7225
- Orange County PW Operations & Maintenance (714) 567-7275
  (Contact: Bill Hisey)
- West O.C. Water Boards (714) 536-5527
  (Contact: Howard Johnson)
- City of Westminster Water Dept. (714) 548-3693
  (Contact: Scott Miller)
- Garden Grove Unified School Dist. (714) 663-6185
  (Contact: Casey Pijl)

The cost of relocating, removing, or coordinating the construction in the locale of the existing utilities shall be considered as paid for in the lump sum price, and no additional compensation will be allowed. In the event of damage to any utility during the process of construction, the Contractor shall promptly repair the damage, pay for all costs of repair, and shall be liable for all costs resulting from the interruption of any service.

4.02 Dust Control

Replace the second paragraph of section 7-8.1 "Cleanup and Dust Control" of the standard specifications:

Contractor shall furnish and operate a self-loading motor sweeper with spray nozzles at least once each working day to keep paved areas acceptably clean. The Contractor shall never leave the construction premises dirty and dusty.

Additional water shall be applied if ordered by the Engineer for the alleviation or prevention of dust nuisance. Water shall be applied either by pipelines, pressure, or pressure-type distributors or mobile units through a spray system or nozzles that will ensure a uniform application of water. The application of water for alleviation of dust nuisance shall be under the control

of the Engineer. Water shall be applied by the Contractor, twice a day, as necessary, to prevent dust nuisance and in amounts and at locations designated by the Engineer (see also Section 4.16).

When Contractor uses City Water Division fire hydrants as a source of water supply, the Contractor shall make application with the City or contact Dave Silvas at (714) 548-3698. Deposit fees for City hydrant meters shall be paid for by Contractor.

No separate payment will be made for any work performed or material used to control dust resulting from the Contractor's performance of the work, or by public traffic, either inside or outside the right-of-way.

4.03 Soil and Material Tests

Soil compaction and material tests may be required. Tests shall be performed and provided by a City approved testing laboratory. It shall be the responsibility of the Contractor to notify the Engineer 48 hours in advance of testing. All initial tests will be paid for by the City. All tests repeated because of failure shall be paid for by the Contractor. Repeated testing costs will be deducted from the Contractor's final progress payment.

Contractor shall designate a member of its crew to coordinate, collect, and submit test samples.

4.04 Traffic Control, Public Safety, and Convenience

Public convenience and traffic control shall conform to Section 7-1.08, "Public Convenience", and these Special Provisions.

The Contractor shall conduct its work in such a manner as to minimize the disruption of traffic flow. The Contractor shall not obstruct or restrict any portion of the roadway until proper arrangements for the conduct of traffic have been received and approved by the Engineer. Contractor shall be prepared to discuss a detour plan for all phases of the work at the preconstruction conference, and shall submit a Detour Plan to the Engineer at least five (5) working days prior to the commencement of construction.

Public traffic shall be permitted to pass through the construction area with as little inconvenience and delay as possible at all locations where approved detour alternate routes are not available. **Major and secondary streets shall maintain one (1) fourteen foot (14') lane of traffic in each direction at all times. Collector Streets shall maintain at least one (1) twelve foot (12') wide travel lane in each direction, and shall be kept open and maintained for public use at all times, except as indicated on the plans or as directed by the Engineer during construction**. At no time shall any travel lane be shut down overnight. No cross streets or intersecting streets shall be closed at any time without approval of the Engineer.

A minimum of one (1) four foot (4') wide pedestrian walkway shall be kept open and maintained to the satisfaction of the Engineer along each public street and school at all times during construction.

Prior to restricting normal access from public streets to adjacent properties, the Contractor shall notify each property owner or responsible person, informing them of the nature of the access restriction, the approximate duration of the restriction, and the best access route for that particular property. Reasonable access, as determined by the Engineer, from public streets to all adjacent properties, shall be maintained at all times during construction.

All detours within the construction area shall be designed by the Contractor to the satisfaction of the Engineer. The Engineer, at times, will require the Contractor to submit its proposed detour in drawing form. Such proposed detour plans would include type and location of barricades, signs, flashers, reflectors, guidance marking, etc, and must provide for 30:1 tapers and be approved by the Engineer. When a detour is shown on the plans or is allowed by the Engineer that will direct motorists from an arterial street into a local street, the Contractor will be required to use detour directional signs to guide the motorists entirely through the local streets to the same or another arterial street. Conditions during construction may require traffic controls to vary from that shown on the plans or specified in these Special Provisions. The Engineer must approve, and may require, a deviation of the temporary traffic controls shown on the plans or in the specifications.

The Contractor shall furnish flagmen and erect and maintain such fences, barriers, lights, flares, signs, and miscellaneous traffic devices as are necessary to give adequate warning to the public at all times. As determined by the Engineer, the Contractor shall also erect and maintain such warning and directional signs as may be furnished by the City. Signs used for handling traffic during construction shall be in accordance with the California MUTCD, or as directed by the Engineer.

The Contractor shall field check all temporary traffic control signs, barricades, and other devices at least once every day, including Saturdays, Sundays, and holidays, to ensure their proper maintenance and conformance to plans, specifications, and detailed instructions of the Engineer.

If attention is directed to the existence of a hazard and Contractor fails to provide such devices **within 30 minutes of notification**, said devices will be placed or caused to be placed by the City. The cost of placement of these devices shall be the sole responsibility of the Contractor and shall be paid for at the rate of fifty-five dollars ($55.00) per hour for labor and the pickup truck, five dollars ($5.00) per day per barricade, and any other costs incurred by the City relative to traffic control. Said costs, if any, shall be

deducted from the progress payment and from the total contract price for the work.

All traffic control methods shall conform to the latest edition of the California MUTCD. Flag persons shall be stationed at each end of the construction location where it is necessary to temporarily stop or detour traffic for the movement of materials and equipment. During the construction activity hours, flagmen and workers shall wear bright orange vests while working in street areas. Traffic stoppages shall be limited to time periods approved by the City Engineer.

Construction on Newland Street, 15th Street, McFadden Street and Ward Street shall be performed between the hours of 8:30 a.m. and 4:00 p.m., Monday to Friday, or as otherwise approved by the Engineer.

The Contractor shall coordinate with the adjacent schools, and pedestrian traffic must be maintained in a safe manner during the construction period. Pedestrian and emergency vehicular access shall be maintained to all residences, businesses, and manufacturing establishments within the construction area.

Signs, lights, flags, and other warning and safety devices shall conform to the requirements set forth in the California MUTCD, latest edition.

All costs associated for temporary and permanent traffic controls shall be included in the lump sum bid price, and no additional compensation will be allowed.

4.05 Temporary No Parking

Contractor, at no cost to the City, shall post, sign, and distribute letters notifying residents, patrons, and business owners along all streets within the areas of proposed construction at least seven (7) days before start of construction, showing the date and traffic closures in accordance with the approved Schedule of Work. Contractor shall provide all “Temporary No Parking" signs required at no expense to the City.

Contractor shall post "Temporary No Parking" signs where required only after notifying and receiving approval from the Engineer. Type of sign and method and location of posting shall also be subject to the Engineer's approval. Establishment of such zones must be coordinated with the Westminster Police Department (714) 548-4690, and the Engineer. The Contractor, at no cost to the City, shall notify all affected residences and business establishments at least forty-eight (48) hours prior to the posting of signs.

4.06 Schedule of Work

The Contractor shall provide to the Engineer, in writing, prior to the start of construction, a description of the proposed sequence of operations in the performance of the work, method of construction, traffic control, and a Schedule of Work. **Contractor shall not be allowed to start construction until said Schedule of Work has been submitted to the Engineer.** Any variation from the above general description and schedule will require written approval of the Engineer.

Loss of work for any cause during the period of time prior to the submission of the Schedule of Work will not be considered by the Engineer in computations should a time extension be requested. In addition, the Contractor shall submit a complete list of Sub-contractors who will perform work on this project, and a list of all major material suppliers. No substitutions of any kind will be allowed, either of Sub-contractors or material suppliers, without prior written approval of the Engineer.

4.07 Guarantee

The Contractor shall guarantee the work against defective material or workmanship for a period of one (1) year from date of official acceptance of completion of the contract. Damage due to acts of God is specifically excempted from the guarantee. The one (1) year guarantee includes lamps for indications and illuminated street name signs.

Manufacturers' warranties or guarantees on all equipment shall apply. Should any equipment prove defective or should the system as a whole prove defective due to faulty workmanship, material furnished or methods of installation, or should said system or any part thereof fail to operate as planned due to any of the foregoing causes, the Contractor agrees that the repairs shall be made and such material as necessary shall be furnished and installed within ten (10) calendar days after oral or written receipt of demand from the City. In the event repairs are not made within ten (10) calendar days, the City shall have the unqualified option to make any needed repairs or replacements itself or by any other contractor. The Contractor agrees to reimburse the City, upon demand, for its expenses incurred in restoring said systems to the condition specified in said contract, including the cost of any equipment or materials replaced or, upon demand by the City, to replace any such equipment and repair said systems completely without cost to the City so they will operate successfully as originally contemplated.

When the City staff performs emergency repairs, the Contractor shall reimburse all costs including, but limited to labor, material and equipment to the City for the defective material or workmanship resulting in emergency repairs. Emergency repairs will be deemed as those repairs necessary, due to malfunctions of equipment that interrupt the normal flow of traffic. Said systems will be deemed defective within the meaning of this guarantee in

the event that they fail to operate as originally intended by the manufacturers thereof and in accordance with the plans and specifications included in said contract.

When defective material and/or workmanship are discovered which require repairs to be made under this guaranty, all such work shall be done by the Contractor at its own expense within five (5) days after written notice of such defects has been given to Contractor by the City. Should the Contractor fail to repair such defective material or workmanship within five (5) days thereafter, the City may cause the necessary repairs to be made and charge the Contractor with the actual cost of all labor and materials required. In emergencies demanding immediate attention, the City shall have the right to repair the defect and charge the Contractor with the actual cost of all labor and material required. Any repair work performed as herein specified shall be done under the provisions of the original contract specifications.

4.08 Permanent Survey Markers

The Contractor shall be responsible for protecting all existing horizontal and vertical survey controls, monuments, ties, and bench marks located within the limits of the project. If any of the above requires removal, relocating, or resetting, the Contractor shall, prior to any construction work and under the supervision of a California-licensed Land Surveyor or Civil Engineer, establish sufficient temporary ties and bench marks to enable the points to be reset after completion of construction.

Any ties, monuments, or bench marks disturbed during construction shall be reset per City standards after construction and the tie notes submitted to the City on 8 ½" x 11" loose leaf paper, after it is signed and recorded at the County Surveyor's Office, see attached sample of centerline ties preparation. The Contractor or its surveyor shall use the same form as the attached one. The Contractor and its sureties shall be liable for, at their expense, any resurvey required due to Contractor's negligence in protecting existing ties, monuments, bench marks, or any such horizontal and vertical controls.

4.09 Survey Service

All work under this contract shall be built in accordance with the lines and grades as shown on the plans. Field survey for establishing these and for the control of construction shall be the responsibility of the Contractor. All such surveys, including construction staking, shall be under the supervision of a California-licensed Land Surveyor or Civil Engineer. Staking shall be performed on all items ordinarily requiring grade and alignment at intervals normally accepted by the City and trade involved.

The Contractor shall provide a copy of the office calculations and grade sheets to the City Inspector. The Contractor shall be responsible for any

error in the finished work and shall notify the Engineer within 24 hours of any discrepancies or design error discovered.

4.10 Working Hours

Normal working hours shall be from 7:30 AM to 4:30 PM. The City's Inspector does not go out until 8:30 AM; therefore, the Contractor shall schedule all items for inspection before 4:30 PM the day before or schedule inspection requests accordingly. Work shall not commence earlier than 7:30 AM except when working at street intersections and upon approval of a detour plan submitted by the Contractor (see section 4.04). Working earlier than 7:30 AM must have the approval of the engineer.

The Contractor may establish temporary "No Parking" zones adjacent to the work zone. Establishment of such zones should be coordinated with the Westminster Police Department, (714) 548-4690 and the Engineer (see Section 4.05 also).

All travel lanes shall be open to traffic after 3:30 PM until 8:30 AM the next morning. Exceptions may be made only with the written approval of the Engineer. Flagmen must be provided when only one (1) lane is open to traffic.

4.11 Property Ownership

Ownership of all materials existing and incorporated in the work is vested in the name of the City of Westminster. Any materials delivered and paid for in part by the City or any material furnished by the City to be incorporated in the work is or becomes the property of the City. Any salvageable materials or installations existing at the site of the work, including but not limited to manhole rings and covers, gratings, angle iron, pipe railings, valve boxes, fence posts, gates, and fencing materials, traffic posts, traffic signs, lamp hole boxes, etc., within the road right-of-way, are the property of the City. If they are to be removed, they are to be delivered to a storage yard designated by the City. The salvageable materials shall be cleaned of clinging concrete and debris and delivered to the storage yard unless the Contractor is instructed otherwise. Excavated dirt, A.C., and concrete not incorporated into the work shall become the property of the Contractor.

4.12 Examination of Plans, Specifications, and Site of the Works

The plans and specifications to which the proposal forms refer are on file and open to inspection in the office of the Director of Public Works/City Engineer. The plans indicate conditions at the site of the work as they are believed to exist, but it is not intended, nor to be inferred, that such indication constitutes a presentation by the City, or any officer thereof, that the conditions so indicated are actually existent, nor shall the City or any officer or employee thereof, be liable for any loss sustained by a contractor as a

result or consequence of any variance between such conditions as indicated and those actually revealed during the progress of the work, or otherwise. Therefore, prior to the award of the contract, Contractor was required to, and did, carefully examine the plans and specifications, and the site of the proposed work, and judged for itself as to the nature and location of the work to be done and the general conditions relative thereto; and the submission of Contractor's proposal which has been accepted by the agreement between the parties, will be considered prima-facie evidence that the Contractor has made the necessary investigation and is satisfied with respect to the conditions to be encountered, the character, quantity, and quality of the work and materials to be performed or furnished, and the requirements and provisions of the plans, specifications, and contract documents.

4.13 Estimate of Quantities

The quantities shown in the proposal form shall be considered as approximate only, being listed therein for materials to be performed or furnished, and as a basis for the comparison of bids; and the Director of Public Works/City Engineer of the City of Westminster does not guarantee or agree, either expressly or by implication that the actual amounts required will correspond therewith, but reserves the right to increase or decrease the amount of any item or portion of work or material to be performed or furnished, or to omit any such item or portion, in accordance with the provisions relative thereto set forth in the Standard Specifications.

4.14 Permits, Licenses, and Inspections

The Contractor and **ALL** its Sub-contractors shall obtain and pay for a City business license from the City of Westminster, **prior** to any commencement of work. A City encroachment permit is required; however, it will be issued at no cost.

The Contractor and all its Sub-contractors shall comply with the Clean Air and Federal Water Pollution Control Acts and the regulations of the Environmental Protection Agency. The Contractor and/or the Contractor's Sub-contractors shall pay for and obtain all necessary permits to comply with these acts and regulations.

4.15 Conduct of Construction Operations

Construction operations shall be conducted in such a manner as to cause as little inconvenience as possible to abutting property owners. Convenient access to driveways, houses, businesses, and buildings along the line of work shall be maintained and temporary approaches to crossings or intersecting highways shall be provided and kept in good condition. No material or equipment shall be stored where it will interfere with the free and safe passage of public traffic. At the end of each day's work and at other times when construction operations are suspended for any reason, the

Contractor shall remove all equipment and other obstructions from the portion of the roadway and open it for use by public traffic.

Contractor shall hand deliver notices to residents informing them of the proposed work and schedule. All residents must be notified at least seven (7) calendar days in advance of when work on their street will take place and the type of impact they should anticipate.

All spillage and any excessive dirt or debris caused by hauling operations or moving equipment along or across any private or public property, or publicly traveled way, shall be removed immediately at the Contractor's expense.

No trenches shall be left open overnight and all backfill shall be properly compacted. All trench surfaces shall be paved with temporary asphalt at the end of each work day.

In addition, the Contractor shall coordinate its schedule with the Midway City Sanitary District trash pickup schedule by contacting Kenny Robbins at (714) 893-3553. The Contractor shall contact the sanitary district to arrange for trash pickup in a way not to affect construction and improvements to the roadway.

4.16 Water

The Contractor shall be responsible for obtaining any supplies of water needed for the project. The Contractor shall obtain written permission from the owner of any water sources obtained from private property prior to use. The Contractor shall obtain a meter from the Westminster Water Division in order to obtain water from fire hydrants. The Westminster Water Division (714/548-3698) will require an application together with a deposit, plus a non-refundable service fee (contact the Water Division for current prices). Water usage will be charged on a monthly basis. The deposit less the last month’s usage will be refunded upon the return of the meter to the City’s Corporation Yard at 14381 Olive Street, Westminster (see also Section 4.02).

The Contractor shall provide unobstructed access to all fire hydrants at all times except as otherwise provided, in writing, by the Engineer. The use of City Water Division fire hydrants as a source of water supply as provided in Section 4.02 shall be authorized only by the Engineer or authorized representative.

4.17 OSHA

All contractors and sub-contractors performing work shown on or related to these plans shall conduct their operations so that all employees are provided a safe place to work and the public is protected. All contractors and sub-contractors shall comply with the "Occupational Safety and Health

Regulations" of the U.S. Department of Labor and with the State of California Department of Industrial Relations "Construction Safety Orders," and the Director of Public Works/City Engineer shall not be responsible in any way for this compliance.

Contractor further agrees that the Contractor will assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the owner and Director of Public Works/City Engineer harmless from any and all liability, real or alleged, in connection with the performance of work on the project, except for liability arising from sole negligence of the owner or the City.

4.18 Construction Yard

It shall be the Contractor's responsibility to locate any storage sites for materials and equipment needed and such sites must be approved in advance by the City.

When storage sites are located on private properties, the Contractor shall be required to submit to the City written approval from the recorded owner authorizing the use of their property by the Contractor.

4.19 Earthwork and Subgrade Preparation

Whenever reference to finished grade is made, it shall be considered to be the finished surface of the completed facility.

Relative compaction of not less than 95% shall be obtained for all base materials. Relative compaction of not less than 90% shall be obtained for the top six (6) inches of sub-grade material and fill areas.

4.20 Damages Due to Construction

Street pavement, curbs, sidewalks, driveways, sprinklers, gutters, etc., damaged as a result of the Contractor's operation shall be repaired in accordance with the City's standard drawings and specifications at the Contractor's sole expense, as soon as possible.

4.21 Sound Control

The Contractor shall comply with all local sound control and noise level rules, regulations, and ordinances which apply to any work performed pursuant to the contract.

Each internal combustion engine, used for any purpose on the job or related to the job, shall be equipped with a muffler of a type recommended by the

manufacturer. No internal combustion engine shall be operated on the project without said muffler.

The noise level from the Contractor's operations, between the hours of 9 PM and 6 AM shall not exceed 86 DBA at a distance of fifty (50) feet. This requirement in no way relieves the Contractor from responsibility for complying with local ordinances regulating noise level.

Said noise level requirement shall apply to all equipment on the job or related to the job, including but not limited to trucks, transit mixers or transient equipment that may or may not be owned by the contractor. The use of loud sound signals shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel.

4.22 Slag Aggregates

Aggregates produced from slag resulting from any steel-making process shall not be used in any highway construction.

4.23 NPDES Requirements

The Contractor shall conform to the requirements of the National Pollutant Discharge Elimination System (NPDES) Permit for Construction Activities, NPDES No. CAS000002, Applicable Municipal Codes including Chapter 8.30 of the City of Westminster Municipal Code and the Drainage Area Management Plan (DAMP) which includes the City Local Implementation Plan appendix containing Best Management Practices in compliances with the Federal Requirements for the Control of Urban Pollutants to Storm Water Runoff.

As a part of the requirements of the DAMP, the Contractor will prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) prior to the start of construction activities. The SWPPP will identify the Best Management Practices (BMPs) the Contractor will use to prevent pollutants from entering the storm drain system. In addition, the Engineer may require the Contractor to install additional BMPs as needed to prevent pollutants from entering the storm drain system.

4.24 Contractor and/or Sub-Contractor Identification

The Contractor and/or all Sub-contractors must identify themselves by means of posting or embedding their company's name and/or logos on their working vehicles or at the premises; the identification must be visible while working in the City's right-of-way. The Contractor, any Sub-contractors, and any individuals shall not be allowed to commence any work in the public right-of-way without proper identification as noted above.

SECTION 5 ADDITIONS TO SPECIAL PROVISIONS

5.01 Traffic Control

The Contractor shall provide and maintain all signs, barricades, pedestals, flashers, delineators, and other necessary facilities for the protection of the motoring public within the limits of the construction area and all its approaches, including advanced signing and barricades. The Contractor shall also post proper signs to notify the public regarding the conditions of the roadway, all in accordance with the provisions of the Vehicle Code and the California MUTCD, latest edition, as published by the State of California, Business and Transportation Agency, Department of Transportation.

The Contractor shall conduct its operations so as to provide a minimum of one traffic lane width and reasonable access to the adjacent properties, and shall have no greater length or quantity of work under construction than the Contractor can properly prosecute with a minimum of inconvenience to the public and other contractors engaged on adjacent or related work. Portable delineators shall be spaced as necessary for proper delineation of the travel way. The spacing between delineators shall not exceed fifty (50) feet on tangents or twenty-five (25) feet on curves, except when used for lane closures.

If the traffic cones or portable delineators are damaged, displaced, or are not in an upright position from any cause, said cones or portable delineators shall immediately be replaced or restored to their original location in an upright position by the Contractor.

The Contractor shall furnish such flagmen as are necessary to give adequate warning to traffic or to the public of any dangerous conditions to be encountered. Flagmen, while on duty and assigned to give warning to the public of any dangerous conditions to be encountered, shall perform their duties and shall be provided with the necessary equipment in accordance with the current Caltrans "Instructions to Flagmen." The equipment shall be furnished and kept clean and in good repair by the Contractor at Contractor's expense.

Spillage resulting from hauling operations along or across any public traveled way shall be removed immediately by the Contractor at Contractor's expense.

Should the Contractor appear to be neglectful or negligent in furnishing warning and protective measures as above provided, the Engineer may direct attention to the existence of a hazard and the necessary warning and protective measures shall be furnished and installed by the Contractor at Contractor's expense. Should the Engineer point out the inadequacy of warning and protective measures, such action on the part of the Engineer

shall not relieve the Contractor from responsibility for public safety or abrogate Contractor's obligation to furnish and pay for these devices.

5.02 Clearing and Grubbing

Clearing and grubbing shall conform to the applicable portions of Section 300, "Earthwork" of the Standard Specifications and shall include removal and/or relocation of various existing facilities shown on the plans to be removed or relocated for which there is no specific bid item. Clearing and grubbing shall consist of removing all natural and artificial objectionable materials from the right-of-way in construction areas. Clearing and grubbing shall include the removal of all objects such as property improvements (i.e., wood fences, brick or masonry walls, concrete walkways, A.C., planters, mail boxes, shrubs, trees, etc.) located within the City's right-of-way that interfere with the construction of the improvements shown on the plans or specified herein. Contractor shall field verify with the Engineer on what items will be removed or relocated. For those existing improvements that are to be relocated, the Contractor shall relocate property improvements (i.e., wood fences, mail boxes, etc.), located within the City's right-of-way, that interfere with the construction of the improvements shown on the plans or specified herein at the direction of the Engineer. It is the Contractor's responsibility to field-verify the items described above before submitting a bid. Once the trees are removed, it is the Contractor's responsibility to dispose those trees away from the job site.

Clearing and grubbing shall also include, but not be limited to, removal and/or restoration of turf, soil, shrubs, trees, conduit, concrete foundations, curb and gutter, sidewalk, access ramps, driveways, pull boxes, AC aggregate base, sprinkler heads and irrigation lines encountered during demolition and construction, reseeding or re-sodding, and properly grading the disturbed areas within or outside parkways, and any other material necessary to complete the improvements required per the plans.

Removal and disposal shall be done in accordance with Section 300-1.3 of the Standard Specifications and these Special Provisions.

5.03 Construct Curb and Gutter, Driveway Approach, Wheel Chair Ramp and Sidewalk

The construction of curb, gutter, sidewalk, and wheelchair ramp approach shall conform to Sections 201-1, 303-1, 303-5, and applicable subsections of the Standard Specifications; the City of Westminster Standard Drawings No. 201, 202, 203, 204, 205 and 208; Orange County or Orange/RDMD Standard Plan No. 1803; and Caltrans Standard Plan No. A88A and A88B.

Driveway approaches shall be steel trowelled to a smooth and even finish. All formed edges shall be rounded to a radius of 1/4 inch. Edges at expansion joints and weakened plane joints shall be rounded to a radius of

1/8 inch. Score lines shall have a minimum depth of 1/4 inch and a radius of 1/8 inch. After preliminary trowelling, apply a medium broom texture, transverse to direction of pedestrian travel, using a fine hair broom. Re-mark as necessary after final finish, to assure neat and uniform edges, joints, and score lines. Driveway approaches, and PCC driveway shall join smoothly to existing property owner's driveways. Residential walkways shall also join smoothly to existing property owners' walkways.

The bid price includes the removal and reconstruction of wheelchair ramps, curb and gutter, and sidewalk. The price includes furnishing the aggregate base needed, and the removal and disposal of existing materials, concrete, and/or existing base or sub-base, to allow the placement of the new wheelchair ramps, curb, gutter, and sidewalk.

The construction of wheel chair ramps will include the removal and reconstruction of adjacent curb and gutter. In case there is the existing spandrel connect to the wheel chair ramps then the construction of wheel chair ramps shall use horizontal curb cut method to save the existing curb and spandrel. Contractor need to inform the City's inspector or engineer prior to performing the work.

All existing concrete sections that are to be joined by new construction shall be sawcut in a straight line. Contractor shall exercise due caution to avoid any damage to the existing improvements to be protected in place. Any damage done by Contractor and/or its equipment shall be repaired or replaced as called out in Section 7-9 of the Standard Specifications at Contractor's expense.

Removal of existing concrete structure sections shall be done to the depth or length required for construction of the replacement sections as shown on the plans. It is the Contractor's responsibility to do whatever subsurface exploration required to submit a complete bid covering the cost of removal to the grades required.

The Contractor shall also cut and remove any tree roots encountered within construction limits to at least six (6) inches below the subgrade. All removal materials become the property of the Contractor and shall be hauled and disposed of properly outside of the roadway right-of-way.

5.04 Crushed Aggregate Base

Aggregate base shall conform to Section 200-2, 301-1, 301-2 and their subsections of the Standard Specifications and **County of Orange Public Works/RDMD** Standard Plan No. 1804.

Crushed aggregate base is anticipated for use at localized pavement, curb, gutter, sidewalk, and wheelchair ramp removal locations where soft, spongy, wet or otherwise unsuitable sub-grade is encountered. Since crushed

aggregate quantities are impossible to estimate at this time, the cost of crushed aggregate base is included in the lump sum bid cost.

5.05 Installation of Conduit

This section shall govern to furnish and install conduit of the type and sizes and installation method shown on the plans and as directed by the Engineer.

5.05.1 Requirements

1. The PVC Schedule 80 UL conduit shall be designed and engineered for direct burial or encased underground applications, and shall be installed at the pull box modification locations where conduit elbows are upgraded to sweeps, and at locations shown on the plans. Where the conduits enter pull boxes or splice vaults they shall be grouted to form a seal against the entry of soil. The PVC conduit shall be straight and the ends shall be cut square to the inside diameter. The PVC conduit system shall be designed so that straight sections and fittings will assemble without the need for, nor use of, lubricants or cement.

2. The high density polyethylene (HDPE) Schedule 80 UL continuous conduit shall be designed and engineered for direct burial, directionally drilled installation, or encased underground applications, and shall be installed at locations as shown on the plans. Where the conduits enter pull boxes or splice vaults they shall be grouted to form a seal against the entry of soil.

3. All conduits shall be free from defects including non-circularity, foreign inclusions, etc. It shall be nominally uniform (as commercially practical) in color, density, and physical properties.

4. If new conduit is being installed into an existing pull box location not designated for a new pull box, the Contractor shall protect the existing pull box and conduit(s) from damage. Should the existing pull box and/or conduit(s) become damaged, the Contractor shall repair and/or replace damaged pull box and conduit(s) at the cost of the Contractor and not the City. Prior to repair/replacement, the Contractor shall notify the City of exact location and contents of damaged pull box and conduit(s).

5. Special pavement markings shall be returned to existing conditions. If disturbed, the Contractor shall replace or repair any and all special pavement markings. All work shall be approved by the Engineer.

6. The Contractor shall obtain written approval from the Engineer before installing any conduit.

7. All conduits furnished, as part of the Contract shall be new, UL-listed, and meet NEMA and NEC requirements pertaining to electrical conduits and components.

5.05.2 PVC Schedule 80 Conduit Requirements

1. The PVC Schedule 80 conduit shall conform to NEMA TC-2 and UL 651 specifications.

2. The conduit shall have an extended 6" integral "bell" end.

3. The conduit shall have a circumferential ring on the spigot end, which shall be used to insure proper insertion depth when connecting conduit ends.

4. The conduit shall also be marked with data traceable to plant location, date, shift, and machine of manufacture.

5. A complete line of fittings, adapters, and bends (sweeps) shall be provided by the conduit manufacturer and shall be manufactured from the same materials and manufacturing process as the conduit. The complete system will allow for all these fittings: Coupling Kits, Manhole Terminator Kits, Lubrication Fittings, and Repair Kits.

6. The coupling body shall be factory assembled in the bell end of the conduit and shall be manufactured from a high impact engineered thermoplastic.

7. The coupling body shall include a factory assembled, multistage gasket that is anti-reversing, sealing the conduit.

8. New PVC conduit shall include one (1) green AWG#10 stranded wire for pull and trace wire. All wires entering pull box or splice vault shall be connected with wire nut.

9. Conduit shall be Carlon or Endot made or approved equivalent.

5.05.3 HDPE Schedule 80 Continuous Conduit Requirements

1. The HDPE Schedule 80 continuous conduit shall conform to NEMA TC-2 and UL651B.

2. Continuous HDPE conduit leading to splice vaults or pull boxes shall be terminated with a manufacture-produced terminator connector to seal the wall of the spice vault/pull box.

3. The conduit shall be color coded black.

4. The conduit shall also be marked with data traceable to plant location, date, shift, and machine of manufacture.

5. New HDPE conduit shall include one (1) green AWG#10 stranded wire for pull and trace wire. All wires entering pull box or splice vault shall be connected with wire nut.

6. Conduit shall be Carlon or Endot made or approved equivalent.

5.05.4 Conduit Installation

1. All conduits shall be installed at locations as shown on the plans, or as directed by the Engineer. Locations of proposed conduit are approximate and may be changed to suit field conditions as directed or approved by the Engineer. For conduit installation in street, conduit shall be installed next to the gutter to minimize the disruption of traffic. Conduit sizes shown on the plans shall be used.

2. Conduit shall be installed by trenching over box culvers and at the locations shown on the plans, unless specified otherwise by the Engineer. Trenching shall conform to Westminster Standard Drawing #609, Utility Excavation in the Public Right of Way.

3. Conduit shall be installed by directional drilling method at the locations shown on the plans, unless specified otherwise by the Engineers. Drilling pits shall be kept at least two (2) feet clear of the edge of any type of pavement wherever possible. Conduit alignment shall not location conduit under stamped pedestrian cross walks to prevent check pits in special pavement. Excessive use of water, such that pavement might be undermined or subgrade softened, will not be permitted.

4. Conduit shall be laid to a depth as shown on the plans. A minimum of thirty (30) inches of cover to the top of the conduit is required at all locations.

5. Conduit shall be placed in a manner to allow the cable/wire to be pulled in a straight line and clear the side of the pull box by at least two inches.

6. Where conduits are shown on the plans to be installed parallel and adjacent to each other, they shall be installed together in a common trench or directional drill bore.

7. Make right angle bends in conduit runs with long-radius elbows or conduits bent to radii not less than three (3) feet.

8. All bend radii shall be three (3) feet unless otherwise set forth elsewhere in this Special Provisions or as directed by the Engineer. The

sum of the angles for conduit bends between two consecutive pull boxes shall not exceed 270 degrees. All conduit bends shall be factory bends done by the manufacturer. Hot box or other field bends will not be accepted. The bell and spigot ends of each PVC conduit shall be chamfered by the manufacturer. Transition of the conduit without bends shall not exceed more than one foot for every ten feet.

9. Make bends and offsets so that the inside diameter of conduit is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.

10. Do not use diagonal runs except when specifically noted in the drawings.

11. New conduit shall contain a single #10 green wire. All #10 wires entering a pull box shall be joined by a wirenut.

12. Affix a waterproof label on each end of the pull rope/wire to indicate the destination of the other end.

13. Conduits entering vaults shall terminate flush with the inside walls of each pull box.

14. Conduits entering vaults and pull boxes shall be capped or sealed to prevent ingress of water, debris, and other foreign matters into the conduit.

15. Immediately prior to installing cables, conduits shall be blown out with compressed air until all foreign material is removed. After cables have been installed, the ends of conduits shall be sealed with a reusable mechanical plug insert (not cap).

16. Conduit and fittings shall be supplied with an ultraviolet inhibitor.

17. Within pull box, conduit shall be placed to provide a minimum vertical clearance of two (2) inches between the lowest portion of the opening and the bottom (“floor”) of the pull box. And there shall be a minimum vertical clearance of eight inches between the top portion of the conduit opening and the pull box lid.

18. Conduit shall enter the pull box at not more than a 45-degree upward angle. In addition, conduit may not be terminated less than 45 degrees to the ground level, except for pull boxes with extensions. Conduit ends shall be terminated three (3) inches above the gravel surface and nine (9) inches clearance between the top of the bushing and the top of the pull box shall be provided.

19. Within the splice vault, the conduit shall be laid no closer than two (2)

inches from any wall of the splice vault.

20. After conductors/cables have been installed, the exposed end of conduits remaining in pull boxes and controller cabinets shall be sealed with a sealing compound as approved by the Engineer.

5.05.5 Trenching

1. Trenching in Westminster right of way shall conform to Westminster Standard Plan No. 609.

2. Installation of conduit in unpaved areas (dirt) shall conform to the following:

   a. Conduit shall be placed in a trench approximately two (2) inches wider than the outside diameter of the conduit to be installed. Trench shall not exceed eight (8) inches in width. A minimum of thirty- (30) inches of cover to the top of the conduit is required. For all pull boxes the trench may be hand dug to required depth.

   b. Where cover to top of conduit is less than thirty- (30) inches, the conduit shall be placed in the bottom of the trench and the trench shall be backfilled with sand-cement slurry backfill, containing not less than two (2) sacks (188 pounds) of cement per cubic yard of Type I or II Portland cement added per cubic yard of imported sand and sufficient water for workability.

5.06 Cold Planing at Variable Depth

(Not applicable for this project)

Cold planing shall conform to the applicable portions of Section 302-5.2 of the Standard Specifications and these Special Provisions.

Cold planing shall be done at a depth as shown in plan.

If any existing curb and/or gutter is damaged during cold planning or milling operations, both the curb and gutter must be removed and replaced in sections no less than six (6) feet in length or as directed by the Engineer, at the contractor's expense.

The machine shall be self-propelled and designed for the varying cut. Water shall be used to control the dust from the operation, at the contractor's expense. Material deposit on the street shall be picked up and disposed off site by the contractor and the street surface shall be thoroughly cleaned.

Payment for Cold Planing at Variable Depth shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals,

removing and disposing of residue, and all the work involved in cold planning of asphalt concrete pavement, and no additional compensation shall be allowed.

5.07 Place Pavement Reinforcing Fabric

(Not applicable for this project)

Pavement reinforcing fabric materials and construction methods shall conform to **County of Orange Public Works/RDMD** Standard Plan No. 1808.

Payment for pavement reinforcement fabric shall be based on the theoretical widths called for on the plans subtract one (1) foot of the clearance and also will include additional areas as directed by the Engineer. If standard fabric widths and overlap requirements result in fabric being placed in excess of the areas shown on the plan, unless specifically directed by the Engineer, no additional compensation will be made for the excess fabric placed.

A small quantity of AC, to be determined by the Engineer, shall be spread over the fabric and rolled over immediately in advance of placing AC overlay in order to prevent fabric from being picked up construction equipment.

Payment for Place Pavement Reinforcing Fabric shall include full compensation for furnishing all labor, materials, tools, equipment incidentals and doing all work involved in placing the pavement reinforcing fabric. This includes sweeping, patching and preparing the existing surface, application of asphaltic binder and placement of the fabric, and no additional compensation shall be allowed.

5.08 Place Asphalt Concrete Pavement

All work shall conform to Section 302-5 and 400-4 of the Standard Specifications for Public Works (Green Book, latest edition, including any supplements), **County of Orange Public Works/RDMD** Standard Plan 1805, and these special provisions.

Asphalt concrete overlays (surface course) shall be Asphalt Concrete Type III C2-PG 64-10 conforming to the following:

a. The Contractor shall submit the final mix design to the City for approval prior to use.

b. The following layer of asphalt concrete shall not be spread when the underlying is above 150 degrees F.

c. The wet mixing cycle shall be fifty (50) seconds.

Asphalt concrete leveling courses (base course) shall be Type III B-PG 64-10. Tack coat shall be SS-1h emulsified asphalt.

Asphalt concrete shall be placed with a paving machine equipped with a Ski (Preco, Laser or equivalent) attachment for use in thickness control and smoother rideability. Asphalt concrete shall be laid in course not exceeding 4 inches in thickness unless directed by the Engineer.

All surfaces to be overlaid shall be cleaned by the use of an air-blower, water or by hand broom. The overlaid surface shall be free of water, dust, or foreign material before tack coat is applied. Payment for surface clean-up shall be included in the related items of work and no other compensation will be allowed.

At all locations where new asphalt concrete pavement is joining existing asphalt pavement, the Contractor shall saw-cut existing pavement to provide straight neat lines and place the new asphalt concrete to form a smooth transition.

Finished surface of the new pavement at the edge of the gutter shall be 3/8" higher than the edge of the gutter.

The Contractor shall be responsible for maintaining location of, and access to, all water line gate valves during construction operations. **All water and hydrant valves shall be marked & exposed within 24 hours after paving work.**

Initial or breakdown compaction shall consist of a minimum of three coverages of a layer of asphalt mixture. A pass shall be a movement of a roller in both directions over the same path. A coverage shall be as many passes as are necessary to cover the entire width being paved. Overlap between passes during any coverage made to ensure compaction without displacement of material in accordance with good rolling practice shall be considered a part of the coverage being made and not a part of a subsequent coverage. Each coverage shall be completed before subsequent coverages are started. Pneumatic rollers shall not be used without prior approval of the Engineer. The top layer of each lane, once commenced, shall be placed without interruption.

Payment for Place Asphalt Concrete work shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved in construction of asphalt concrete paving, including liquid and emulsified asphalt and asphalt concrete paving on miscellaneous areas requiring hand work, compaction, and all other necessary work. No other compensation will be allowed.

Temporary asphalt concrete work, where required by the Engineer for traffic control or other purposes, shall be considered included in the price bid for the various items of work and no additional compensation will be allowed.

SECTION 6 TRAFFIC SIGNAL SYSTEM INSTALLATION SPECIAL PROVISIONS

Installation of the modified traffic signal system, highway lighting, associated equipment, foundations, traffic striping, pavement markings, roadside signage and all associated work and material required to provide operation as shown on the plans, and payment therefore, shall conform to the provisions in the State of California Department of Transportation Standard Plans (CSP) and Specifications (CSS), latest edition, and all addendums thereto, these Special Provisions, the current City of Westminster Standard Plans, and the project plans.

The Contractor shall submit to the Engineer a progress schedule showing the proposed sequence of operations in the performance of the work. Loss of work for any cause during the period of time prior to the submission of the progress schedule will not be considered by the Engineer in his computations should time extension be requested. In addition, the Contractor shall submit a complete list of Sub-contractors who will perform work on this project and a list of all major material suppliers. No substitutions of any kind will be allowed, either of Sub-contractors or material suppliers, without written approval of the Engineer.

6.01 Equipment and Materials

Attention is directed to Section 6-1.05, "Trade Names and Alternatives", of the Caltrans Standard Specifications. The Engineer reserves the exclusive right to determine if proposed alternative equipment shall be acceptable.

Before the start of work, the Contractor shall furnish the Project Engineer with a statement from the vendors. Said statements shall state the date that any equipment ordered is shipped. The City shall not be liable for any delay to performance prior to delivery of these required submittals.

6.02 Equipment Lists and Drawings

Equipment lists and drawings of electrical equipment and material shall conform to the provisions in Section 86-1.03, "Equipment List and Drawings", and these Special Provisions.

The controller cabinet schematic wiring diagram and intersection sketch shall be combined into one drawing so that when the cabinet door is full open the drawing is oriented with the intersection. A minimum of four prints must be provided for each location.

The Contractor shall furnish two maintenance manuals for all auxiliary equipment, vehicle detector sensor units, control units, and amplifiers. The maintenance manual and operation manual may be combined into one manual. The maintenance manual or combined maintenance/operation manual shall be submitted at the time the controllers are delivered for testing or, if ordered by the Engineer, previous to purchase. The maintenance manual shall include, but need not be limited to, the following items:

a. Specifications

b. Design characteristics

c. General operation theory

d. Function of all controls

e. Trouble shooting procedure (diagnostic routine)

f. Block circuit diagram

g. Geographical layout of components

h. Schematic diagrams

i. List of replaceable parts with stock numbers

j. The heavy-duty plastic envelope specified in Section 86-1.03 shall be provided.

6.03 Plant Inspection

The production and assembly of systems required in these specifications shall at all times be subject to inspection and approval by the Engineer.

6.04 Samples

The Contractor shall submit for approval by the Engineer such materials or equipment components as may be required, whether mentioned specifically herein or not.

6.05 Standards, Steel Pedestals, and Posts

Structural design of steel poles and standards shall be determined by the manufacturer and shall be capable of safely sustaining all standard loadings.

All traffic signal poles, including mast arms and luminare arms shall have a galvanized polished finish.

6.06 Foundations

Foundations shall conform to the provisions of Section 86-2.03, "Foundations", these Special Provisions, and as indicated on the plans. The fifth paragraph in Section 86-2.03 is amended to read:

Cast-in-drilled-hole concrete pile foundations for traffic signal and lighting standards shall conform to the provisions in Section 49, "Piling", with the added requirements that standards shall not be erected until seven calendar days have elapsed after placing the concrete and that material resulting from drilling holes shall be disposed of as provided in Section 86-2.01, "Excavating and Backfilling."

Portland cement concrete may be produced from commercial quality aggregate and cement, and shall contain not less than six sacks of cement per cubic yard.

The presence of a shallow ground water table may result in excessive efforts in the installation of the subject foundations. This project bid shall include the cost to utilize corrugated steel Sonotubes, rather than a typical cardboard Sonotube. The corrugated steel Sonotube shall be used for the installation of all traffic signal poles, except Type 1A poles.

6.07 Conduit

Conduit shall conform to the applicable portions of the provisions in Section 86-2.05, "Conduit", and these Special Provisions.

All new buried conduits shall be Type 3, rigid, non-metallic, PVC, Schedule 80, conforming to UL Publication UL651 for rigid non-metallic conduit. Non-metallic bell end bushings, Carlon plus E997J or approved equal, are to be placed on the terminating ends of all conduits prior to installing the conductors.

Contractor shall pothole for the utility locations and depths within the project area. Conduit shall be installed 36 (thirty-six) inches below sidewalk and 30 (thirty) inches below street grade. Pull boxes for interconnect conduit shall be number 6 and 6E.
The utilities information for as-builts shall be provided to the Engineer.

Conduit runs shown on the construction plans are in schematic form only. Actual installation shall be done on the most direct manner except where directed otherwise on the construction plans.

After conductors have been installed, the ends of conduit termination in pull boxes and controller cabinets shall be sealed with an Agency-approved type of sealing compound.

Electrical Service Conduit

All conduits shall be Schedule 80 Electrical Grade PVC. All conduits shall be installed with ¼' poly pull rope and any sweeps and other appurtenances as required by Edison's specifications.

Conduit shall be installed 36 (thirty-six) inches below sidewalk and 30 (thirty) inches below street grade. Pull boxes for interconnect conduit shall be number 6 and 6E.

6.08 Conductors and Wiring

Conductors and wiring shall conform to the provisions in Section 86-2.08,

"Conductors", Section 86-2.09, "Wiring", and these Special Provisions.

Conductor cables shall be pulled into conduits by hand and the use of winches or other power-actuated pulling equipment will not be permitted. At least one foot of slack shall be left for each conductor at each signal or lighting standard, or combined standard, at least 6 (six) feet of slack at each pull box.

The epoxy insulated spring connector type splice and splice insulation specified in Section 86-2.09D, "Splicing", shall not be used on this project. Aluminum conductors shall not be substituted for copper. Conductors shall be spliced by the use of "C" shaped compression connectors. Splices in low voltage circuits (600 volts, maximum) shall be insulated as follows:

Two layers of oil and flame-resistant, self-fusing, synthetic rubber tape shall be applied half-lapped. Following application, the tape shall be rolled. After rolling, polyvinyl chloride tape, 0.007 inch minimum thickness with pressure-sensitive adhesive, shall be applied, half-lapped, to a thickness equal to the original insulation, after which the finished splice shall be painted with an electrical insulating compound.

All splicing shall be as per State of California Department of Transportation Standard Plans and Specifications.

Multi-conductor cable shall be used for Traffic Signal Field Wiring unless otherwise shown on construction plans. Refer to Section 6.24 in the Special Provisions for testing.

6.09 Interconnect Conduit and Pull Box

(Not applicable for this project)

Interconnect conduit shall be PVC Schedule 80 conduit with 45° sweeps indicated on the project plans. Interconnect conduit shall be installed 36 (thirty-six) inches below sidewalk and 30 (thirty) inches below street grade. Pull boxes for interconnect conduit shall be number 6 and 6E.

6.10 Connectors and Terminals

The following shall be added to §86-2.09C:

Compression-type terminals (spade or eyelet) shall not be permitted for termination on solid conductors.

All terminating blocks shall be manufactured by EDCO, part number TBLK-25 and COHP-030 or approved equal.

6.11 Global Positioning System Time Source Module

(Not applicable for this project)

6.12 Bonding and Grounding

Bonding and grounding shall conform to the provisions in Section 86-2.10, "Bonding and Grounding", and these Special Provisions.

Grounding jumper shall be attached by a 3/16 inch or larger brass bolt in the standard or pedestal and shall be run to the conduit or a ground rod in the adjacent pull box. Grounding jumper shall be visible after cap has been poured on foundation.

6.13 Service

(Not applicable for this project)

A Type III service shall conform to the provisions in Section 86-2.11, “Service”.

Safety lighting shall be unmetered and the signal and illuminated street name signs shall be metered. Provide 40-amp signal, 20-amp safety light, and 15-amp illuminated street name sign breakers.

The Contractor shall install Type III-BF service cabinet and coordinate with the SCE service planner to complete the installation of new meters or relocation of existing meters.

6.14 Traffic-Actuated Controller

(Not applicable for this project)

The Contractor shall furnish and install, latest Caltrans approved McCain Model 2070 controller with BiTran 2033 firmware, 8-line display, Ethernet capability, traffic signal controller assembly and all auxiliary equipment necessary to provide the intended operation, or approved equal. The Model 2070 traffic signal controller assembly shall conform to the latest Caltrans Transportation Electrical Equipment Specifications (TEES). The fourth paragraph of §86-3 of the CSS shall apply to Type 2070 traffic signal controller assemblies.

The Contractor shall provide a qualified technician from the manufacturer to assist on the day of the signal turn-on. Controller operation and preliminary timing shall be set by the field Engineer and the equipment manufacturer, subject to field adjustment instructions by the Engineer. Flasher units shall be set "red" on the intersections specified in the project.

6.15 Traffic-Actuated Controller Cabinet

(Not applicable for this project)

The solid-state traffic-actuated controller cabinet, auxiliary equipment, and

components shall conform to the provisions in Section 86-3.07, 3.08, and 3.09 of the Standard Specifications and these Special Provisions. The Contractor shall furnish McCain Model 333L Controller cabinet or approved equal. The cabinet shall meet all Caltrans and FHWA functional requirements to accommodate Caltrans approved 170 cabinet assembly. The cabinet shall also fit the foot print of the NEMA Type P cabinet.

The cabinet shall include 19" EIA rack to provide space for UPS and ITS applications, detector and preempt test switch panel, intersection display panel, communication panel, red monitoring kit, and cabinet diagnostic kit or prom.

The cabinet shall be aluminum, with standard anti-graffiti and natural color. The cabinet's main door shall be equipped with 3 points Corbin locks and an auxiliary door equipped with lock for police key. Two keys shall be furnished for each lock. Each police key shall have a shaft at least 4.445 centimeters in length.

The cabinet shall be provided with a fluorescent lighting fixture mounted on the inside top of the cabinet near the front edge. Fixture shall be provided with a cool white lamp operated from a normal power factor UL listed ballast. An "On-Off" switch shall be operated by opening and closing the cabinet door. Machine screws used for mounting equipment on door or walls of the cabinet shall have nuts on the side. Conduit shall enter the controller cabinet at the front. All cabinet switches and auxiliary equipment shall be labeled with permanent printed or engraved labels to match the phasing on the plans.

Testing of traffic signal equipment, including controller unit, fully-wired cabinet and auxiliary equipment as specified in Section 86-3.01, "Controllers", shall be performed by a qualified testing laboratory. Charges for testing will be paid for by the Contractor. The Contractor will deliver and pick up the equipment from the testing laboratory.

In the event traffic signal equipment submitted for testing does not comply with specifications, the Contractor shall remove said equipment for repair within five (5) working days after notification that the equipment is rejected. In the event the equipment is not removed within said period, it may be shipped to the Contractor at its expense.

The period of time between notification of the Contractor of equipment noncompliance until the corrected equipment is returned to the test site and the required retesting period shall not be considered part of the testing period. All testing subsequent to rejection of the equipment for failure to comply with specification requirements will be at the expense of the Contractor. Deductions to cover the cost of such testing will be made from any monies due or which may become due the Contractor under this contract.

Switches shall be provided in the common keyed outer panel of the cabinet

to accomplish the following functions by police, civil defense, and other personnel authorized to have a common key:

a. Signal power on/off

b. Signal conversion to flashing

With the signal flash switch in the "flashing" position, the controller unit shall remain energized.

After installing the new controller cabinet, the Contractor shall complete all new connections in the controller cabinet to provide fully operational traffic signal system per the Engineer's direction and as shown on construction plans.

6.16 Vehicle Detection

6.16.1 Detectors

Loop wire shall be Type 2.

Loop detector lead-in cable shall be Type B, unless specified otherwise on the plans.

Unless shown otherwise on the plans, all new loop detectors shall conform to Standard Plan ES-5B, Type E, except that the loops shall be 1.8 meters (6-foot diameter) and shall be spaced 3 meters (10-feet) apart in the direction of travel. The front loop shall be placed one (1) foot behind the limit line or the back crosswalk line.

Loop detector sealant shall be "Hot-Melt Rubberized Asphalt Sealant."

Loop detectors shall be installed (including sealant) on the same day in which the loop detector slots are cut.

The number of loop detector lead-in cables required to achieve the specified detection shall be installed.

No more than two loops shall be installed per home run. Loops shall be wired in series.

6.16.2 Video Detection System

For new traffic signal installations, the Contractor shall furnish and install Iteris Vantage Edge 2 Vehicle Detection Processors with RZ-4 Advanced Wide Dynamic Range COLOR cameras and Vantage Lens Adjustment Module with carrying case (type of case to be selected by the Engineer). All cablings and all appurtenances complete for all approaches to the intersection shall be included.

6.16.2.1 General

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

1. System Hardware
The video detection system shall consist of up to six COLOR video cameras, a video detection processor (VDP) capable of processing from one to six video sources and a pointing device; including poles, mounts, brackets and sun shields for eliminating glare.

2. System Software
The system shall include software that detects vehicles in multiple lanes using only the video image. Detection zones shall be defined using only an on board video menu and a pointing device to place the zones on a video image. Up to 144 detection zones shall be available. A separate computer shall not be required to program the detection zones.

6.16.2.2 Functional Capabilities

1. The VDP shall process video from up to 6 video sources simultaneously. The sources can be video cameras or S-VHS video tape players. The video shall be input to the VDP in RS170 format and shall be digitized and analyzed in real time. A separate microprocessor for each video input shall be used.

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

3. Detection zones shall be programmed via an on board menu displayed on a video monitor and a pointing device connected to the VDP. The menu shall facilitate placement of detection zones and setting of zone parameters or to view system parameters. A separate computer shall not be required for programming detection zones or to view system operation.

4. The VDP shall store up to three different detection zone patterns. The VDP can switch to any one of three different detection patterns within one (1) second of user request via menu selection with the pointing device.

5. The VDP shall detect vehicles in real time as they travel across each detection zone.

6. The VDP shall have an RS232 port for communications with an external computer. The VDP RS232 port shall be multi-drop capable.

7. The VDP shall accept new detection patterns from an external computer through the RS-232 port when the external computer uses the correct communications protocol for downloading detection patterns. A Windows™-based software designed for local or remote connection and providing video

capture, real-time detection indication and detection zone modification capability shall be provided with the system.

8. The VDP shall send its detection patterns to an external computer through the RS-232 port when requested when the external computer uses the correct communications protocol for uploading detection patterns.

9. The camera system shall be able to transmit an NTSC video signal, with minimal signal degradation, up to 1,000 (one thousand) feet under ideal conditions.

10. The associated VDP shall default to a safe condition, such as a constant call on each active detection channel, in the event of unacceptable interference with the video signal.

11. The system shall be capable of automatically detecting a low-visibility condition such as fog and respond by placing all defined detection zones in a constant call mode. A user-selected output shall be active during the low-visibility condition that can be used to modify the controller operation if connected to the appropriate controller input modifier(s). The system shall automatically revert to normal detection mode when the low-visibility condition no longer exists.

6.16.2.3 Vehicle Detection

1. Up to 144 detection zones shall be supported and each detection zone can be sized to suit the site and the desired vehicle detection region.

2. Detection zones shall be capable of being OR'ed or AND'ed together to indicate vehicle presence on a single detector output channel.

3. Placement of detection zones shall be done by using only a pointing device, and a graphical interface built into the VDP and displayed on a video monitor, to draw the detection zones on the video image from each video camera. No separate computer shall be required to program the detection zones.

4. Up to three (3) detection zone patterns shall be saved for each camera within the VDP memory and this memory shall prevent loss during power outages.

5. The selection of the detection zone pattern for current use shall be done through a menu. It shall be possible to activate a detection zone pattern from VDP memory and have that detection zone pattern available within one (1) second of activation.

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

7. Detection shall be at least 98% accurate in good weather conditions, with slight degradation possible under adverse weather conditions (e.g. rain, snow, or fog) which reduce visibility. Detection accuracy is dependent upon camera placement, camera quality and detection zone location, and these accuracy levels do not include allowances for occlusion or poor video due to camera location or quality.

8. The VDP shall provide 32 channels of detection outputs through either a NEMA TS1 port or a NEMA TS2 port.

9. The VDP shall provide dynamic zone reconfiguration (DZR). DZR enables normal operation of existing detection zones when one zone is being added or modified during the setup process. The VDP shall output a constant call on any detector channel corresponding to a zone being modified.

10. Detection zones shall be directional to reduce false detections from objects traveling in directions other than the desired direction of travel in the detection area.

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

12. Detection zone setup shall not require temporal information such as date and time.

13. The VDP shall process the video input from each camera using a separate microprocessor at thirty (30) frames per second.

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

15. Detection zone outputs shall be configurable to allow the selection of presence, pulse, extend, and delay outputs. Timing parameters of pulse, extend, and delay outputs shall be user definable between 0.1 to 25.0 seconds.

16. Up to six detection zones per camera view shall have the capability to count the number of vehicles detected. The count value shall be internally stored for later retrieval through the RS-232 port. The data collection interval shall be user definable in periods of 5, 15, 30 or 60 minutes.

6.16.2.4 VDP Hardware

1. The VDP shall be housed in a durable metal enclosure suitable for shelf mounting or 19" rack mounting in a roadside traffic equipment cabinet. The VDP enclosure shall not exceed 7" height, 17.75" width, and 10.5" depth. The VDP shall be modular in construction with plug in field replaceable units (FRU's) to minimize trouble-shooting and repair time.

2. The VDP shall operate satisfactorily in a temperature range from -34 °C to +74 °C and a humidity range from 0%RH to 95%RH, non-condensing as set forth in NEMA specifications.

3. The VDP shall be powered by 120 VAC 60 Hz single-phase power. Surge ratings shall be as set forth in NEMA specifications. Power consumption shall not exceed 135 watts.

4. The VDP shall include an RS232 port for serial communications with a remote computer. The VDP RS232 port shall be multi-drop capable. This port shall be a 9-pin "D" subminiature connector on the front of the VDP.

5. The VDP shall include ports for transmitting TS1 and TS2 detections to a traffic controller. The TS1 port shall be a 37-pin "D" connector on the front of the VDP. The TS2 port shall be a 15-pin "D" connector on the front of the VDP.

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

7. The front of the VDP shall include one BNC video output. Any one of the six video inputs shall be switch selectable for output on this BNC connection via the pointing device at the VDP, momentary push-button switch, or through software and a personal computer connected through the RS-232 multi-drop port via a full duplex modem link.

8. The video inputs to the VDP shall include transient voltage suppression and isolation. Amplification that shall assure the 1-volt peak to peak video signal integrity is maintained despite video cabling losses and externally induced transients. The amplifier shall have a minimum common mode rejection at 60 Hz of 90 dB.

9. The VDP enclosure shall include provisions to be bonded to a good earth ground.

10. The front face of the VDP shall contain indications, such as LED displays, to enable the user to view real time detections for up to eight (8) detector output channels at a time.

11. The VDP shall consist of functional modular field replaceable units (FRU's) to facilitate maintenance and expandability. Each camera video input shall be processed of a separate higher performance RISC processor.

12. Software upgrades shall not require replacement of EPROMS or other integrated circuits. Setup and programming data shall be retained in FLASH memory. Upgrades may be accomplished locally or remotely over appropriate communications means from a standard computer.

13. A seven (7) inch or higher handheld monitor and cables for local communication shall be provided with the system. The monitor shall include all necessary capabilities to aim the cameras to establish detection zones and shall include a carrying case.

6.16.2.5 Video Detection Camera

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

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

3. The camera shall use a CCD sensing element and shall output monochrome video with resolution of not less than 380 lines vertical and 380 lines horizontal.

4. The camera shall include an electronic shutter control based upon average scene luminance and shall be equipped with a factory adjusted manual iris.

5. The camera shall include a variable focal length lens with variable focus that can be adjusted, without opening up the camera housing, to suit the site geometry by means of a portable interface device designed for that purpose and manufactured by the detection system supplier. The horizontal field of view shall be adjustable from 8.1 to 45.9 degrees. A single camera configuration shall be used for all approaches in order to minimize the setup time and spares required by the user.

6. The camera electronics shall include AGC to produce a satisfactory image at night.

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

8. The camera enclosure shall be equipped with a sun shield or lens hood. The sun shield shall include a provision for water diversion to prevent water from flowing in the camera's field of view. The camera enclosure with sun shield shall be less than six (6) inches diameter, less than fifteen (15) inches long, and shall weigh less than six (6) pounds when the camera and lens are mounted inside the enclosure.

9. The camera enclosure shall include a thermostatically controlled heater to assure proper operation of the lens shutter at low temperatures and

prevent moisture condensation on the optical faceplate of the enclosure.

10. When mounted outdoors in the enclosure, the camera shall operate satisfactorily in a temperature range from -34 °C to +60 °C and a humidity range from 0% RH to 100% RH.

11. The camera shall be powered by 120-240 VAC 50/60 Hz. Power consumption shall be 15 watts or less under all conditions.

12. Recommended camera placement height shall be thirty-three (33) feet (or ten [10] meters) above the roadway, and over the traveled way on which vehicles are to be detected. For optimum detection the camera should be centered above the traveled roadway. The camera shall view approaching vehicles at a distance not to exceed 350 feet for reliable detection (height to distance ratio of 10:100). Camera placement and field of view (FOV) shall be unobstructed and as noted in the installation documentation provided by the supplier.

13. It is the Contractor and manufacturer's responsibility to mount the camera in a manner that ensures full functionality of the system. Verification on the traffic signal pole schedule is required. No not assume that the camera units will be mounted on traffic signal poles with luminare arms. In the absence of luminare arms, mast arm mounting will be necessary. The material shall be provided by the Contractor, at no additional expense to the City. The installation details are to be provided by the manufacturer.

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

15. The video signal output by the camera shall be black and white in RS170 or CCIR format.

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

6.16.2.6 EdgeConnect Remote Communications Module

The EdgeConnect quad-view remote communications module shall provide both local and remote management of data and video over Ethernet, enabling system operators to manage their video detection systems by allowing the user to view real-time video.

The Contractor shall provide eight (8) EdgeConnect quad-view remote communications modules.

Standard features include:

1. MPEG4/H.264 video compression

2. Plugs into any standard detector rack that provides 12 or 24 volts of DC

3. Accommodates up to four video source inputs

4. Accommodates up to four expansion devices

5. 10/100 Base-T Ethernet Port

6. Web browser set up and support

7. USB and trackball mouse support

8. EIA-232 Serial communications port

9. High intensity LED status indicators

6.16.2.7 Rack Mount LCD Monitor Drawer

The rack mount LCD monitor shall install into traffic cabinets providing rapid or permanent access to a monitor for viewing and configuration purposes. It shall fold flat when not in use and be hinged to allow optimum viewing. The drawer shall be lockable to prevent unauthorized access. The monitor shall be capable of supporting computer resolutions up to 1280 x 1024 pixels as well as displaying video signals meeting NTSC or PAL composite video and S-video standards.

6.16.2.8 Installation

1. The coaxial cable to be used between the camera and the VDP in the traffic cabinet shall be Belden 8281 or a 75 ohm, precision video cable with 20 gauge solid bare copper conductor (9.9 ohms/M), solid polyethylene insulating dielectric, 98% (min) tinned copper double-braided shield and black polyethylene outer covering. The signal attenuation shall not exceed 0.78 dB per 100 feet at 10 MHz. Nominal outside diameter is 0.304 inches. The coax cable shall be a continuous unbroken run from the camera to the VDP. This cable shall be suitable for installation in conduit or overhead with appropriate span wire. 75-ohm BNC plug connectors should be used at both the Camera and Cabinet ends. The coaxial cable, BNC connector, and crimping tool shall be approved by the supplier of the video detection system, and the manufacturer's instructions must be followed to ensure proper connection.

2. The power cabling shall be 16 AWG three conductor cable. The cabling shall comply with the National Electric Code, as well as local electrical codes. Cameras may acquire power from the luminaire if approved by the engineer.

3. The Contractor shall be responsible for contacting the video detection equipment supplier to arrange a mutually acceptable schedule for a certified technician to be on-site to set up the final camera field of view. The Contractor shall provide support for the video technician until the technician certifies that final camera placement is acceptable.

4. After component installation, the Contractor shall contact the video detection system supplier to arrange the setup of the video system for operation. The video detection system shall be set up for operation by supplier factory certified installers.

6.16.2.9 Limited Warranty

1. The supplier shall provide a limited two-year warranty on the video detection system. See suppliers standard warranty included in the Terms and Conditions of Sale documentation.

2. During the warranty period, technical support shall be available from the supplier via telephone within four (4) hours of the time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers.

3. During the warranty period, updates to VDP software shall be available from the supplier without charge.

6.16.2.10 Maintenance and Support

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

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

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

4. All product documentation shall be written in the English language.

6.17 Pedestrian Traffic Signal Module

The pedestrian traffic signal countdown module shall be manufactured by GE Lumination; the system shall be the CA MUTCD and ITE compliant, GE Lumination Model #PS7-CFF1-26A (16 inch x 18 inch) or approved equal. The purpose of this specification is to provide the minimum

performance requirements for the LED "walking person" and "hand" icon pedestrian signal modules with countdown (hereafter called module or modules). This specification is only for the nominal overall message-bearing surface of 406 x 457 mm (16 x 18 in). This specification refers to definitions and practices described in "Pedestrian Traffic Control Signal Indications" published in the *Equipment and Materials Standards of the Institute of Transportation Engineers*, (referred to in this document as "PTCSI") and in the Applicable Sections of Manual on Uniform Traffic Control Devices (MUTCD) 2003 Section 4E. This purchasing specification applies to modules purchased after the effective date of these specifications.

6.17.1 Physical and Mechanical Requirements

Modules designed as retrofit replacements for existing pedestrian signal indication lamps shall not require special tools for installation. Retrofit replacement modules shall fit into existing pedestrian signal housings built for the PTCSI sizes stated in Section 7.01 of the "walking person" and "hand" icon pedestrian signal indication Standard without modification to the housing.

Installation of a retrofit replacement module into an existing pedestrian signal housing shall only require the removal of the existing optical unit components, i.e., lens, lamp module, gaskets, and reflector; shall be weather tight and fit securely in the housing; and shall connect directly to existing electrical wiring.

6.17.2 The Module Under Physical and Mechanical Requirements

1. The retrofit module shall be capable of replacing the optical component of the pedestrian indication.

2. The LED module shall have a visual appearance similar to that of an incandescent lamp (i.e.: smooth and non-pixilated).

3. The module lens shall not be a replaceable part. Screwed on lenses are not allowed. Only modules with internal mask shall be utilized. No external silk-screen shall be permitted.

4. The dividers inside the module that make up the icons and digits shall be black so as to eliminate sun phantom effect. When not illuminated with the sun shining into the module, the WALKING PERSON and UPRAISED HAND and COUNTDOWN DIGITS shall not be readily visible.

5. The countdown digits of the pedestrian signal module shall be located adjacent to the associated UPRAISED HAND (symbolizing DON'T WALK). When displaying a number "1" for both digits, the number "1" shall use the two segments furthest to the right. The digits shall remain on during the entire count down cycle. Flashing digits are not allowed.

6. The display of the number of remaining seconds shall begin only at the beginning of the pedestrian change interval. After the countdown displays zero, the display shall remain dark until the beginning of the next

countdown.

7. The walking person, hand icons and countdown digits (16"x18" size only) shall be incandescent looking. The configurations of the walking person icon, hand icon and numbers icons are illustrated in **Figures 1, 2** (per PTCSI Part 2 Specification) **and Figure 3**, respectively.

Figure 1

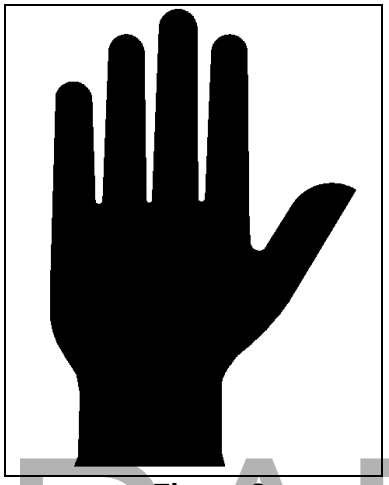


Figure 2

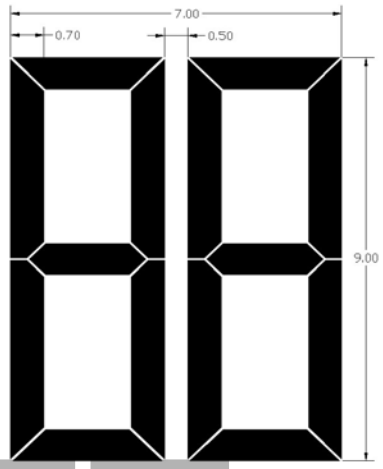


Figure 3

Dimensions for Figures 1, 2 and 3, for each nominal message bearing surface (module) size, use the corresponding minimum H (height) and W (width) measurements:

Module Size	Icon Height	Icon Width	Countdown Height	Countdown Width	Countdown Segment Width
406 x 457 mm (16 x 18 in)	297 mm 11 in	178 mm 7 in	229 mm 9 in	178 mm 7 in	17.78 mm 0.7 in

Note: The units shall not have any external attachments, dip switches, toggle switches or options that will allow the mode to be changed from counting the clearance cycle, to the full walk/don't walk cycle or any other modification to the icons or digits.

6.17.3 Environmental Requirements

1. All exposed components of a module shall be suitable for prolonged exposure to the environment, without appreciable degradation that would interfere with function or appearance. As a minimum, selected materials shall be rated for service for a period of a minimum of 60 months in a south-facing Arizona Desert installation.

2. The module shall be rated for use in the ambient operating temperature range, measured at the exposed rear of the module, of -40°C to +74°C. (-40°F to +165°F)

3. A module shall be protected against dust and moisture intrusion, including rain and blowing rain. Shall be sealed and meet MIL-STD-810F

Procedure I, Rain & Blowing Rain specifications.

4. The module lens shall not crack, craze or yellow due to solar UV irradiation typical for a south-facing Arizona Desert installation after a minimum of 60 months in service.

6.17.4 Construction

1. To prevent water seepage between the back cover and the electrical wires, or between the copper and insulation of the wires, the electrical wires shall not penetrate the LED module housing. Connection shall be made by use of an overmolded connector.

2. The module shall be a single, self-contained device, not requiring on-site assembly for installation into an existing pedestrian signal housing. The power supply shall be designed to fit and mount inside the pedestrian signal module.

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

6.17.5 Materials

1. Materials used for the lens and LED module construction shall conform to ASTM specifications where applicable.

2. Enclosures containing the power supply and electronic components of the LED module shall be made of UL94 flame retardant materials. The lens of the LED module is excluded from this requirement.

3. The front window shall be a transparent polycarbonate material with internal masking to prevent the icons and digits from being visible when not in operation. External masking or silk-screen technology shall not be permitted. When not illuminated, the Walking Person, Hand and Countdown Digits shall not be readily visible.

6.17.6 Module Identification

1. Each module shall be identified on the backside with the manufacturer's name, model, serial number and operating characteristics of each symbol. The operating characteristics identified shall include the nominal operating voltage and stabilized power consumption, in watts and Volt-Amperes.

2. Modules conforming to this specification (WALKING PERSON, UPRAISED HAND only), may have the following statement on an attached label: "Manufactured in Conformance with the ITE Pedestrian Traffic Control Signal Indications - Part 2: Light Emitting Diode (LED) Pedestrian Signal Modules".

6.17.7 Luminance, Uniformity & Distribution

1. For a minimum period of 60 months, the maintained minimum luminance values for the modules under the operating conditions defined in Sections 7.04 and 7.11, when measured normal to the plane of the icon surface, shall not be less than:

a. Walking person: 2,200 cd/m^2

b. Hand: 1,400 cd/m^2

c. Countdown digits: 1,400 cd/m^2

2. The luminance of the emitting surface, measured at angles from the normal of the surface, may decrease linearly to a value of 50% of the values listed above at an angle of 15 degrees.

3. The light output requirements in this specification apply to pedestrian signal heads without any visors, hooded or louvered (egg-crate).

4. The LED module shall have a visual appearance similar to that of an incandescent lamp (i.e.: Smooth and non-pixilated).

5. Maximum Permissible Luminance: When operated within the temperature range specified in Section 7.04, the actual luminance for a module shall not exceed three times the required peak value of the minimum maintained luminance.

6. Luminance Uniformity: The uniformity of the signal output across the emitting section of the module lens (i.e. the hand, person or countdown icon) shall not exceed a ratio of 5 to 1 between the maximum and minimum luminance values (cd/m^2).

6.17.8 Chromaticity

1. The standard colors for the LED Pedestrian Signal Module shall be White for the walking person and Portland Orange for the hand icon and the countdown digits. The colors for these icons shall conform to the following color regions, based on the 1931 CIE chromaticity diagram:

Walking Person —White:

Blue boundary: $x = 0.280$.
1st Green boundary: $0.280 \leq x < 0.400$
$y = 0.7917 \cdot x + 0.0983$.
2nd Green boundary: $0.400 \leq x < 0.450$
$y = 0.4600 \cdot x + 0.2310$.

Yellow boundary: $x = 0.450$
1st Purple boundary: $0.450 \le x < 0.400$
$y = 0.4600 \cdot x + 0.1810$.
2nd Purple boundary: $0.400 \le x < 0.280$
$y = 0.7917 \cdot x + 0.0483$.

White		
Point	**x**	**y**
1	0.280	0.320
2	0.400	0.415
3	0.450	0.438
4	0.450	0.388
5	0.400	0.365
6	0.280	0.270

Hand and Countdown Digits—Portland Orange:

Yellow boundary: $y = 0.390$

White boundary: $0.600 \le x \le 0.659$
$y = 0.990 - x$

Red boundary: $y = 0.331$.

Portland Orange		
Point	**X**	**Y**
1	0.609	0.390
2	0.600	0.390
3	0.659	0.331
4	0.669	0.331

2. **Color Uniformity:**

Walking Person—White: $\sqrt{(\Delta x^2) + (\Delta y^2)} \le 0.04$
Where Δx and Δy are the differences in the chromaticity coordinates of the measured colors to the coordinates of the average color, using the CIE 1931 Chromaticity Diagram and a 2 degree Standard Observer.

Hand and Countdown Digits—Portland Orange:
The dominant wavelength for any individual color measurement of a portion of the emitting surface of a module shall be within ±3nm of the dominant wavelength for the average color measurement of the emitting surface as a whole.

6.17.9 Electrical

All wiring and terminal blocks shall meet the requirements of Section 13.02 of the VTCSH Standard. Maximum of three secured, color

coded, 1 meter (39 in) long 600 V, 16 AWG minimum, jacketed wires, conforming to the National Electrical Code, rated for service at +105°C, are to be provided for electrical connection. The conductors shall be color coded with orange for the hand, blue for the walking person and white as the common lead.

6.17.10 Voltage

1. LED modules shall operate from a 60 ± 3 Hertz ac line power over a voltage range from 80 to 135 VAC RMS.

2. Nominal operating voltage for all measurements shall be 120 ± 3 VAC RMS.

3. Fluctuations in line voltage over the range of 80 to 135 VAC RMS shall not affect luminous intensity by more than ± 10 %.

4. Catastrophic failure of one LED light source in Man & Hand icons shall not result in the loss of more than the light from that one LED.

5. To prevent the appearance of flicker, the module circuitry shall drive the LEDs at frequencies greater than 100 Hz when modulated, or at DC, over the voltage range specified in Section 7.11.

6. Low Voltage Turn Off: There should be no illumination of the module when the applied voltage is less than 35 VAC RMS. To test for this condition, each icon must first be fully illuminated at the nominal operating voltage. The applied voltage shall then be reduced to the point where there is no illumination. This point must be greater than 35 VAC RMS.

7. Turn-ON and Turn-OFF Time: A module shall reach 90% of full illumination (turn-ON) within 75 msec of the application of the nominal operating voltage. The signal shall cease emitting visible illumination (turn-OFF) within 75 msec of the removal of the nominal operating voltage.

8. Default Condition: For abnormal conditions when nominal voltage is applied to the unit across the two-phase wires (rather than being applied to the phase wire and the neutral wire) the pedestrian signal unit shall default to the hand symbol.

9. Icon Power Supplies: LED pedestrian countdown modules shall have two separate power supplies for powering the Walking Person and Upraised Hand icons. The circuitry shall be unrelated to power the LED Walking Person icon and the LED Upraised Hand icon, in order to virtually eliminate the risk of displaying the wrong icon.

6.17.11 Transient Voltage Protection

The on-board circuitry of a module shall include voltage surge protection:

1. To withstand high-repetition noise transients and low-repetition high-energy transients as specified in NEMA Standard TS-2 2003; Section 2.1.8.

2. Section 8.2 IEC 1000-4-5 & Section 6.1.2 ANSI/IEEE C62.41.2-2002, 3kV, 2 ohm.

3. Section 8.0 IEC 1000-4-12 & Section 6.1.1 ANSI/IEEE C62.41.2-2002, 6kV, 30 ohm.

6.17.12 Electronic Noise

The LED signal and associated on-board circuitry shall meet the requirements of the Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise by Class A digital devices.

6.17.13 Power Factor (PF) and AC Harmonics

1. The modules shall provide a power factor of 0.90 or greater when operated at nominal operating voltage and 25 º C (77ºF).

2. Total harmonic distortion induced into an AC power line by the module, operated at nominal operating voltage, and at 25ºC (77ºF) shall not exceed 20%.

6.17.14 Controller Assembly Compatibility

1. The current draw shall be sufficient to ensure compatibility and proper triggering and operation of load current switches and conflict monitors in signal controller units.

2. Off State Voltage Decay: When the module is switched from the On state to the Off state the terminal voltage shall decay to a value less than 10 VAC RMS in less than 100 milliseconds when driven by a maximum allowed load switch leakage current of 10 milliamps peak (7.1 milliamps AC).

6.17.15 Constant Current Drive

The countdown digits shall be driven by constant current to improve LED efficiency and lifespan.

6.17.16 Power Consumption

Maximum power consumption requirements for the modules are as follows:

25°C

"Hand"	11.0 Watts
“Walking Person”	8.0 Watts
"Count-Down Display"	6.0 Watts (when display shows “88”)

6.17.17 Cycle

1. The module shall operate in one mode: Clearance Cycle Countdown Mode Only.

2. The module shall start counting when the flashing don’t walk turns on and will countdown to “0” and turn off when the steady “Don’t Walk” signal turns on.

3. The module shall not have user accessible switches or controls for the purpose of modifying the cycle, icons or digits.

6.17.18 Learning Cycle

At power on, the module enters a single automatic learning cycle. During the automatic learning cycle, the countdown display shall remain dark.

6.17.19 Cycle Modification

The unit shall re-program itself if it detects any increase or decrease of Pedestrian Timing. The digits shall go blank once a change is detected and then take one complete pedestrian cycle (with no counter during this cycle) to adjust its buffer timer.

6.17.20 Recycling

The module shall allow for consecutive cycles without displaying the steady Hand icon (“Don’t Walk”).

6.17.21 Pre-Emption

The module shall recognize preemption events and temporarily modify the crossing cycle accordingly.

1. If the controller preempts during the walking man, the countdown shall follow the controller's directions and shall adjust from walking man to flashing hand. It shall start to count down during the flashing hand.

2. If the controller preempts during the flashing hand, the countdown shall continue to count down without interruption.

The next cycle, following the preemption event, shall use the correct, initially programmed values. This specification is worded such that the flashing don’t walk time is not modified.

6.17.22 “Don’t Walk” Steady

If the controller output displays Don't Walk steady condition or if both the hand/person go dark and the unit has not arrived to zero, the unit suspends any timing and the digits shall go dark.

6.17.23 Power Outage

The digits will go dark for one pedestrian cycle after loss of power of more than 2.0 seconds.

6.17.24 Digit Operation

The digits shall remain continuously lit during the clearance cycle and shall not flash in conjunction with the Hand/Don't Walk icon.

6.17.25 Quality Assurance

Unless otherwise specified all of the test will be conducted at an ambient temperature of 25°C and at the nominal operating voltage of 120 VAC RMS.

1. The modules shall be manufactured in accordance with a vendor quality assurance (QA) program.

2. QA process and test result documentation shall be kept on file for a minimum period of seven years.

6.17.26 Conformance

The module designs not satisfying design qualification testing and the production quality assurance testing performance requirements shall not be labeled, advertised, or sold as conforming to this specification.

6.17.27 Design Qualification Testing

1. Design Qualification testing shall be performed on new module designs, and when a major design change has been implemented on an existing design.

2. High Temperature High Humidity (HTHH): 1000 hours at +60°C (+140°F), 90% Relative Humidity with cycling starting at 30 down to 0. This will ensure that each symbol is properly tested.

3. Unless otherwise specified, all of the tests shall be conducted on the same set of randomly selected modules, hereafter called the sample set, at an ambient temperature of 25°C and at the nominal operating voltage of 120 VAC RMS.

4. Testing shall be performed once every 5 years or when the module design or LED technology has been changed. The module manufacturer shall retain test data for a minimum period of 7 years and for a period of at least 5 years

beyond the last date of manufacture of that model type.

5. Conditioning: The module shall be energized for a minimum of 24 hours in an ambient temperature of +60°C (+140°F), 0% Relative Humidity with cycling starting at 99 down to 0. This will ensure that each symbol is properly conditioned.

6. Mechanical Vibration: Mechanical vibration testing shall be performed per MIL-STD-883, Test Method 2007.

7. Temperature Cycling: Temperature cycling shall be performed per MIL-STD-883, Test method 1010. The temperature range shall include the full ambient operating temperature range specified in Section 7.04.

8. Moisture Resistance: Moisture resistance testing shall be performed per MIL-STD-810F, Test Method 506.4, Procedure I, Rain and Blowing Rain. The test shall be conducted on stand-alone modules, without a protective housing. The modules shall be vertically oriented, such that the lens is directed towards the wind source when at a zero rotation angle. The modules shall be energized throughout the test. The water shall be at 25° ± 5°C (77° ± 9°F). The wind velocity shall be 80 km/hr (50 mph).

6.17.28 Warranty

Manufacturers will provide the following warranty provisions. Replacement or repair of an LED signal module that fails to function as intended due to workmanship or material defects within the first 5 years (60 months) from the date of delivery.

6.18 Pedestrian and Bicycle Push Buttons

All new Pedestrian and Bicycle push button assemblies shall be Polara “Bulldog” push button, color black (or approved equal), Type B and ADA compliant. Pedestrian push button assemblies shall be furnished with a Caltrans R62D sign and the sign shall be installed on the Pedestrian push button assembly with stainless steel tamper-proof screws. Bicycle push button assemblies shall be furnished with a Caltrans R62C sign and the sign shall be installed on the Bicycle push button assembly with stainless steel tamper-proof screws.

6.19 Pull Boxes

All new traffic signal pull boxes shall be plastic, except where noted otherwise on the plans. All new traffic signal pull box extensions shall be plastic, except where noted otherwise on the plans. All traffic signal new pull box lids shall be plastic, except where noted otherwise on the plans. Pull box lid bolt-down hardware shall be required unless noted otherwise on the plans. All new pull boxes shall be No. 5 with 45° sweeps unless noted otherwise on the plans. All new pull box extensions shall be eight (8) inches deep. New pull boxes and pull box lids shall be the following Christy

Concrete Products, Inc., or approved equal:

Pull Box Size	Pull Box (Christy Concrete Products, Inc., Catalog No.)	Pull Box Lid (Christy Concrete Products, Inc., Catalog No.)
3-1/2	FL9	FL9D
5	FL30	FL30D
6	FL36	FL36D
TRAFFIC RATED PULL BOXES		
3-1/2	B1017	B1017-61JH
5	B1324	B1324-61JH
6	B1730	B1730-51JH

For the interconnect pull boxes, cover marking shall be marked "Traffic Signal-Fiber Optic" and conforming to Caltrans Standard Plan ES-8, "Pull Box Details," Note 4-a.5 and b.10, shall not be used.

Where the sump of an existing pull box is disturbed by the Contractor's operations, the sump shall be reconstructed and, if the sump was grouted, the old grout shall be removed and new grout placed. Where the sump of an existing non-grouted pull box is disturbed by the Contractor's operations, the sump shall be reconstructed and new grout and roofing paper shall be placed as described above.

No new or existing pull box shall be located in or within one (1) foot of any wheelchair ramp.

6.20 Safety Lighting

Unless otherwise indicated on the plans, all safety lighting shall consist of 250 watt, 120 volt, 27,500 lumen high pressure sodium vapor lamps mounted at a height of thirty-five (35) FEET above the pavement surface plus or minus twelve (12) inches. All luminaries shall have integral ballasts and/or integral power supplies that are mounted and wired with quick disconnect hardware and wiring for module type replacement.

All luminaries shall be of the 90 degree cut-off type and the desired lighting pattern will be M-S-III (I.E.S. type). Photoelectric controls shall be Type IV and shall conform to the provisions in Section 86.6.07, "Photoelectric Controls", and these Special Provisions. Each luminaire shall be provided with an integrally mounted plug-in photoelectric cell.

6.21 LED Light System for IISNS

6.21.1 General

The LED light system shall be manufactured by Illumecon LLC or approved

equal.

This specification sets forth the minimum requirements for a LED light system for use with internally illuminated street name signs as defined by Caltrans Standards Section 86-6.065. LED light systems compliant to this specification shall be provided to accommodate either single or double-sided IISNS in 6 ft. and 8 ft. lengths as directed by the Engineer.

6.21.2 General Specifications

1. The LED light system shall be a fully operational unit consisting of a lightweight aluminum extruded frame, LED modules attached to the frame and wired to the power converter.

2. The LED light system mounting pins shall be sized and spaced to fit into the existing fluorescent sockets of the IISNS and will not require assembly or tools for insertion.

3. The LED system shall produce a minimum output of 2184 lumens for a 6 foot and 2808 lumens for an 8 foot directed fully at the IISNS sign faces.

4. The LED light system power consumption shall not exceed 40 watts for a 6 foot size and 50 watts for the 8 foot size.

5. The LED light system shall not require the use of an additional or external diffuser to disperse light.

6. The LED light modules shall not be encased in plastic tubing.

7. The LED modules and Class 2 power supply/power converter shall be IP-67 rated.

8. The LED system shall have been installed in an IISNS in the field for over 12 months (references required).

9. The LED system shall be prequalified with the City of Westminster prior to the bid.

10. As part of the prequalification process the LED system shall have been installed in the city for a period of not less than 60 days.

11. The LED light system and transformer shall have a 5 year warranty.

12. The LED light system shall be assembled in California.

6.21.3 Class 2 Power Converter

1. The Class 2 power converter shall be waterproof IP-67 rated, UL recognized component, compliant to CE standards, and Rohs compliant.

2. The Class 2 power converter shall be 7.9 x 1.73 x1.57 inches – weight 20.2 ounces.

3. The Class 2 power converter shall maintain output voltage 24V (24-26.4V), Input Voltage 100-277V 50/60Hz, Load 1-60VA.

4. The Class2 power converter shall provide efficiency >87%.

5. Shall be manufactured in an ISO 9001 facility.

6.21.4 LED Modules

1. The LED modules shall be IP-67 rated, UL certified, CE conformity, and Rohs compliant.

2. The LED modules shall have a 120 degree viewing angle.

3. The LED modules shall be available in single or double sided.

4. The LED modules shall include LED's rated for 90,000 hours.

5. The LED modules shall work in an operating temperature of from -20C to + 70C.

6. Shall be manufactured in a ISO 9001 facility.

6.21.5 Description of Work

The LED light system shall be installed in new IISNS as specified in the plans. It is the Contractor's responsibility to furnish and install all necessary cabling to complete the connection between the LED light system and IISNS housing.

6.22 Internally Illuminated Street Name Signs

6.22.1 General

The IISNS shall be manufactured by McCain, Inc. or approved equal.

This specification sets forth the minimum requirements for an IISNS as defined by Caltrans Standards Section 86-6.065. IISNS compliant to this specification shall be provided to accommodate either single or double-sided IISNS in 6 ft. and 8 ft. lengths as directed by the Engineer.

IISNS shall conform to the details shown on the plans. The general design of signs shall be as shown on the plans. Minor details of construction shown

are typical and may be modified subject to approval by the Engineer.

The sign fixture shall be designed and constructed to prevent deformation or failure when subjected to 70 mph wind loads in conformance with the requirements in the AASHTO publication, "Standard Specifications for Structural Supports of Highway Signs, Luminaires and Traffic Signals," and amendments thereto. A Certificate of Compliance conforming to the provisions in Section 6-1.07 of Caltrans Standard Specifications, "Certificates of Compliance," shall be submitted by the manufacturer with each lot of IISNS. The certificate shall state that the IISNS meets the wind load requirements as described above.

6.22.2 General Specifications

All material used in fabrication shall be new. If not covered herein, both the material and workmanship shall be of the best quality consistent with the intended purpose. All ferrous parts shall be galvanized or cadmium plated, unless otherwise specified herein or shown otherwise on the plans.

Signs shall be Type A.

The top and bottom shall be formed or extruded aluminum and shall be attached to formed or cast aluminum end fittings. The design shall provide continuous sealing between top and bottom assemblies and the end fittings. The housing shall be rigidly constructed to resist torsional twist and warp. Provisions shall be made for ease of maintenance of all components. The opening or removal of one panel shall permit access to the interior of the sign and allow for replacement or service of the LED light system.

- Photoelectric unit sockets will not be allowed.

- The Type A signs, both sides shall be hinged at the top to permit installation or removal of the sign panels, and to permit access to the interior of the sign.

6.22.3 Gaskets

The Type A sign gaskets shall be installed between the sign panel frame and the fixture housing to prevent the entrance of water between the frame and the fixture housing. Gaskets shall be uniform and even textured and shall be the closed cell, sponge neoprene type, designed for use at temperatures between -20°C and +74°C.

Gaskets shall be neatly applied to thoroughly degreased, clean surfaces with a suitable heat-resistant adhesive which will not allow the gaskets to slip at temperatures between -20°C and +74°C.

6.22.4 Lampholders

Lampholders shall be listed by UL or ETL for outdoor use, shall be provided

with silver coated contacts and waterproofed entrance leads for use with a rapid-start fluorescent lamp. These lamp holders shall be for the LED light system to mechanically fit into for position and shall be spaced at 6 inches center to center. Each lampholder shall be provided with a heat-resistant, circular cross section, partially recessed neoprene ring to seal against the lamp ends and protect electrical contacts from moisture and dirt or other injurious elements.

One lampholder for each lamp shall be of the spring-loaded type. The distance between the face of the lampholders for each lamp shall provide a compression of at least 0.10-inch on the spring-type lampholder when the lamp is in place. The lamp shall have positive mechanical and electrical contact when the lamp is in place. The socket on the spring-type lampholder shall have sufficient travel to permit installation of the LED light system. Springs for lampholders shall not be part of the current carrying circuit. Lampholders shall match lamp requirements and shall not increase cathode filament circuit resistance by more than 0.10-Ω.

6.22.5 Terminal Blocks

All wiring connections in the fixture shall be terminated on molded, phenolic, barrier type, terminal blocks rated at 15 A, 1,000 V, and shall have integral type, white, waterproof marking strips. All current carrying parts of the terminal block shall be insulated from the fixture with integral plugs or strips to provide an insulating value in excess of the line-to-ground flashover voltage. If the Contractor elects to use sectionalized terminal blocks, each section shall be provided with an integral barrier on each side and shall be capable of rigid mounting and alignment. Terminal screws shall be size No. 10, minimum.

6.22.6 Weep Holes

Screened weep holes shall be provided at strategic locations in all members subject to the collection of moisture. Weep holes shall be shielded to prevent light leakage from the fixture.

6.22.7 Fasteners

All fasteners, screws and hardware shall be of passive stainless steel (Type 302 or 304) or aluminum Type 6060-T6.

6.22.8 Mounting Assemblies

The top of the fixture housing shall have 2 free-swinging mounting brackets. Each of the brackets shall be adjustable vertically for leveling the sign to either a straight or curved mast arm. The bracket assembly shall permit the fixture to swing perpendicular to the sign panel.

Hinge pins for the free-swinging brackets shall have a minimum diameter of $^1/_2$ inch.

At least 16 feet of clearance shall be provided between the bottom of the fixture and the roadway.

6.22.9 Weight

The total weight of the complete sign assembly, including lamps, ballasts, mounting brackets and appurtenances shall not exceed 65 pounds.

6.22.10 Conductors

All fixture conductors shall be UL or ETL listed appliance wiring material (AWM) stranded copper wire with 28 mils, minimum, thermoplastic insulation, rated at 1,000 V and rated for use at 90°C. Conductors shall be No. 16, minimum, and shall match the color coding of the ballast leads.

The size of conductors from the sign disconnect to the fuse block shall be as shown on the plans.

All conductors within the fixture shall be secured with easily removable spring cross straps (not clamped) in the chassis or fixture. Straps shall be installed not more than 12 inches apart.

Stranded copper conductors connected to screw type terminals shall terminate in approved crimp type ring connectors.

Splices will not be permitted within the fixture unless approved in writing by the Engineer.

6.22.11 Photocell

Photocell assembly shall be installed on the top of IISNS housing and wired to control the sign operation. Photocell will sense darkness and cause the sign to turn on. Per Caltrans, this is called “Type IV photo control”, meaning that each individual sign has a photocell and is individually controlled.

All new IISNS shall include a photocell.

6.22.12 Description of Work

The IISNS shall be installed at various locations as specified in the attached plans.

Any material or equipment required to complete the installation of the IISNS, shall become the property of the Contractor, and be removed from the project site as specified in the attached figure and table. Disposal expenses shall be borne by the Contractor.

6.23 Internally Illuminated Street Name Sign Panels

6.23.1 General

This specification sets forth the minimum requirements for a sign panel as defined by Caltrans Standards Section 86-6.065. Sign panels compliant to this specification shall be provided and accommodated in either single or double-sided IISNS in 6 ft. and 8 ft. lengths as directed by the Engineer.

6.23.2 General Specifications

The sign panels shall not deform or warp under a 70 mph wind loading.

The sign panels shall be rigid mounted **in a frame**, with white legend, symbols, arrows, and border on each face, as shown on the plans. The background shall be green.

The entire surface of the sign panel shall be evenly illuminated. The light transmission factor of the sign panel shall provide a letter to background brightness ratio of between 10 to 1 and 20 to 1. The luminance of the background shall not vary by more than 40 percent from the average of background brightness reading. The luminance of the letters, symbols and arrows shall not vary by more than 20 percent from the average brightness reading of letters, symbols and arrows.

The sign panels shall be translucent panels of high impact resistant plastic of the following type:

A. Polycarbonate resin as per 3M Diamond Grade “DG3” or approved equal by the Engineer.

B. Street name lettering and border are provided through the use of 3M “EC” Electronically Cuttable Film Type 1177C or as approved equal by the Engineer; this which forms the green background.

Samples shall be submitted to the Engineer for approval prior to production.

The sign panels must meet the minimum level of reflectivity per Federal standards, and as specified in the California MUTCD.

All surfaces shall be free of blemishes in the plastic or coating that may impair the serviceability or detract from the general appearance and color matching of the sign.

The white or green color shall not fade or darken when the sign is exposed to an accelerated test of ultraviolet light which is equivalent to 2 years of outdoor exposure. The green color of the sign, when not illuminated, shall conform to Color No. 14109 of Federal Standard 595B or as approved by the Engineer.

The sign panels shall not crack or shatter when a one inch diameter, steel ball with a weight of 2.4 ounces is dropped from a height of 8.5 feet above the sign panel to any point of the sign panel. The panels shall be lying in a

horizontal position and supported within their frame for this test.

6.23.3 Sign Message

The message, as shown in the attachments, shall be displayed on both sign panels, unless otherwise noted. If not shown on the plans, the message, and the size of symbols or arrows will be furnished by the Engineer at the request of the Contractor.

Unless shown otherwise, letters comprising the street name shall be 8-inch upper case and 6-inch lower case, Series C.

Unless shown otherwise, letters comprising the city name shall be 3-inch upper case, Series D.

6.23.4 Description of Work

The sign panels shall be installed at various locations as specified in the plans. It is the Contractor's responsibility to furnish and install all necessary material and equipment to properly install each sign panel.

6.24 LED Traffic Signal Lamp Modules

The LED traffic signal lamp modules shall be manufactured by GE Lumination or approved equal.

The purpose of this specification is to provide the minimum performance requirements for 300 mm (12 in), 200 mm (8 in) and Arrow LED traffic signal modules. This specification refers to definitions and practices described in "Vehicle Traffic Control Signal Heads" published in the *Equipment and Materials Standards of the Institute of Transportation Engineers*, referred to in this document as "VTCSH".

6.24.1 Physical and Mechanical

LED traffic signal modules designed, as retrofit replacements for existing signal lamps shall not require special tools for installation. Retrofit replacement LED signal modules shall fit into existing traffic signal housings built to the VTCSH "Vehicle Traffic Control Signal Heads" standard without modification to the housing.

Installation of an 8"or 12" Ball or Arrow retrofit replacement LED signal module into an existing signal housing shall only require the removal of the front lens and incandescent lamp. The LED retrofit replacement shall not require the removal of the incandescent lamp reflector or socket assembly; shall be weather tight and fit securely in the housing; and shall connect directly to existing electrical wiring.

Each LED module shall be identified on the backside with the manufacturer's name and serial number. The following operating

characteristics shall be identified: nominal operating voltage, power consumption, and Volt-Ampere. LED modules shall have a prominent and permanent vertical indexing indicator, i.e., an arrow pointing up or the word 'UP' or 'TOP', for correct indexing and orientation inside a signal housing.

6.24.2 Construction

The LED signal module shall be a single, self-contained device, not requiring on-site assembly for installation into an existing traffic signal housing. The power supply must be designed to fit and mount inside the traffic signal module. The unit shall be serviceable and repairable without the use of special tools. The LED module external lens shall be capable of being replaced without special tools, independent of replacing the complete LED module. The LED module shall be constructed to allow replacement of the internal light engine when needed. The external lens shall be smooth on the outside to prevent excessive dirt/dust buildup. To ensure the unit meets required environmental standards (including water tightness), the unit shall be sealed by use of an O-ring gasket compressed radially (silicone shall not be used as a sealant).

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

In order to prevent water seepage between back cover and electrical wire, or between copper and insulation of the wires, the electrical connection between wires and power supply unit shall be done using over-molded lug connectors. **Electrical wires shall not be permitted to penetrate LED housing.**

6.24.3 Environmental Requirements

The LED signal module shall be rated for use in the ambient operating temperature range of -40ºC (-40ºF) to + 74ºC (+165ºF).

The LED signal module shall be protected against dust and moisture intrusion per the requirements of NEMA Standard 250-1991, for Type 4 enclosures to protect all internal LED, electronic, and electrical components.

The LED signal module lens shall be UV stabilized. The external lens shall be specifically designed with a sloped front face to reduce sun reflections (Sun Phantom). The LED module shall be supplied with an installed gasket.

6.24.4 LED Signal Module Lens

The red, yellow, and green ball modules shall have a visual appearance similar to that of an incandescent lamp (i.e. Smooth and non-pixelated).

The red, yellow, and green ball modules shall meet the minimum

luminous intensity requirements outlined in the attached table.

The red and green ball modules shall be measured per ITE specifications and meet all other applicable ITE specifications and Caltrans specifications on light intensity and be listed on Caltrans pre-QPL.

Photometric, luminous intensity and color measurements for the 8" & 12" Red, Yellow & Green LED signal modules shall be taken immediately after the modules are energized. The ambient temperature for these measurements shall be 25ºC. Test results for this testing shall record the current, voltage, total harmonic distortion (THD) and power factor (PF) associated with each measurement. The yellow modules shall meet all other applicable Caltrans specifications. Independent laboratory reports (Intertek Testing Services ETL Semko), shall be supplied to verify modules meet the above requirements.

The optical assembly shall diffuse the light output and provide uniform illumination across the entire surface of circular lenses. Individual LED's shall not be visible to the observer of indications displayed. To ensure even illumination and reliability, 12" LED full ball modules shall consist of a minimum of 100 InGaN (green) or AlInGaP (red & amber) LEDs and 8" LED full balls shall consist of a minimum of 30 InGaN(green) or AlInGaP(red & amber) LEDs. The balls shall meet all applicable Caltrans specifications on light intensity and be listed on the Caltrans pre-QPL.

The LED arrow modules shall have a full, filled profile, reflecting a light distribution look and appearance similar to that of an incandescent lamp, without the individual LED's being visible. The arrows shall meet all applicable Caltrans specifications on light intensity and be listed on Caltrans pre-QPL.

6.24.5 Materials

The multiple LED light source should be the latest technology available on the market. The LED's utilized shall be AlInGaP technology for red, amber and yellow indications, or InGaN for green indications, and shall be the ultra bright type rated for 100,000 hours of continuous operation from -40°C to +74°C. Materials used for the lens and signal module construction shall conform to ASTM specifications for the materials where applicable.

Enclosures containing either the power supply or electronic components of the signal module shall be made of UL94VO flame retardant materials. The lens of the module is excluded from this requirement.

6.24.6 Chromaticity

The measured chromaticity coordinates of LED signal modules shall conform to the chromaticity requirements of Section 8.04 and Figure 1 of the VTCSH standard.

6.24.7 Electrical

All wiring and terminal blocks shall meet the requirements of Section 13.02 of the VTCSH standard. Two secured, color-coded, 914 mm (36 in) long 600 V, 20 AWG minimum, jacketed wires, conforming to the National Electrical Code, rated for service at +105ºC, are to be provided for electrical connection.

The module shall operate on a 60 Hz AC line voltage ranging from 80 volts rms to 135 volts rms with less than 10% light intensity variation. Nominal rated voltage for all measurements shall be 120 ± 3 volts rms. The circuitry shall prevent flickering over this voltage range. The modules shall conform to applicable Energy Star® limitations for energy consumption. Proposed LED modules shall be less than or equal to the base wattage shown below at 25 degrees C.

Type	Wattage
12” Red Ball	10 or less
12” Yellow Ball	22 or less
12” Green Ball	12 or less
8” Red Ball	5 or less
8” Yellow Ball	14 or less
8” Green Ball	6 or less
Red Arrow	5 or less
Yellow Arrow	10 or less
Green Arrow	5 or less

6.24.8 Electrical Noise

The LED signal and associated on-board circuitry must meet Federal Communications Commission (FCC) Title 47, SubPart B, Section 15 regulations concerning the emission of electronic noise.

6.24.9 Power Factor (PF)

The LED signal module shall provide a power factor of 0.90 or greater at 25ºC and at the nominal operating voltage.

6.24.10 AC Harmonics

Total harmonic distortion (THD), (current and voltage), induced into an ac power line by a signal module shall not exceed 20 percent, over the operating voltage range specified in Section 8.13 and within the ambient temperature range specified in Section 8.04.

6.24.11 Transient Voltage Protection

The signal module on- board circuitry shall include voltage

surge protection to withstand high-repetition noise transients and low-repetition high-energy transients as stated in Section 2.1.6 and Nondestruct Transient Immunity as stated in 2.1.8, NEMA Standard TS-2, 1992. Independent laboratory reports from Intertek Testing Services ETL Semko or Lighting Technoligies Inc. shall be supplied to verify modules meet the above requirements.

6.24.12 Voltage Range

The LED signal module shall operate from a 60 ± 3 HZ ac line power over a voltage range from 80 Vac rms to 135 Vac rms. The current draw shall be sufficient to ensure compatibility and proper triggering and operation of load current switches and conflict monitors in signal controller units the procuring traffic authority customer has in use.

There shall be no illumination from the module when the applied voltage is less than 35 volts AC. To test for this condition the unit must first be fully illuminated at the nominal operating voltage. The applied voltage is then reduced to the point that there is no illumination. This point must be greater than 35 volts AC. The same requirement should apply in rising voltage from 0 to 35 with no visible illumination.

The modules shall reach 90% of their full illumination (turn-on) within 100 msec (+ or - 10%) after the application of the nominal operating voltage. The LED modules shall not be illuminated (turn-off) within 100 msec (+ or - 10%) after the removal of the nominal operating voltage.

6.24.13 Signal Module Burn-in

All LED signal modules shall be energized for a minimum of 24 hours, at 100 percent on-time duty cycle, in an ambient temperature of 60ºC (+140ºF).

6.24.14 Design Qualification Testing

Design Qualification testing shall be performed on new LED signal module designs, and when a major design change has been implemented on an existing design.

Testing shall be performed once every 5 years or when the module design or LED technology has been changed. Test data shall be retained by the manufacturer for a minimum period of 5 years.

6.24.15 Quality Assurance

LED signal modules shall be manufactured in accordance with a vendor quality assurance (QA) program. The QA program shall include two types of quality assurance: (1) design quality assurance and (2) production quality assurance. The production quality assurance includes statistically controlled routine tests to ensure minimum performance levels of LED signal modules built to meet this specification.

QA process and test results documentation shall be kept on file for a minimum period of seven years.

6.24.16 Certificate of Compliance

Manufacturers shall provide a Certificate of Compliance to this specification for each shipment of LED signal modules to an end user. Each LED signal module shall be identified with a serial number. Independent laboratory reports from Intertek Testing Services ETL Semko or Lighting Technoligies Inc. shall be supplied to verify modules meet the above requirements.

6.24.17 Certificate of Warranty

Manufacturer will provide the following warranty provisions:

1. Replacement or repair of an LED signal module that fails to function as intended due to workmanship or material defects within the first 60 months from the date of delivery.

2. Replacement or repair of LED signal modules that exhibit luminous intensity of less than the minimum values specified in Table 1 (Minimum Luminous Intensity for LED Signal Modules), within the first 60 months from the date of delivery.

6.25 Battery Backup System

(Not applicable for this project)

The battery backup system shall be manufactured by Sensata Technologies; the system shall be the Caltrans approved Dimensions Model #24M11-WBE (24VDC, 1100 Watts) or approved equal. The following specification and requirements is for a complete emergency battery backup system for use with Light Emitting Diode (LED) Traffic Signal Modules. The Battery Backup System (BBS) shall include, but not be limited to the following: Inverter/Charger, batteries, combination power transfer relay and manual bypass switch and all necessary hardware and interconnect wiring. The BBS shall provide reliable emergency power to a traffic signal system (Vehicle and Pedestrian Traffic) in the event of a power failure or interruption.

The BBS shall be capable of providing power for full run-time operation for an “LED-only” intersection (all colors: red, yellow, green and pedestrian heads), an intersection with only yellow and/or pedestrian incandescent bulbs or flashing mode operation for an intersection using Red LED’s.

The battery backup system shall be designed for outdoor applications, in accordance with the Caltrans Transportation Electrical Equipment Specifications (TEES), dated August 16, 2002, Chapter 1, Section 8 requirements.

Furnish and install battery backup system equipped with Ethernet port, battery system and battery harness complete in place at the following intersections:

- **None**

Data transmission between the TMC and the battery backup system locations will be done via the existing Ethernet System.

The data shall be transmitted from the battery backup system to the Ethernet switch located in the traffic signal controller cabinet, to the Gigabit Ethernet switch at the communication hub for transmission to the Westminster TMC.

The battery backup systems equipped with Ethernet ports will be furnished by the Contractor, including the battery system, and battery harness. The Contractor shall install the battery backup systems and furnish and install all battery backup cabling, wiring and connections for operation of the battery backup systems, per the direction of the Engineer and as shown on the manufacturer's specifications, including all incidental accessories necessary to make the battery backup systems complete, fully functional, and ready for operation, even if not particularly specified. Such incidentals shall be furnished, delivered and installed by the Contractor without additional expense to the Engineer or the City. Minor details not usually shown or specified, but necessary for the proper installation and operation of the battery backup system shall be included. It is understood and agreed by the Contractor that the system description provided herein is complete and includes all equipment necessary for the proper functioning of the battery backup systems, even though every item may not be specifically mentioned.

6.25.1 General Requirements

1. All components of the battery backup system, including the batteries, battery harness and external cabinets will be furnished by the manufacturer of the battery backup system.

2. Contractor shall furnish and install integrated battery backup and Ethernet cables at each installation.

3. Contractor shall furnish and install all other related items as specified in these special provisions, and as directed by Engineer or vendor representative.

4. Contactor shall furnish and install all necessary miscellaneous equipment and cabling to make the battery backup systems operational.

5. All equipment and materials used shall be standard components, regularly manufactured, and regularly utilized in the manufacturer's system.

6. All Systems and components shall have been thoroughly tested and proven in actual use.

7. Equipment used shall be identical at each field location and shall be completely interchangeable.

8. The data management system at TMC shall be furnished by the battery backup system vendor. Complete set up and integration of the data management system shall be by the vendor. Contractor shall coordinate with the manufacturer for support set-up and integration of battery backup systems as directed by Engineer.

6.25.2 Operation

1. **Compatibility**
BBS shall be compatible with NEMA, Caltrans Model 332A Cabinets, McCain 333JP Cabinets, Model 170E Controllers, Model 2070 Controllers and cabinet components for full time operation.

2. **Run-Time**
The BBS shall provide a minimum two (2) hours of full run-time operation for an "LED-only" intersection (minimum 700W/1000VA active output capacity, with 80% minimum inverter efficiency).

3. **Output Capacity**
The BBS shall be able to provide a minimum of 1100W @ +25ºC, continuous active output capacity, with 80% minimum inverter efficiency while running in Backup Mode (on batteries).

4. **Output Voltage**
When utilizing battery power, the BBS output voltage shall be between 110 VAC and 125 VAC, pure sine wave output, $\leq$ 3% THD, 60Hz $\pm$ 0.05Hz.

5. **DC System Voltage**
The BBS DC system voltage shall be 24 VDC.

6. **Transfer Time**
The maximum transfer time allowed, from disruption of normal utility line voltage to stabilized inverter line voltage from batteries shall be 40 milliseconds. The same maximum allowable transfer time shall also apply when switching from inverter line voltage to utility line voltage.

7. **Operating Temperature**
Operating temperature for the inverter/charger, and power transfer relay and manual bypass switch shall be –40 °C to +74 °C.

8. **AC Feedback**
BBS shall be equipped to prevent a malfunction feedback to the cabinet or from feeding back to the utility service.

9. **Surge Protection**
The BBS shall have lightning surge protection compliant with IEEE/ANSI C.62.41.

10. **Power & Control Connections**
The BBS shall be easily replaced by having easily removable AC input and output cables. The DC input connection shall be a one piece Anderson type connector. The external transfer relay control and battery temperature compensation cables shall be a quick release connector. The AC, DC, external transfer relay, and battery temperature compensation cables shall be removable without the use of a screwdriver.

11. **AC Connection**
The AC input and output shall be separate panel mounted plug receptacles that allow no possibility of accidental exposure to dangerous voltages (male receptacle for AC Input and female receptacle for AC Output). The receptacles shall utilize some form of locking mechanism or hold down clamps in order to prevent accidental disconnects.

12. **DC Connection**
The DC connection shall be a recessed one piece Red Anderson style receptacle.

13. **Relay / Temperature Probe Connection**
The external power transfer relay control and battery temperature sense inputs shall be heavy duty panel mounted connectors. The temperature probe must have a lug for attaching the sensor to the battery.

14. **General Connections**
All connections shall provide mechanically and electrically secure connections without the use of a screwdriver. The only exception will be the 18-position Relay Terminal Block which shall require a small screwdriver for holding down the relay wires.

15. **Unit Failure**
In the event of inverter/charger failure, battery failure or complete battery discharge, the power transfer relay shall revert to the NC (and de-energized) state, where utility line power is connected to the cabinet.

16. **Overload**
The Battery Backup System must be able to shutdown to protect against internal damage in the event of an overload at its output.

6.25.3 Functionality, Display and Controls

1. **Standby Type System**
There shall be two, user adjustable transfer point set types if the user wanted to use the BBS as a “Standby” type system instead of the default “Buck/Boost or Line Interactive” type system. The user will be able to select

either “Normal” or “Generator” transfer points. The user will be able to set the low and the high cutoff transfer points which are adjustable between 89 and 135 AC volts. The BBS will automatically apply the 5 volt difference for the return transfer points.

a. If the BBS is configured to use these adjustable transfer points, the BBS shall bypass the utility line power whenever the utility line voltage is outside of the set transfer points (± 2VAC).

b. In cases of low (below the set low cutoff point) or absent utility line power, when the utility line power has been restored at or above 5 VAC ± 2 VAC of the set low cutoff point for more than 30 seconds (or the user configured line qualify time), the BBS shall transfer from battery backed inverter mode back to utility line mode.

c. In cases of high (above the set high cutoff point) utility line power, when the utility line power has been restored at or below 5 VAC ± 2 VAC of the set high cutoff point for more than 30 seconds (or the user configured line qualify time), the BBS shall transfer from battery backed inverter mode back to utility line mode.

2. **Buck/Boost or Line Interactive Type System**

The BBS shall be line interactive by default, and have a Buck/Boost function or mode of operation. The Buck/Boost shall have a range of 80-160Vac. There are not to be any user configurable transfer point settings for the Buck/Boost function. With Buck/Boost selected as the sense type, the output to the signal system will be regulated to voltages between 102-130 Vac.

3. **Buck/Boost Counter and Run Time**

There will be a Buck and Boost event counter and run time meter accessible through the LCD and Ethernet. Buck and Boost events will be recorded separately from each other. The counter and run time meter will show the cumulated information since the last reset.

4. **Line Qualify Time**

The BBS will have an adjustable line qualify time. The range will be from 1 to 60 seconds, in 1 second increments. The factory default setting will be 30 seconds.

5. **LCD Display**

The BBS shall have a 4 line by 20 character backlit Blue Negative LCD display. The main screen shall indicate information regarding; transfer points, transfer point type, time of day status, utility input voltage, charger on/off status, battery percent of charge, battery voltage, BBS Mode, a scrolling line of text (which automatically lists any faults, alarms and relay status information), inverter event counter and run time meter. The run time meter shall indicate run time in hours and minutes. The display shall be temperature compensated and have a user selectable contrast adjustment by pressing “Enter” at the main screen.

6. **Keypad**
The BBS shall have a 4-way navigational keypad so that the user can navigate the menu system by using "↑", "↓", "←", "→", "Enter", and "Esc" keys. There shall also be an "Inv" key to turn the inverter on or off.

7. **Status LED's**
The BBS shall have three status LED's.

a. Green LED "Output" – This is to be on any time the BBS is providing output for either backup, buck, or boost modes.

b. Red LED "Fault" – This is to be on any time there are any faults in the system.

c. Yellow LED "Alarm" – This is to be on anytime there are alarms on the system.

8. **Charger**
The BBS shall have an integral charger. The charger shall be a 4 step charger (zero-volt start, bulk, accept, and float).
a. The charger shall have the capability of providing the charge current required by the battery up to 20 amps DC.

b. The user shall be able to select either "gel" or "AGM" type batteries. The default setting is for AGM.

c. The BBS shall use a temperature-compensated battery charging system. The charging system shall compensate over a range of 2.5 – 4.0 mV/ °C per cell.

d. The temperature sensor shall be external to the inverter/charger unit. The temperature sensor shall come with 2 meters (6'6") of wire and have a lug at the end for termination to the negative post of a battery for the best temperature measurement.

e. Batteries shall not be recharged when battery temperature exceeds 50 °C ± 3 °C.

f. Recharge time for the battery, from "protective low-cutoff" to 80% or more of full battery charge capacity, shall not exceed ten (10) hours.

9. **Backup Counter and Run Time**
The BBS shall include a front-panel event counter display to indicate the number of times the BBS was in Backup, Buck, and Boost modes; and a front-panel hour meter to display the total number of hours and/or minutes the unit has operated in those modes since last reset. The run time shall be displayed in HHH:MM format. All meters shall be re-settable. The information displayed shall be cumulative since last reset.

10. **Event Log**
There shall be an event log that is 256 lines in length. Data shall be recorded in a FIFO format so that the oldest record is purged as the newest is entered. The event log shall date and time stamp all events. Each event that is recorded will also show the current operating mode of the BBS (Standby, Backup, Buck, and Boost).

11. **Dry Relay Contacts**
The BBS shall provide the user with 6 programmable dry relay contacts. These dry relay contacts shall be rated for 3 amps @ 125 VAC. Each relay can be programmed to trigger by more than one condition simultaneously. If any relay is energized, it will show up on the main screen of the LCD, Ethernet web browser, and the RS-232 menu. The programming options are as follows:

- On Battery
- Low Battery
- Timer
- Time of Day
- Alarm
- Fault
- BBS Failure
- Off

a. The relay contact terminal blocks shall conform to On-Shore Technology, type ED2200/22, or Phoenix Contact type FRONT 2,5-H/SA 5, or WECO type 180-A-111, or equivalent. The spacing between each terminal shall be 0.197" (5mm), with the hold-down screw and wire entrance both on the same face, facing forward and in the horizontal axis.

12. **Timer Relay Contacts**
The BBS shall have a timer that will energize the dry contact relays (that are configured for "Timer") after the user configured time has elapsed. This timer is started when the BBS is in Backup mode. The user can configure the timer from 0 to 480 minutes, in 1 minute increments. The factory default setting is at 120 minutes.

13. **Low Battery Relay Contacts**
The BBS shall have an adjustable low battery relay setting. This setting shall be adjustable so that the user can set the point at which the low battery relay energizes. This setting applies to any dry contact relay that is configured for "Low Battery". This setting is adjustable from 0 to 100% of remaining usable battery capacity in 5% increments. This setting must be in

percent. The factory default setting is 40%.

14. **Battery Voltage Test Points**
The BBS shall include a LCD display to indicate battery voltage and standard meter probe input jacks (+) and (-) to read the battery voltage externally.

15. **Circuit Breakers**
The BBS shall be equipped with Input and Output AC circuit breakers. The BBS shall also have a DC input circuit breaker.

16. **Time of Day Program**
The BBS shall be equipped with a Time Of Day (TOD) program. The user can set the beginning and the end time of the TOD program. The user can also "Enable" and "Disable" the program. Operation is such that if the program is enabled and the BBS goes to Backup mode, the TOD program will energize any dry contact relays that are programmed for TOD. If the BBS is still in Backup mode and the TOD program has expired, any relay that was energized by the TOD program will de-energize when the TOD program expires.

17. **Keypad Password Protection**
The BBS Configuration and System menus (on LCD) shall be password protected with a 6 digit alphanumeric password. The password feature can be disabled by the user in the System menu. This feature by default is disabled.

18. **Web Browser Password Protection**
The web browser shall be password protected and require a user ID and a password. This feature by default is disabled.

19. **Bypass Switch**
The manual bypass switch module and power transfer relay shall be rated at 240VAC/30 amps.

6.25.4 Communications

1. User Configuration, System, and Status Menus
All BBS Configuration, System, and Status menus shall be accessible and programmable from the RS-232 port and from the Ethernet port. Additionally, all log files shall be available through these ports.

2. **RS-232**
The BBS shall have RS-232 communications. The communications port shall be an EIA-232 (DB9-Female) connector.

a. The data transmission rate shall be user adjustable between 300 and 115200 baud.

3. **Ethernet**

The BBS shall have an Ethernet port as standard. The Ethernet port shall be an RJ45, EIA 568B pin out type connector. The data rate shall be 100mbps.

4. The BBS shall have an embedded web server.

5. The Ethernet port shall have user configurable IP, subnet mask, and gateway.

6. **Web Pages**

- On Battery
- Shall have a header area that shows location, date, time, firmware version, BBS Mode, quick status updates of alarms, faults and relay status. This header is to be on every web page.
- Shall have a Configuration page that allows for configuration of; sense type, transfer points (normal and generator), line qualify time, Time of Day program, self test, low battery relay in percent, timer relay, and dry relay contacts.
- Shall have a Status page that shows the current settings of; sense type, transfer points, line qualify time, Time of Day program, self test, and dry relay contacts.
- Shall have a System page to configure; location, date, time, password, user ID, IP address, sub-net mask, and gateway address.
- Shall have an email page to configure which events trigger an email. It also shall allow input of up to 6 email addresses.
- Shall have a 256 line event log (FIFO). The event log shall be able to be printed from the web browser. The event log shall be able to be saved as an HTML file. The event log shall also be able to be copied and pasted into an excel spreadsheet.

6.25.5 Battery System

1. Individual batteries shall be:

- On Battery
- Voltage rating: 12V type
- AGM/VRLA
- Batteries shall be easily replaced and commercially available off the shelf.

2. Batteries used for BBS shall consist of 2 to 8 batteries to run the loads for the specified time, and a maximum system voltage of 24 VDC to comply with NEC Class 2 Voltage.

3. Batteries shall be deep cycle, sealed prismatic lead-calcium based AGM/VRLA (Absorbed Glass Mat/ Valve Regulated Lead Acid).

4. Batteries shall be certified by the manufacturer to operate over a temperature range of – 40 °C to +60 °C.

5. The batteries shall be provided with appropriate interconnect wiring and corrosion-resistant mounting trays and/or brackets appropriate for the cabinet into which they will be installed.

6.25.6 Battery Harness

1. Interconnect wiring shall be via two-piece modular harness consisting of 8 gauge welding style cable, UL listed, super K90.

2. Cable assembly shall be equipped with insulated, mating, power pole style connectors. Where two-piece power pole style connectors are used Positive (+) shall be red, Negative (-) shall be black.

3. All power pole connectors shall be assembled to ensure proper polarity and circuit configuration throughout the entire harness.

4. Part one of the two-piece harness shall consist of seven inches of appropriate colored cable with ¼ inch ring terminals for connecting to the battery terminal and the appropriate colored modular power pole style connector.

5. Battery terminals shall be covered and insulated with appropriate colored molded boots.

6. Part two of the harness shall consist of mating two-piece power pole style connectors for connecting to the batteries and a single insulated power pole connector for connecting to the BBS unit.

7. Cable length shall be a minimum of 12 inches between batteries and 60 inches between BBS unit and first battery.

6.25.7 Mounting Inside Traffic Signal Cabinet

NOTE: All references made to EIA rail or EIA 19” (482.6mm) rack shall conform to Electronic Industries Standards EIA-310-B, Racks, Panels, and Associated Equipment, with 10-32 “Universal Spacing” threaded holes.

1. Mounting method shall be rack-mount. Front or rear mounted available rack space is 3U or approximately 6 inches.

2. The Power transfer relay and manual bypass switch shall be mounted on the EIA rail or the cabinet shelf.

3. All necessary hardware for mounting (shelf angles, rack, etc) shall be included in the bid price of the BBS. Bolts/fasteners and washers shall meet the following requirements:

- Screw Type: Pan Head Phillips Machine Screw
- Size and Thread Pitch: 10-32
- Material: 18-8 stainless steel (Type 316 stainless steel is acceptable as an alternate).
- Washer: Use one flat washer (18-8 stainless steel) under the head of each 10-32 screw (provided that the screws are properly tightened, lock washers are unnecessary).

4. All interconnect wiring shall be provided between power transfer relay and bypass switch and cabinet terminal service block and shall be no less than 2 meters of UL Style 1015 CSA TEW with the following characteristics:

- AWG Rating: 10 AWG
- Stranding: 105 strands of 30 AWG tinned copper
- Rating: 600 V, 105 °C, PVC Insulation

5. Relay contact wiring provided for each set of NO/NC relay contact closure terminals shall be 3 meters of UL Style 1015 CSA TEW 18 AWG wire, same ratings as above, except 16 strands of 30 AWG tinned copper.

6.25.8 Quality Assurance

1. Each BBS shall be manufactured by an ISO 9001:2000 certified company in accordance with a manufacturer Quality Assurance (QA) program.

2. QA process and test results documentation shall be kept on file for a minimum period of seven years.

3. Each system shall be visually inspected for any exterior physical damage or assembly anomalies. Any defects shall be cause for rejection.

6.25.9 Warranty

1. Manufacturers shall provide a five (5) year warranty for the complete battery backup system. The first three years will be with the Advanced Replacement Program. Under the Advanced Replacement Program, the manufacturer will send out a replacement unit within two business days of

the call notifying them of an issue. The manufacturer will send out either a new unit or a re-manufactured unit that is fully tested and is up to the latest revision. The manufacturer is responsible for all shipping charges to the customer. The last two years of the warranty will be factory-repair warranty for parts and labor on the BBS.

2. Batteries shall be warranted for full replacement for two (2) years after the project notice of completion at no cost to the City.

3. The external cabinet shall be warranted by the manufacturer against mechanical defects for two (2) years after the project notice of completion at no cost to the City.

4. The warranty shall be included in the total bid price of the BBS.

6.25.10 Wiring Requirements

All wiring shall meet the requirements of the national electric code. All wires shall be cut to proper length before assembly. No wire shall be doubled-back to take up slack. Wires shall be neatly laced into cable with nylon lacing or plastic straps. Cables shall be secured with clamps. Service loops shall be provided at all connections.

6.25.11 Design Requirements

The battery backup system equipment shall be modular in design to allow major portions to be readily replaced. Modules and assemblies shall be clearly identified with name, model number, serial number and any other pertinent information required to facilitate equipment maintenance.

6.25.12 Fail Safe Provision

The equipment shall be designed such that the failures of the equipment shall not cause the failure of any other unit of equipment.

6.26 Traffic Signal Fiber Optic Communications Workmanship

(Not applicable for this project)

All fiber work should be performed by NPI Corning Certified technicians to ensure a ten (10) year warranty of the fiber optic traffic signal system. This includes, but is not limited to, the installation of fiber optic cable, fiber splicing, continuity testing and documentation.

6.27 Fiber Splice Enclosures

(Not applicable for this project)

This section includes material and installation for fiber splice enclosures.

6.27.1 Description

Any below ground fiber optic splices or fiber optic splices exposed to the elements shall be contained in a waterproof, rodent proof, re-enterable fiber optic splice enclosure designed for use on optical fiber cables in a cable vault environment where total and continuous submersion in water may be expected.

Fiber splice enclosures shall be complete with outer and inner enclosures, splice organizer trays, brackets, plugs, clips, cable ties, seals and sealant, and a dry encapsulate and shall conform to the following Special Provisions.

1. The fiber optic splice enclosure shall conform to the requirements of Bellcore GR 771 and shall be designed for a temperature range of -40° C. to +70° C.

2. The splice enclosure shall be suitable for either a direct burial or pull box/vault application.

3. The size of the enclosure shall allow all the fibers of the largest fiber optic cable to be spliced to a second cable of the same size. The enclosure shall be not more than 22 inches in length and not more than 6 inches in diameter. The enclosures shall be designed for both horizontal and butt splicing.

4. All materials in the enclosures shall be non-reactive and shall not support galvanic cell action. The outer-enclosure shall be compatible with the other enclosure components, the inner enclosure, splice trays, and cables.

5. The outer-enclosure shall protect the splices from mechanical damage; shall provide strain relief for the cable, and shall be resistant to salt corrosion. The outer-closure shall be waterproof, and re-enterable. The outer-enclosure shall be flash-tested at 100 kPa.

6. The inner-enclosure shall be of metallic construction. The inner-enclosure shall be compatible with the outer enclosure and the splice trays and shall allow access to and removal of individual splice trays.

7. The splice trays shall be compatible with the inner-enclosure and shall be constructed of rigid plastic or metal.

8. Acceptable fiber splice enclosures, encapsulant, trays, and reseal kits shall be from Corning Cable Systems, OFS, or approved equal.

6.27.2 Installation

1. Adequate splice trays shall be provided to splice all fibers of the communication cable with the greatest fiber count entering the enclosure.

2. Upon completion of the splices, the splice trays shall be secured to the

inner enclosure. The Contractor shall verify the quality of each splice prior to sealing the splice enclosure.

3. The enclosure shall be sealed using a procedure recommended by the manufacturer that will provide a waterproof environment for the splices. Encapsulant shall be injected between the inner and outer enclosures.

4. Care shall be taken at the cable entry points to ensure a tight salt resistant and waterproof seal is made which will not leak upon aging. It is acceptable to have multiple service drop cables enter the fiber optic splice enclosure through one hole as long as all spaces between the cables are adequately sealed.

5. The fiber splice enclosure shall be mounted horizontally in a manner that allows the cables to enter at the end of the enclosure without exceeding any minimum bending radius specification.

6. All fiber optic cable splicing performed on this project shall be of the fusion type. All fiber optic cable splices shall be of the fusion type and shall not exceed 0.1 dB loss per splice.

7. The field splices shall connect the fibers of the two (2) fiber optic cable lengths together. The termination splices shall connect the fiber optic cable span ends with pig tails. The field splices shall be placed in a splice tray, and then the splice tray with splice shall be placed in a splice enclosure.

8. The termination splices shall be placed in a splice tray and the splice tray with splice shall then be placed in a fiber distribution unit or field cabinet as required. All splices shall be protected with a thermal shrink sleeve.

9. The fiber optic field splices shall be enclosed in fiber splice enclosures, which shall be waterproof, rodent proof, and re-enterable, and shall accommodate all the fibers in a single cable.

10. The microduct coupling shall house the fiber optic cable up to the cable opening in the splice enclosure.

The Contractor shall furnish and install fiber optic splice enclosures capable of accommodating a minimum of six (6) splice trays and a maximum of 72 splices. The splice enclosure shall also include the required encapusulant. The splice enclosure shall be able to accommodate up to four (4) cable entries. If all four cable entry holes are not required, the remaining unused entry holes will be closed such that moisture does not enter the splice enclosure and affect the operation of the fiber optic cable. The splice enclosure shall have sleeves to size the cable entry to the appropriate cable diameter. Each splice enclosure shall come equipped with the required number of single mode splice trays.

Included within the splice enclosure, the Contractor shall also supply and install splice trays. Each spice tray shall be appropriately sized to fit inside

the splice enclosure. The splice trays shall be of injection-molded plastic type with a clear plastic cover so allow visibility of fibers without opening the tray. Each splice tray shall handle up to twelve (12) single mode fusion splices.

A minimum of three unopened kits required for the resealing of the splice enclosure shall be supplied with this contract and considered as part of the necessary equipment.

6.28 Fiber Optic Cable

(Not applicable for this project)

This item shall govern to furnish and install fiber optic cable in designated locations as shown on the Plans and as detailed in accordance with these Special Provisions.

6.28.1 Requirements

Fiber optic cables shall be supplied in the configurations shown on the plans and specified in these Special Provisions.

There shall be two (2) principal cable types as well as incidental cabling procured under this specification. They are identified using a naming convention as follows:

1. Mainline cable which shall contain twenty-four (24) or twelve (12) stand single-mode optical fibers.

2. Drop cable which shall contain six (6) single-mode optical fibers.

Each fiber optic cable shall be suitable for both underground duct placement and indoor application. The fiber optic cable shall be plenum and fire rated.

Additionally, there will be ancillary connecting (patching) optical fiber cables furnished and installed by Contractor under this Contract and these Special Provisions, which are more precisely described elsewhere in this document or shown on the Plans.

All materials furnished, assembled, fabricated or installed under this item shall be new, corrosion resistant and in strict accordance with the details shown on the Plans and in these Special Provisions. All fibers in the cables shall be usable fibers and free of surface imperfections and occlusions, in order to meet or exceed all of the optical, mechanical, and environmental requirements contained in these Special Provisions.

All cables shall be free of material or manufacturing defects and dimensional non-uniformity that would:

- Interfere with the cable installation employing accepted cable

installation practices.

- Degrade the transmission performance and environmental resistance after installation.

- Inhibit proper connection to interfacing elements.

- Otherwise yield an inferior product.

- Each fiber optic outside plant cable for this project shall be all-dielectric, dry water-blocking material, duct type, with loose buffer tubes, and shall conform to these Special Provisions.

The Contractor shall furnish, install, splice and test all the required fiber optic cable. All splicing kits, fiber optic cable caps, moisture/water sealants, terminators, splice trays, patch cords, connectors, pig tails and accessories to complete the fiber optic network shall be provided as incidentals. All equipment for installation, splicing and testing shall be provided by the Contractor.

All fiber optic glass/cable on this project shall be from the same manufacturer and who is regularly engaged in the production of optical fiber material.

The cable shall be qualified as compliant with Chapter XVII, of Title 7, Part 1755.900 of the Code of Federal Regulations, and “REA Specification for Filled Fiber Optic Cables.”

6.28.2 Packaging

1. The completed cable shall be packaged for shipment on non-returnable wooden reels. Required cable lengths shall be stated in the purchase order.

2. Top and bottom ends of the cable shall be available for testing.

3. Both ends of the cable shall be sealed to prevent the ingress of moisture.

4. Each reel shall have a weather resistant reel tag attached identifying the reel and cable.

6.28.3 Cable Marking

1. The optical fiber cable outer jacket shall be marked with manufacturer's name, the month and year of manufacture, the words "Optical Cable," telecommunications handset symbol as required by Section 350G of the National Electrical Safety Code® (NESC®), fiber count, fiber type, and sequential meter marks.

2. The markings shall be repeated every two (2) feet.

3. The actual length of the cable shall be within ±1% of the length marking.

4. The marking shall be in a contrasting color to the cable jacket.

6.28.4 Quality Control

The manufacture(s) of supplied optical cable, optical cable assemblies, and hardware shall be TL 9000 and/or ISO 9001 registered. All cabled optical fibers shall be 100% attenuation tested. The attenuation of each fiber shall be provided with each cable reel.

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

- 12-strand count single mode optical fiber
- Ripcord
- Central tube
- Dielectric strength members
- HDPE outer jacket

6.28.5 Fiber Characteristics

One hundred percent (100%) of the optical fibers shall meet or exceed the requirements contained in this specification.

The cable shall be tested in accordance with TIA/EIA-455-3A (FOTP-3), "Procedure to Measure Temperature Cycling Effects on Optical Fiber, Optical Cable, and Other Passive Fiber Optic Components." The average change in attenuation at extreme operational temperatures (-40 °C to +70 °C) will not exceed 0.05 dB/km at 1550 nm. The magnitude of the maximum attenuation change of each individual fiber will not be greater than 0.15 dB/km at 1550 nm. This figure includes an allowance of up to 0.05 dB/km for measurement repeatability.

6.28.6 Color Coding

Optical fibers shall be distinguishable from others in the same buffer tube by means of color-coding according to the following:

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

The colors shall be targeted in accordance with the Munsell color shades

and shall meet TIA/EIA-598B "Color Coding of Fiber Optic Cables" and RUS 7 CFR 1755.900.

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, it shall not affect the transmission characteristics of the optical fibers and shall not cause fibers to stick together.

6.28.7 General Cable Performance Specifications

The fiber optic cable shall withstand water penetration when tested with a one meter static head or equivalent continuous pressure applied at one end of a one meter length of filled cable for one hour, no water shall leak through the open cable end. Testing shall be done in accordance with TIA/EIA-455-82 (FOTP-82), "Fluid Penetration Test For Fluid-Blocked Fiber Optic Cable."

The cable shall exhibit no flow (drip or leak) for 24 hours at 80° C. The weight of any compound that drips from the sample shall be less than 0.05 grams (0.002 ounce). A representative sample of cable shall be tested in accordance with TIA/EIA-455-81B (FOTP-81), "Compound Flow [Drip] Test for Filled Fiber Optic Cable". The test sample shall be prepared in accordance with method A.

Crush resistance of the finished fiber optic cables shall be 220 N/cm applied uniformly over the length of the cable without showing evidence of cracking or splitting when tested in accordance with TIA/EIA-455-41 (FOTP-41), "Compressive Loading Resistance of Fiber Optic Cables." The 220 N/cm (125 lbf/in) load shall be applied at a rate of 2.5 mm (0.1 in) per minute. The load shall be maintained for a period of 1 minute. The load shall then be decreased to 110 N/cm (63 lbf/in). Alternatively, it is acceptable to remove the 220 N/cm (125 lbf/in) load entirely and apply the 110 N/cm (63 lbf/in) load within five minutes at a rate of 2.5 mm (0.1 in) per minute. The 110 N/cm (63 lbf/in) load shall be maintained for a period of 10 minutes. Attenuation measurements shall be performed before release of the 110 N/cm (63 lbf/in) load. The change in attenuation shall not exceed 0.4 dB during loading at 1550 nm for single-mode fibers and 1.0 dB during loading at 1300 nm for multimode fiber. The repeatability of the measurement system is typically 0.05 dB or less. No fibers shall exhibit a measurable change in attenuation after load removal.

The cable shall withstand 25 cycles of mechanical flexing at a rate of 30±1 cycles/minute with a sheave diameter not greater than 20 times the cable diameter. The cable shall be tested in accordance with Test Conditions I and III of TIA/EIA-455-104A (FOTP-104), “Fiber Optic Cable Cyclic Flexing Test.” The magnitude of the attenuation change will be within the repeatability of the measurement system for 90% of the test fibers. The remaining 10% of the fibers will not experience an attenuation change greater than 0.1 dB at 1550 nm. The repeatability of the measurement system is typically ± 0.05 dB or less. The cable jacket will exhibit no cracking or splitting when

observed under 5X magnification.

Impact testing shall be conducted in accordance with TIA/EIA-455-25B (FOTP-25) "Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies." The cable shall withstand 20 impact cycles. The magnitude of the attenuation change will be within the repeatability of the measurement system for 90% of the test fibers. The remaining 10% of the fibers will not experience an attenuation change greater than 0.1 dB at 1550 nm. The repeatability of the measurement system is typically ± 0.05 dB or less. The cable jacket will not exhibit evidence of cracking or splitting at the completion of the test.

Using a maximum mandrel and sheave diameter of 560 mm, the finished cable shall withstand a longitudinal tensile load of 2700 N (608 lbs.) applied for one hour (using "Test Condition II" of the test plan). The test shall be conducted in accordance with TIA/EIA-455-33 (FOTP-33), "Fiber Optic Cable Tensile Loading and Bending Test." The measured fiber tensile strain shall be $\leq$ 60% of the fiber proof strain. The cable will not experience a measurable increase in attenuation when subjected to the rated residual tensile load, 890 N (200 lbf). The repeatability of the measurement system is typically ± 0.05 dB or less.

The cable shall be capable of withstanding a bending radius of fifteen (15) times the cable diameter under tensile loading and ten (10) times the cable diameter under a no-load condition.

6.28.8 Fiber Optic Cable Installation

Fiber optic cables shall be installed in continuous lengths without intermediate splices throughout the project, except at the location(s) specified in the Plans.

When ordering fiber optic cable the Contractor shall exercise extreme caution so as to ensure that no additional splicing, beyond that indicated in the Plans, shall be required. Should the Contractor believe additional splices are required; this matter shall be immediately brought to the attention of the City's Engineer for resolution.

The Contractor shall install the fiber optic cable in strict adherence to the manufacturer's recommended procedures. Care shall be taken to avoid cable damage during handling and placing. Fiber optic cable is sensitive to excessive pulling, bending and crush forces. The minimum bending and maximum tension requirements for installing the fiber optic cables shall be according to the manufacturer's specifications. The Contractor shall submit the manufacturer's recommended procedures for pulling the fiber optic cable to the Engineer for review and approval at least twenty (20) working days prior to installing cables.

Cable installation personnel shall be familiar with the cable manufacturer's recommended procedures including, but not limited to the

following:

- Proper attachment to the cable for blowing or pushing during installation.

- Proper attachment to the cable strength elements for pulling during installation.

- Cable tensile limitations and tension monitoring procedures.

- Cable bending radius limitations.

To accommodate long continuous installation lengths, bi-directional pushing of the optical fiber cable in microduct is permissible and shall generally be implemented as follows:

1. From the midpoint of a pull station, push or blow the optical fiber cable into the microduct from the shipping reel in accordance with the manufacturer's specifications.

2. When this portion of the push/blow is complete, the remainder of the cable should be removed from the reel to make the inside end available for pulling in the opposite direction.

3. This is accomplished by hand pulling the cable from the reel and laying it into large "figure eight" loops on the ground. The purpose of the figure eight pattern is to avoid cable tangling and kinking.

4. The figure eight loops shall be laid carefully one upon the other (to prevent subsequent tangling) and shall be in a protected area.

5. The inside reel end of the cable should be available for testing.

6. Should it be necessary to set up an air compressor to blow the fiber at an intermediate pull box, the required length of cable shall be pushed to that point and brought out of the pull box and coiled into a figure eight.

7. The figure eight is then turned over to gain access to the free cable end. This can then be reinserted into the conduit system for installation into the next section.

Large diameter wheels, pulling sheaves, and cable guides shall be used to maintain the appropriate bending radius. During cable installation, the bend radius shall be maintained at a minimum of twenty times the outside diameter of the cable. The cable shall not be stressed beyond the minimum bend radius at any time during installation. Tension monitoring shall be provided at all times during the pulling operation and shall be accomplished using commercial dynamometers or load-cell instruments.

The Contractor shall submit detailed installation procedures (pull plans) for

review thirty (30) working days prior to pulling in each optical fiber segment. The pull plan shall state the exact operational procedures to be utilized and identifies the physical locations for equipment placement, proposed equipment setup at each location, location of the manpower, the pulling methodology and the estimated pulling tensions for each pull section. The Contractor shall provide the pulling tension calculations and any backup information with the pull plan.

Where the fiber optic cable is installed in existing conduct or utility ducts that contain existing cables, the Contractor shall install the microduct and fiber in conduit without removal of the existing cables, unless otherwise specified on the Plans. The Contractor shall be responsible for replacing any cables damaged during removal and reinstallation at the cost of the Contractor and not the City.

Cable slack shall be provided for each cable at each fiber optic splice location, as shown on the Plans and as specified in these Special Provisions. Cable slack shall be divided equally on each side of a splice closure or pull box. Sufficient slack shall also be provided at all pull boxes to facilitate placing the optical fiber cable against the side of the pull box. Slack fiber optic cable shall be housed in microduct coupling as shown on the plans.

At all pull boxes and vaults, cable slack, as shown on the plans, shall be left by the Contractor for all unspliced cable. Cable slack shall be coiled and secured to the racking hardware with tie wraps. The Contractor shall ensure that the minimum bending radius of the optical fiber cable is not compromised when preparing this stored cable slack.

Following installation of the cable in duct, all duct entrances in cabinets, pull boxes and vaults shall be sealed with mechanical plugs; or at the discretion of the Engineer, duct sealing compound, to prevent the ingress of moisture, foreign materials and rodents.

6.28.9 Splicing

Fiber optic cable shall be installed without splices except where specifically allowed on the Plans or described in these Special Provisions. The single-mode fiber optic cables designated as mainline cable shall be spliced only at pull box locations as shown on the plans. When splicing into a mainline cable, only those fibers associated with a specific traffic control device shall be severed. All other fibers shall remain intact. The Engineer may allow additional splices between these specified locations.

Splicing - Optical fibers shall be spliced using the fusion splice method and the insertion loss shall not exceed 0.07 dB of loss per splice.

Field splicing is permitted for the following:

- Connection of cable reel sections.

- Connection of a mainline cable to a drop cable.

- Connection of service drop cable or breakout cable to an optical fiber pigtail at traffic equipment cabinets or the patch panels in a hub equipment cabinet.

- Connection of the mainline cable to an optical fiber pigtail at the FDU at the field locations as shown on the plans.

- Connection of two or more mainline fiber optic cables as shown on the plans.

The Contractor shall not exceed the maximum number of field splices permitted as shown on the plans. Completed splices shall be placed in a splice tray. The splice tray shall then be placed in a watertight splice enclosure. Field splices shall be conducted only at locations as shown on the Plans as an approved splice location.

All splicing equipment shall be in good working order, properly calibrated, and meeting all industry standards and safety regulations. Cable preparation, closure installation, and splicing shall be accomplished in accordance with accepted and approved industry standards.

Using a mid-span splicing method, a drop cable shall be joined to the fibers in the fiber optic cable span. The termination splices shall be placed in a splice tray and the splice tray(s) shall then be placed in a watertight splice closure.

At equipment cabinets, single-mode optical fiber factory fabricated connectorized pigtails shall terminate at the rack-mounted fiber termination unit in each equipment cabinet and be connected to the optical interface to the Ethernet switch / fiber communication equipment with a suitable patch cord. All connected and stored cables shall be routed in each equipment cabinet in a manner that prevents damage during regular operation and maintenance functions. All exposed cable shall be secured every 300 mm to 450 mm to the equipment frame with nylon ties.

Equipment cabinets shall be equipped with splice trays suitable for storage and protection of each single-mode optical fiber pigtail and the splice connection to cable fibers. Equipment cabinets shall be equipped with a suitable means for routing and securing of cables, fibers, and pigtails to prevent damage to fibers during all regular operation and maintenance functions

All splices shall be protected with a thermal shrink sleeve. All fibers shall be labeled in the splice tray with permanent vinyl markers. Pigtail ends shall also be labeled to identify the destination of the fiber. Pigtail ends shall also be labeled to identify the destination of the fiber.

Upon completion of the splicing operation, all waste material shall be deposited in suitable containers, removed from the job site, and disposed of in an environmentally acceptable manner.

6.28.10 Fiber Optic Cable Assemblies

Cable assemblies (consisting of various necessary connectors, pigtails and jumpers) 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, except that the operating temperature shall be modified to -20° C. to +70° C.

Manufacturer's attenuation test results shall be provided for all cable assemblies.

The outer jacket of jumpers shall be yellow.

Optical Fiber Connectors - All optical fiber termination components shall meet or exceed the applicable provisions of TIA/EIA-455-B, Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and Other Fiber Optic Components.

All optical fiber connectors shall be of industry standard SC connector type for single-mode optical fiber and shall meet or exceed the applicable provisions of TIA/EIA-455-2C (FOTP-2), Impact Test Measurements for Fiber Optic Devices, TIA/EIA-455-5B (FOTP-5), Humidity Test Procedure for Fiber Optic Components, and TIA/EIA-455-34A (FOTP-34), Interconnection Device Insertion Loss Test. When tested in accordance with FOTP –2, the connector assembly will be subjected to ten impact cycles by being dropped from a height of 1.5 m. The maximum insertion loss measured before and after the impacts should be < 0.50 dB. The mean insertion loss of the before and after impacts should be < 0.30 dB. The insertion loss increase measured before and after the impacts should be < 0.30 dB. The maximum reflectance measured before and after the impacts should be < 40 dB. When tested in accordance with FOTP – 5, the connector assembly will be subjected to test conditions of 75 °C and 95% relative humidity for 7 days. Measurements of loss and reflectance will be made at the beginning of the test, at a minimum of six hour intervals during the test, and at the end of the test. The maximum insertion loss measured before, during, or after the test should be < 0.50 dB. The mean insertion loss of the before, during, or after the test should be < 0.30 dB. The insertion loss increase measured before, during, or after the test should be < 0.30 dB. The maximum reflectance measured before, during, or after the test should be < 40 dB.

Optical fiber connectors shall satisfy all of the interface parameters of equipment components as may be defined by the transmission equipment specifications. All optical fiber connector assemblies shall be machine polished for low back-reflection and low insertion losses at both 1310 nm and 1550 nm operating wavelengths.

Single-mode pigtails shall be provided with factory pre-connectorized single-mode connectors of the SC type. Connectors shall have maximum insertion loss of 0.27 dB or better. Connectors shall have a stainless-steel barrel (coupling nut) with a bayonet connection design, ceramic (zirconia) ferrule. Each connector shall be capable of 200 repeated matings with a total maximum additional increase in insertion loss after 200 matings limited to 0.30 dB.

Each connector shall have a return loss (back reflection) equal to or better than 55 dB.

All connectors shall be factory-assembled and tested. There shall be no fabrication of connectors in the field.

All unmated connectors shall have protective caps installed.

Couplers - Couplers shall be made of nickel plated zinc or a glass reinforced polymer that is consistent with the material forming the associated SC connector body. The design mechanism for mounting the coupler to the connector panel may be flanged or threaded but shall coincide with the connector panel punch-outs. All coupler sleeves shall be ceramic of the split clamshell or cloverleaf design. The temperature operating range for couplers shall be the same as that specified for the SC connectors.

Pigtails - Pigtails shall be of simplex (one fiber) construction, in 900 Φm tight-buffer form, surrounded by aramid for strength, with a connector on one end. The outer jacket shall be yellow PVC with a nominal diameter of 3 mm, marked with the manufacturer's identification information. All pigtails shall be of adequate length for the intended connection purpose, but not less than one meter in length. Pigtails installed in conduit shall follow the installation procedures outlined for fiber optic cables, except that the pulling tension shall not exceed 500 N (110 lbf.).

Jumpers - Jumpers shall be simplex. All jumpers shall be at least two (2) meters in length, sufficient to avoid stress, and allow orderly routing. Jumpers shall have appropriate connectors on both ends.

6.28.11 Fiber Optic Cable Link Testing

The installed optical fiber cable shall be tested for compliance with the transmission requirements of this specification, the cable and hardware manufacturer's specifications, and prescribed industry standards and practices. The Contractor shall provide all personnel, equipment, instrumentation, and materials necessary to perform all testing herein.

Multiple tests shall be required prior to shipment as well as before and after installation of the cable. The results of these tests shall be logged and posted in the cabinet and in a conspicuous location for future comparisons. Documentation of all test results shall be provided to the Engineer within two

working days after the field tests are performed. The documentation shall also be made part of and submitted as part of the Operations & Maintenance Manual.

The types of acceptance tests required by the City of fiber optic cable system certification are:

- Documentation of compliance with the fiber specifications, as specified in these Technical Provisions, shall be supplied by the fiber manufacturer. Before shipment, but while on the shipping reel, 100% of all fibers shall be tested for attenuation.

Copies of the results shall be:

- Maintained on file by the fiber manufacturer, with a file ID number for a period of five (5) years.

- Attached to each fiber cable shipping reel in a waterproof pouch.

- Submitted to both Contractor and Engineer and shall be made part of the Operations and Maintenance Manual.

6.28.12 Continuity Testing (Before Installation)

The fiber cable shall be physically inspected on delivery and the attenuation shall be measured for 100% of the fibers. In addition, the continuity test procedure shall be used on short links (less than 300 feet) of the cable system during construction to validate continuity of fiber elements.

Failure of any single fiber within the cable to comply with these Technical Provisions shall be cause for rejection of the entire reel. Test results shall be recorded, dated, compared and filed with the copy accompanying the shipping reel in a waterproof pouch. Attenuation deviations of greater than 5% from the shipping records 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 test results are unsatisfactory, the reel(s) of fiber optic cable shall be rejected. The rejected reel(s) of cable shall be replaced with new reel(s) of cable at the Contractor's expense. The new reel(s) of cable shall be tested upon delivery as described herein.

Cable continuity shall be verified using a visual light source, typically a 635-nm laser diode. For cables with insertion loss of less than 3 dB, the light source shall be the Corning Cable System OS-1 OOD test set, a RIFOCS 263A visual fault finder, OFS, or equivalent.

The continuity test procedure shall also be used to verify continuity on all fibers prior to measuring pre-installation attenuation using an Optical Time Domain Reflectometer (OTDR). This insures that the fibers are completely

continuous from end to end, since single-ended OTDR tests cannot reveal fiber discontinuities close to the cable endpoints.

6.28.13 Continuity Testing (After Installation)

These tests shall occur after the termination process has been completed. Each point-to-point link shall be tested for optical power loss with an OTDR in both directions. The connectors shall be identified by numbered colored tape, where each tape color shall be consistent throughout the project.

The Contractor shall use OTDR testing to insure that each fiber is one continuous length (contains no splices within the cable structure) and meets the attenuation specifications of the manufacturer and cognizant industry standards. OTDR measurements made before the cable installation provide baseline data for comparison to post-installation OTDR tests. The OTDR test also provides useful measurements and documentation for the installed system. Therefore, OTDR traces shall be generated into a hard copy and software file on a floppy disk for the purpose of developing historical as-built, documentation regarding the cable's condition before and after it was installed. The hard-copy and floppy disk documentation shall be provided to the City. The recordings shall also be made part of and submitted as part of the Operations & Maintenance Manual.

If specialized software (i.e. other than Microsoft Office Products) is needed to access and read OTDR electronic test results, the Contractor shall provide licensed software to the City at no cost.

Prior to conducting OTDR tests, the Contractor shall provide the City with information regarding the test equipment to be utilized (manufacturer and model number) plus the equipment calibration procedures that will be utilized by the Contractor.

Quality tests shall consider both attenuation and localized loss discontinuities. The OTDR shall be equipped with a switchable, dual wavelength module with 1300 nm and 1550 nm light sources, and be compatible with single mode test fibers. The OTDR shall either be capable of writing to a floppy disk or configured with a plotter to provide a hard copy record of each test measurement. The OTDR shall be equipped with sufficient internal masking to allow the entire cable section to be tested. This may be achieved by using an optical fiber pigtail of sufficient length to display the required cable section, or by using an OTDR with sufficient normalization to display the required cable section. A hard copy XY plot shall be provided to the City for all fiber optic tests.

All traces shall display the entire length of cable under test, highlighting any localized loss discontinuities. The trace shall display fiber length (in meter/feet), fiber loss (dB), and average fiber attenuation (in dB/mile) as measured between two markers placed as near to the opposite ends of the fiber under test as is possible while still allowing an accurate reading. Time

averaging shall be used to improve the display signal-to-noise ratio.

If connectors exist in the cable under test, then two traces shall be recorded. One trace shall record the fiber loss (dB) and average attenuation (dB/mile) of the entire cable link, including connectors. The second trace shall display a magnified view of the connector regions, revealing the connector losses (dB). All connector losses shall be measured using the Least Squares Approximation (LSA) or 5-point splice loss measurement technique.

The OTDR trace shall also include the following information:

- The date and time of the test.
- The Cable ID number.
- The fiber color or ID number.
- The optical wavelength used for the test.
- The refractive index setting of the OTDR.
- The pulse width setting of the OTDR
  *The averaging interval of the test.

Each connector shall be tested for optical loss using an OTDR. Measure each connector in both directions, at 1550 nm, for single mode connectors. An XY plot, from the OTDR, shall be provided for each connector measurement. Connector loss shall meet or exceed the requirements of the connector specifications. The OTDR shall be calibrated for correct index of refraction to provide proper length measurement for the known length of reference fiber.

6.28.14 Insertion Loss Testing (After Installation)

Insertion loss testing is performed after the cable has been installed, terminated with connectors, and connected to the patch panels. It is used to closely emulate the losses incurred in a fully assembled optical data link. It measures actual losses through connector panels and fiber cable. A light source from an insertion loss test set directly replaces the data transmitter at the output launch point and an optical power meter replaces the data receiver at the data receiver input port.

The Contractor shall conduct insertion loss testing on all installed and terminated optical fiber elements. Insertion loss test measurements for each fiber on each cable shall be documented by the Contractor and the results provided to the City. Testing shall be conducted at 1550 nm for all single mode cables. Total end-to-end loss for each fiber in each cable shall be within the fiber optic modem manufacturer's allowable loss budget specifications. If it is not, the Contractor shall take corrective measures to bring the cable link's insertion loss into compliance with the manufacturer's

specifications, including remating and re-termination of the connectors, and/or replacement of the cable.

The Contractor shall provide the City with information regarding what type of test equipment will be utilized (manufacturer and model number) plus the equipment calibration procedures that will be utilized by the Contractor prior-to conducting this test routine.

The test recordings for all fiber cables shall be provided on documentation sheets in a form to be determined by the City and submitted to the City within two (2) weeks after termination of the fiber elements. The recordings shall also be made part of and submitted as part of the Operations & Maintenance Manual, discussed elsewhere in these Special Provisions.

6.28.15 Insertion Loss Test Equipment (Fiber Optic Cable)

1. **Testing Light Source:** An LED laser light source with a wavelength equal to the operational system wavelength shall be used. The LED shall be stable within 0.1 dB in output power over a time period sufficiently long to perform the measurement.

2. **Launch Reference Cable:** It shall provide for attachment to the light source. The launch reference cable shall be of the same fiber size and type as the fiber under test. To eliminate cladding modes, a self-mode-stripping cable or a low loss (-O.5 dB) mandrel wrap mode filter shall be used.

3. **Power Meter:** The detector in the power meter shall have an effective numerical aperture (NA) and active area that is larger than the fiber under test. The power meter shall have a sufficient measurement range to measure the insertion loss of the cable and connectors in the link. The power meter must be linear over the range of losses to be measured in the system and have sufficient resolution for the proposed measurements (0.05 dB). The power meter must be able to measure both absolute power in units of dBm and relative loss in units of dB. The power meter must also be able to change its calibration wavelength to match the system (1310 nm, or 1550 nm) operation wavelength. The meter shall be capable of measuring to -70 dBm.

6.28.16 Insertion Loss Test Procedures and Execution

The Contractor shall provide all personnel, equipment, instrumentation and supplies as necessary to perform all testing.

- Zero Reference Cable: Connect the launch reference cable between the test light source and the power meter detector. Illuminate the reference cable and record the optical power as Ref. Power 1 in dBm.

- System Insertion Loss: The system to be tested shall be inserted between the launch reference cable and the power meter, completing the

optical path from the LED to the power meter. Record the optical power shown on power meter as Test Power 1 in dBm. System Insertion Loss 1 is then calculated by the following equation: NOTE: Record insertion loss as a positive value.

System Insertion Loss 1 (dB) = Ref. Power 1 (dBm) - Test Power 1 (dBm)

The system under test shall then be tested from the other end in a similar fashion as above. Here, record the output of the launch reference cable as Ref. Power 2 and the output of the system link as Test Power 2. System Insertion Loss 2 is calculated identically:

6.28.18System Insertion Loss 2 (dB) = Ref. Power 2 (dBm) - Test Power 2 (dBm)

The results of the insertion loss testing shall be recorded along with the test date, name of person performing the test, and the brand name, model number and serial number of the equipment used during the test. All results shall be made part of and submitted as part of the Operations & Maintenance Manual, discussed elsewhere in these Special Provisions.

6.28.17 Fiber Optic Cable Route Records

The Contractor shall provide the City with a cable route diagram indicating the actual cable route and foot marks, for all intersections, directional change points in the cable routing, and all termination points. The Contractor shall record these points during cable installation. Cable system As-Built drawings showing the exact cable route shall be provided by the Contractor to the City. Information such as the location of slack cable and its quantity shall also be recorded in the cable route diagram. This information shall be included as part of the Operations & Maintenance Manual. Each fiber connectors and patch panel connectors shall be tagged with its fiber number and associated field element location. Each tag shall be permanently attached by a nylon tie-lock to the cable or connectors.

6.29 Fiber Patch Panel (FPP)

(Not applicable for this project)

6.29.1 General

Fiber Patch Panel (FPP - also called Wall Interconnect Center (WIC)) shall be furnished and installed at the locations shown on the Plans. The section includes material and installation for fiber patch panel.

6.29.2 Description

The fiber patch panel shall act as the demarcation point between the fiber optic cable via the fiber pigtail from the splice closure and the terminal

equipment via the fiber optic patch cords. The Contractor shall furnish and install matching connectors. The approved type optical connectors on the end of each pigtail shall screw into a sleeve securely mounted to a patch panel within the fiber patch panel enclosure. The maximum optical loss across the connection shall not exceed 0.4 dB.

The fiber patch panel housings shall be surface or shelf mounted in the outdoor traffic signal controller cabinets, as shown on the Plans. The fiber patch panel shall accept a minimum of twelve (12) fiber terminations (6 in and 6 out). The cabinet shall have fiber optic cable entrances with cable sheath strain relief, leading to the fiber patch panel.

The make of the Fiber Patch Panel shall be OFS, Corning Cable System or approved equal.

6.29.3 Installation

The FPP units shall be installed in Type 333L cabinet as shown on the Plans. FPP units shall be secured in each cable and may be wall mounted on side/shelf of cabinet in 333L cabinets, or rack mounted in 333L cabinets. Contractor shall propose mounting method to Engineer for approval.

6.30 Ethernet Switch

(Not applicable for this project)

6.30.1 General

The Contractor shall furnish and install Ethernet Switch. As a requirement of contract award, the Contractor shall be fully responsible for the field installation said Ethernet Switch per the plans, and necessary connections for a fully operational system.

The Contractor shall be responsible for all incidental accessories necessary to make said Ethernet Switch complete and ready for operation, even if not particularly specified. Such incidentals shall be furnished, delivered and installed by the Contractor without additional expense to the City. Minor details not usually shown or specified, but necessary for the proper installation and operation of the System, shall be included in the work and in the Contractor's price bid. It is understood and agreed by the Contractor that the description provided herein is complete and includes all equipment necessary for the proper functioning of the Ethernet Switch, even though every item may not be specifically mentioned.

6.30.2 Summary of Work

The following summary of work is an overall description of the work to be included for said Ethernet Switch and does not necessarily include every item of work. The Switch shall be furnished complete, installed, tested, and operational when connected with associated equipment. The Contractor

shall supply and install items that meet or exceed the specified requirements.

1. Install **Contractor-Furnished** hardened Fast Ethernet Switch, **Contractor-Furnished** power supply and its associated equipment and peripherals at locations as shown on the Plans, the approved list of equipment, Submittal, and these Special Provisions. Furnish and install 19-inch rack-mounted power strip at Type 333 cabinets, and wall mounted power strip at NEMA cabinets, for hardware installed by Contractor.

2. The Ethernet Switch will be configured by the manufacturer for installation by Contractor. The City will be responsible for the integration of Gigabit and Ethernet Switch equipment, including the assignment of IP addresses for each device and/or IP port, with the elements listed below. Contractor shall install **Contractor-Furnished** Ethernet hardware and support integration and set up as directed by Engineer.

3. The Contractor shall submit within twenty one (21) calendar days from Notice to Proceed, documents showing the Contractor's understanding of the design and list of equipment and materials proposed for the System to the Engineer for review and approval. Approval of the understanding document and equipment submittal is required prior to ordering and installation of any equipment or materials for the System.

4. The Contractor shall perform tests after completing the installation, as specified in these Special Provisions, to show the System is properly installed and operational, and that it meets the specification and applicable codes.

5. The Contractor shall provide warranty documentation and operations and maintenance manuals as specified in these Special Provisions.

6. All network cables shall be CAT-6 cables.

6.30.3 System Capability

The Ethernet Switches shall, as a minimum, conform to the following standards, features and specifications:

- IEEE 802.3 (10Base-T)
- IEEE 802.3u (100Base-TX 100Base-FX)
- IEEE 802.3x (Flow Control)
- IEEE 802.3z (Gigabit Ethernet)
- IEEE 802.1Q (VLAN Tagging)

- IEEE 802.1D (Spanning Tree Protocol)
- IEEE 802.1W (Rapid Reconfiguration of Spanning Tree)
- IEEE 803.1p (Class of Service or QoS for 4-level transmission priorities)

The operating system for the installed switches shall furnish the following capabilities and feature sets:

- VLAN Support
- 802.1Q VLANs
- Port Selectable 802.1Q Membership
- 802.1Q Trunking
- Port Based VLANs

The Ethernet Switches shall be capable of providing multi-protocol communications (voice, data, and video) via Ethernet interfaces, eliminating as much external equipment as possible. It must operate over a wide variety of fiber optic and copper wire network media. It must be capable of being managed remotely. The switches shall provide fault tolerance via the IEEE 802.1D Spanning Tree Algorithm.

6.30.4 Quality of Service (QoS) Support

The Ethernet Switches shall, at a minimum, provide the following QoS features:

- Understands 802.1p settings from an end-device.
- Ability to set 802.1p settings.
- Understands RSVP settings from an end-device.
- Ability to define priority queues.
- Ability to apply QoS at Layer 3.
- Ability to apply QoS to a single switch by Port or VLAN.
- Centralized QoS management.
- Ability to combine multiple QoS settings together.

- Ability to apply QoS at any Layer independent of whether the switch is running in Layer 2 or Layer 3 mode.

The Ethernet Switches shall understand differentiated service and furnish the following:

- (Diffserv) settings from an end-device.
- Ability to set Diffserv settings.
- Ability to set RSVP settings.
- Ability to apply QoS at Layer.
- Ability to apply QoS at Layer 4.
- Ability to apply QoS environment wide.
- Independent Queues per port.
- Ability to set a minimum bandwidth guarantee.
- Ability to set a maximum bandwidth guarantee.

6.30.5 Multicast Support

The Ethernet Switches shall, at a minimum, provide the following multicast support features:

- Internet Group Management Protocol (IGMP) Snooping
- Protocol Independent Multicast (PIM) Sparse/Dense
- Ability to adjust times independently for Layer 3 techniques.
- Ability to intermix IGMP Snooping with a Layer 3 technique.

6.30.6 Configuration and Management Mandates

The Ethernet Switches shall, at a minimum, meet the following specifications for configuration and management mandates:

- Multiple Image File Support on the switch.
- Ability to make changes without rebooting.
- CLI via Telnet
- HTTP GUI

- Enterprise Manager integration with a Management Platform
- ASCII Configuration File Support
- Ping Support
- Ability to track and find an IP address.
- Ability to proactively send alarms.
- Trivial File Transfer Protocol Support
- Internal Logging Support
- Domain Naming Service Support
- Ability to telnet to another device.
- Multiple Configuration File Support on the switch.
- CLI via RS232
- CLI via SSH2
- Enterprise Manager - SNMP based
- Remote Monitoring of networked devices (RMON) Support
- Traceroute Support
- Ability to track and find a MAC address.
- Ability to track and find a DHCP/WINs user.
- Debugging on a feature by feature basis.
- Network Timing Protocol Support
- External Logging Support
- Configuration File Timed Saves
- Consistent Interface from product to product.

6.30.7 Security Features

The Ethernet Switches shall, at a minimum, meet the following specifications for security features:

At Device Level,

- Authorization for console login.
- Authorization for SSH2 login.
- Authorization for SNMP access.
- Ability to deactivate SSH2 access.
- Ability to deactivate SNMP access.
- Ability to restrict access from specific end-devices.
- Internal authorization system.
- Multiple levels of user authorization.
- Authorization for telnet login.
- Authorization for HTTP login.
- Ability to deactivate telnet access.
- Ability to deactivate HTTP access.
- Ability to deactivate access methods independently.
- Ability to log all access requests.
- External authorization system.
- Per command authorization.

At Traffic Level,

- Ability to restrict traffic at the port level (Layer 1).
- Ability to restrict traffic by IP address (Layer 3).
- Ability to restrict traffic by TCP/UDP port (Layer 4).
- Ability to restrict traffic by combinations of Layers.
- Ability to restrict traffic by MAC address (Layer 2).
- Ability to restrict traffic by IPX address (Layer 3).

- Ability to restrict traffic by VLAN

6.30.8 Description

The Ethernet Switch shall consist of the following:

- **Furnish and Install** Managed Hardened Ethernet Switch with a minimum of six (6) 10/100 Mbps Ethernet (copper) ports and two (2) 100 Mbps fiber ports. **Hardened Ethernet Switch shall be EtherWAN EX71620-A0B switch with power supply model number 41-136044-1, or approved equal.**

6.30.9 Electrical Requirements

The Gigabit Ethernet Switch shall have dual power supply which operates on 100-250 ± 10 VAC (auto-ranging) at 47-63 Hz or + 12V DC at 13A and not consume more than 200 watts fully loaded. There shall be reverse polarity and transient protection for the switch.

Each Gigabit Ethernet interface shall have sufficient transmission power and receiver sensitivity to operate for a distance of 10 km over single mode fiber at 1310 nm with a bit error rate of 10-12 or better.

The Ethernet Switch shall operate at a 110 VAC ± 10 VAC (auto-ranging) at 47-63 Hz or + 12V DC at 13A. The Ethernet Switch shall have a plug receptacle and draw power from the surge suppressor located in the Field Element cabinet.

6.30.10 Power

Hardware installed in controller cabinets and communication hubs require GFI receptacles for power. Contractor shall furnish and install 19-inch rack-mounted power strip in communication hubs, and Type 333 traffic signal controller cabinets. Where shown on plans, Contractor shall furnish and install, attached to inside wall of cabinet, wall-mounted power strip in NEMA cabinets. Power strip shall support 20-amp and include six receptacles for plugging in multiple devices. Power strip shall be by Black Box, APC, or approved equal. Contractor shall determine the quantity of power strips per location to support hardware installed.

6.30.11 Environmental Requirements

The Contractor shall meet all NEMA environmental specifications for all material and equipment for the System. The equipment shall meet all specified performance criteria, and will incur no damage, failure, deterioration, or change in tolerance limits when exposed continuously to the following environmental conditions.

Parameter	Requirements
Temperature	• Standard Operating Temperature -34° C to +74° C • Storage Temperature -34° C to +74° C
Humidity	10% to 95% non-condensing humidity
Cooling	1. Natural cooling only
Electromagnetic Compatibility and Interface	2. Complies with FCC Part 15 Class A, CE Class A 3. Complies with UL 1950 4. Proper packaging to minimize electromagnetic emission that may affect other equipment 5. Proper shielding to minimize susceptibility to radio frequency (RF) emissions 6. Shielding shall be integrated along with other basic interference control measures such as filtering, wire routing, cable placement, circuit layout, signal processing, spectrum control, and frequency assignment to achieve operational compatibility with other equipment. 7. Where required, the equipment shall incorporate shields to protect personnel from high level electromagnetic fields that may be intentionally or unintentionally generated by the equipment.
Vibration and Shock	The equipment shall be capable of withstanding normal vibrations and shock as encountered during transportation by road, cross-country terrain, rail, sea, and air.

6.30.12 Equipment Design Requirements

1. Ethernet switch shall be in shelf mounted, wall mounted, or 19” rack mounted. Contractor shall propose mounting configuration in both Type 333JP and NEMA cabinets to Engineer for approval prior to procurement.

2. Ethernet Switches must be “hardened” - must meet the temperature requirements detailed in the environmental section. Optics should be “fixed” (not removable).

3. Network port type shall be 1000Base LX.

4. Switch port can be SC type connector style and shall be compatible with the fiber optic system and communication equipment installed in this project.

6.30.13 IP Addressing

The Ethernet system implemented as part of this project will be a private Ethernet system for use by City staff only. The Westminster Information Technology department is responsible for management of the IP addresses

for City networks. The Ethernet hardware will be configured by the manufacturer for installation by Contractor.

6.30.14 Installation

The Ethernet Switch shall be installed in Type 333 cabinet, as shown on the Plans. All Ethernet switches shall be shelf mounted per approval of Engineer.

All Ethernet switches shall be managed switches in the network and shall have the ability to custom configure the switch and identify it with an IP address for network management.

6.30.15 Warranty

All components of the System shall have a minimum 1-year manufacturer's warranty for parts and labor from date of final acceptance.

Repair or replacement of defective parts for a period of two (2) years from the date of shipment is required.

6.31 Closed Circuit Television Camera System

(Not applicable for this project)

6.31.1 General

The Closed Circuit Television (CCTV) Camera System shall comply with all rules and regulations of the Federal Communications Commission (FCC) and these Special Provisions. The specified product shall be manufactured by a firm whose quality system is in compliance with the I.S./ISO 9001/EN 29001, QUALITY SYSTEM.

The IP dome positioning system (IPDPS) system shall be Cohu 3920^{HD} Series or approved equal.

Furnish and install CCTV Camera System as shown on the plans.

CCTV data and video transmission between the TMC and the CCTV camera system locations will be done by the Ethernet System.

The Contractor shall furnish and install the City-Furnished CCTV camera, mounting hardware and CODEC-1, and furnish and install all CCTV camera cabling, wiring and connections for operation of the CCTV camera systems, per the direction of the Engineer and as shown on the plans, including all incidental accessories necessary to make the CCTV camera system complete, fully functional, and ready for operation, even if not particularly specified. Such incidentals shall be furnished, delivered and installed by the Contractor without additional expense to the Engineer or the City. Minor

details not usually shown or specified, but necessary for the proper installation and operation of the CCTV camera system, shall be included in the work. It is understood and agreed by the Contractor that the system description provided herein is complete and includes all equipment necessary for the proper functioning of the CCTV camera system, even though every item may not be specifically mentioned.

6.31.2 Product Description

1. The dome system specified herein shall provide an integrated network (IPDPS) providing 720p30 video with H.264/MJPEG compression and encoding for providing low bandwidth, low latency, high quality video images transported over standard ethernet infrastructures.

2. The (IPDPS) shall integrate an HDTV standards 720p30 day/night camera with integral 30x motorized zoom, a H.264/MJPEG ASIC based encoding engine and network communication circuitry, a wide dynamic range, variable speed dome drive fully protected by an IP67 sealed and pressurized dome enclosure system.

3. The H.264/MJPEG encoded video shall support 30 frames per second @ HDTV 720p resolution with support for uni-cast and multi-cast connections, using RTP/RTSP network layers.

4. The (IPDPS) shall provide electronic image stabilization (EIS) and defog image processing capabilities, to maximize video image quality under adverse conditions.

5. The (IPDPS) shall include a web server allowing password protected administration/configuration capabilities along with full camera and positioning system control and viewing functions.

6. The (IPDPS) camera manufacturer shall provide a software development kit (SDK) for allowing any 3rd party developers all necessary tools for integrating the (IPDPS) system into the users control system environment.

7. The (IPDPS) shall provide hybrid capability delivering both ethernet and analog composite video and RS422 serial connections for external system connections and control.

8. The (IPDPS) positioning drive system shall provide a wide dynamic range speed capability of 0.1 to 80^0 per second, preset acquisition of 180^0 movements in less than 2.5 seconds with a minimum of 0.1 degree repeatability, 360 degree continuous pan rotation, and +5 to –90 degree tilt range.

9. The (IPDPS) shall include an advanced ID generation capability for indications of viewing direction, compass setting, azimuth/elevation position, location descriptors and user defined image/logo.

10. The (IPDPS) shall be designed for use in harsh operational environments conforming to NEMA TS2 requirements for power, shock and vibration as well as provide IP67 environment protection standards.

11. The (IPDPS) system shall include NTCIP 1205 over IP communication protocol and ONVIF based interface for providing a standardized interoperability of 3rd party system equipment.

12. The (IPDPS) units shall be fully assembled, pressurized and tested at the original manufacturing facility and shipped as a complete unit, ready for installation and commissioning.

6.31.3 Product Specifications

The (IPDPS) shall meet or exceed the following design and performance specifications.

1. 30x CAMERA MODULE

a. Image Sensor: Progressive Scan

b. Image Size: Diagonal 6mm (1/3" type)

c. Image Resolution: 1280 horizontal; 720 vertical

d. Picture Elements (total) 1296 (H) x 966 (V)

e. Video Output: 16 Bit Digital YUV: 4.2.0

f. Day/Night Operation: Auto, Color and Mono Modes via removable IR filter.

g. Maximum Lens Aperture: f/1.4 (wide) to f/4.6 (tele)

h. Optical Zoom Range: 30x, 4.4mm to 132mm

i. Electronic Image Stabilization (EIS): On/Off Mode, selectable frequency setting of 5 or 10hz.

j. Defog Image Processing: On/Off Mode with 3 saturation levels and fine adjustment range of 1 to 128 per level.

k. Digital Zoom Range: 2x, (EIS Mode off)

l. Horizontal Angle of View: Optical: 62.9° to 2.2 +/- 15%

m. Minimum Focus Distance: 0.01m (w); 1.0m (t)

n. Auto Focus: Selectable Auto/Manual; Minimum Scene Illumination for Reliable Auto Focus shall be no more than 50% video output.

o. Auto Iris; Selectable auto/manual; Iris shall automatically adjust to compensate for changes in scene illumination to maintain constant video level output within sensitivity specifications.

p. Manual Shutter: Selectable shutter speeds shall be from 1/30 to 1/10,000

q. Auto DSS Range: ¼ to 1/4000. Provide minimum DSS adjustment of [Off, ¼, 1/8, 1/15)

r. Mirror Image Function: On/Off Mode

s. Image Freeze: On/Off Mode

t. Sensitivity: Scene Illumination; F1.6 @ 30% Video

- 0.3 Lux (0.03 fc) @ 1/30 shutter, color mode
- 0.005 Lux (0.0005 fc) @ 1/4 shutter, mono mode

2. H.264/MJPEG ENCODING ENGINE

The (IPCPS) system shall fully integrate within its positioning system enclosure the H.264/MJPEG encoding component with functions as specified below:

a. Video Encoding: H.264 and MJPEG standards

b. Video Stream Codec Configurations: Up to (2) two independently configurable streams;

- H.264 Only
- MJPEG Only
- H.264 + H.264
- H.264 + MJPEG
- H.264 + Analog
- MJPEG + Analog

c. Video Stream Configuration Properties;

- Stream 1 Image Resolution: 720p
- Stream 2 Image Resolution: 720x480, 352x240
- Streaming Mode: CBR

- Frame Rate: 30, 15, 7.5, 6, 5, 3.75, 3, 2, 1

d. Video Streaming Protocols; the camera system shall support the following streaming protocols:

- RTSP/RTP; The RTSP communication shall occur over a TCP socket. RTP video packets shall be sent over UDP. This mode shall be available at all times for H264 and MJPEG encoded streams.

- RTSP Interleaved; RTSP commands and the RTP video packets shall be transmitted over a single TCP connection. This mode shall be available at all times for H264 and MJPEG encoded streams.

- HTTP tunneling; This mode shall use two separate TCP connections, one for sending and the other for received data from the client over port 80. This mode shall available at all times for H264 and MJPEG encoded streams.

- RTP multicast; This mode shall sends RTP video packets to the user assigned multicast destination. This mode shall be required to be enabled or disabled. This mode shall be available for both H264 and MJPEG encoded streams.

- MJPEG push using HTTP; MJPEG frames shall be delivered as a sequence of multi-part JPEG images using HTTP protocol. This method shall uses TCP communication on port 80. This mode shall only available when on the encoded stream is MJPEG.

- MJPEG pull using HTTP; A single JPEG image is sent by the server upon receiving clients request using http protocol. This scheme shall use TCP communication on port 80. This mode shall only available when on the encoded stream is MJPEG.

e. Data Rate: Adjustable from 256Kb to 8Mb/sec

f. Connection Types: Uni-cast, multi-unicast or multi-cast

g. IPCPS Video Latency: <150ms

h. Network Protocol Layers: RTP, RTSP, UDP, TCP, IP, HTTP, IGMPv2, ICMP, ARP as a minimum

3. Positioning Drive

a. Pan Movement; 360 degrees continuous rotation

b. Pan Speed; Variable from 0.1 to 80 degrees/second.

c. Pan Repeatability; +/- 0.1 degree precision

d. Pan Preset Speed; 180 degree movement < 2.5 Seconds

e. Tilt Movement; Minimum of +5 to –90 degrees

f. Tilt Speed; Variable from 0.1 to 40 degrees/second.

g. Tilt Repeatability; +/- 0.1 degree precision

h. Tilt Preset Speed; 90 degree movement < 2.5 Seconds

i. Positioning control shall allow variable pan/tilt speeds based on zoom position. This shall scale the maximum pan/tilt speed, while maintaining variable speed capability, throughout the zoom range of the camera.

4. IPDPS Operational Requirements

a. Required camera control functions shall include the following features and capabilities as a minimum; these functions shall be exposed as part of the (IPDPS) web server.

- Day/night Mode; shall allow user control of Color, Mono and Auto modes of operation.
- Lens Properties; allow user control of the following features;
  - o Focus; Auto or manual mode. If in manual mode, user shall be capable of adjusting focus near/far settings
  - o Iris; Auto or manual mode. If in manual mode, user shall be capable of adjusting iris open/close settings
  - o Speed; Allow user control of normal or fast zoom lens speed.
- Zoom Lens Control; provide two types of control functions for the zoom lens as follows;
  - o Continuous; Allows user to zoom in or out as necessary on a continuous basis throughout the cameras optical and digital zoom range.
  - o Absolute; Allows user to select an explicit zoom level for the lens setting.
- Shutter Speed; shall allow user control of shutter speed mode from 1/30 to 1/10,000 setting.
- Digital Slow Shutter (DSS): This function shall be available for increasing sensitivity by using slower shutter speeds from 1/15 to ¼ setting. The camera shall provide a DSS limit setting allowing user to disable or configure the slowest shutter speed allowed.

- Electronic Image Stabilization (EIS) shall allow user control of On/Off Mode with selectable frequency setting of 5 or 10hz.

- Defog function shall allow user control of the On/Off Mode with three saturation levels and fine adjustment within each level in a range of 1 to 128.

- Auto white balance: shall allow user control of setting mode to on or off.

- Wide Dynamic Range; shall allow user control of setting mode to on or off.

- Backlight Compensation; shall allow user control of setting mode to on or off.

- Maximum AGC Level; shall allow user selection of maximum AGC level of 1db up to 40db.

b. Required positioning control functions shall include the following features and capabilities as a minimum;

- Pan/Tilt Positioning

  o Movements; The (IPDPS) positioning system shall allow continuous 360 degree azimuth (pan) rotation and + 5 to - 90 degree elevation (tilt) movement.

  o Variable Speed; The (IPDPS) shall provide variable speed azimuth and elevation capability using a minimum of up to 64 distinct speed settings ranging from 0.1 to 80 degrees/second.

  o Vector Positioning; The (IPDPS) system shall be capable of simultaneous pan and tilt movements.

  o Click-n-Drag positioning control; The (IPDPS) shall provide pan/tilt positioning control using in-video-window click-n-drag control. Speed variation shall be accomplished by increasing/decreasing mouse cursor distance relative to initial click point.

  o Scalable Zoom; Variable speed pan/tilt ranges based off of zoom position. This adds the capability of limiting the maximum pan/tilt speed, while maintaining variable speed capability, throughout the zoom range of the camera.

- Presets; Minimum of 64, with each preset consisting of a pan, tilt, zoom and focus coordinate and ID label. When a preset position is recalled the corresponding preset ID shall be displayed. The preset ID shall remain displayed until a

pan, tilt, zoom or another preset command is received.

- Preset Tours; Minimum 8 tours required, each tour shall consist of up to 32 pre-programmed presets, with individual dwell time property per preset per tour.

  - o Tours shall stop upon receipt of any pan/tilt positioning command.
  - o Tour data shall be stored in non-volatile memory and shall not be lost if a power failure occurs.

c. Updates: The (IPDPS) shall allow updates of firmware for new features via the ethernet network communication channel. An internal (IPDPS) web server shall be provided for performing this task.

d. The (IPDPS) system shall return to previous position and state of operation upon power loss and restoration.

5. On-Screen Display

a. The IPCPS system shall provide on-screen display (OSD) generator supporting the following capabilities;

- Provide OSD elements as defined below as a minimum; Up to four OSD elements shall be selectable for inclusion in the cameras two video streams.

  - o Camera title [24 characters]

  - o Time/Date display

  - o Preset location [24 characters]

  - o Pan/Tilt/Zoom position

  - o Sector Zone location [24 characters per zone]

  - o Maintenance Display [temperature and pressure]

  - o Logo Display [96 x 96 pixels maximum]

- The OSD elements shall display on top or bottom of image, on right hand side of video.

- The Logo element shall display on top or bottom of image, on left hand side of image.

6. Event Management

a. Event Triggers

- External Alarm Input

- User Command
- Timer

b. Event Actions

- Activate Alarm Output
- Capture/FTP image snapshot
- Email notification
- Activate Preset Position

7. General Purpose Alarm Input/Output

- Sensor Inputs: (2) dry contact
- Control Output: (1) Open Collector, 500mA sink current

8. Communication Protocols and Formats

The (IPDPS) system shall include integrated video camera system communication drivers for flexibility and system interoperability. The (IPCPS) camera system shall support both serial RS422 and Ethernet communication channels at a minimum, allowing field selection of the following protocol drivers as required;

9. Maintenance Functions

- The camera system shall support querying of camera parameters via the Ethernet connection. The camera parameters shall consist of the following items:
  - o Serial Number
  - o Software Revision
  - o Assembly Date
  - o Camera Model Number
- Internal Temperature Monitoring and Reporting
- Remote Software Upload/Updates via Ethernet
- Camera Device Auto Discovery of IP address

- Camera System Auto Re-connect
- Camera System Reset
- Save and Restore camera system start-up configuration.

10. Management

- The (IPDPS) shall provide at minimum the following network configuration properties;
  - o IP Configuration: DHCP or Static IP address entry
  - o Net mask address entry.
  - o Gateway address entry.
  - o Domain name entry.
  - o DNS server entry.

11. Power Input

- The (IPDPS) system shall fully comply with and include test results confirming compliance with the following electrical operating conditions;
  - o Power; <40 Watts (exclusive of PT Heater Option)
  - o Operating Voltage; 89 to 135Vac +/-3hz. Shall comply with NEMA-TS2 para 2.1.2 and 2.1.3
  - o The (IPCS) system shall NOT require any external to Camera System step-down power supply transformer/interface box for accepting the specified operating voltage. Products requiring this shall not acceptable.

12. Mechanical

- Connectors; 18 Pin MS style PT06E-14-18S(SR) weatherproof non-corrosion type or equal.
- Weight; Maximum 14lbs (6.3kg)
- Dimensions; Housing shall be 11.05” outer diameter x 11.66” Height. Dome acrylic shall be less than 7.00” diameter.
- Construction; Powder Coated 6061 T6 aluminum; all internal and external parts corrosion protected, stainless steel fasteners, and shall use only optically corrected acrylic for

dome bubble.

- Camera Mount; 1.5" NPT

13. Environmental

- The (IPDPS) system shall fully comply with and include independent laboratory test results confirming compliance with the following environmental operating conditions;

  - o Operating Temperature; -40C to 60C.

  - o Vibration; Per Nema-TS2 paragraphs 2.1.9, 2.2.3, 5-30Hz sweep @ 0.5g applied in each of 3 mutually perpendicular planes.

  - o Shock; Per Nema-TS2 paragraphs 2.1.10, 2.2.4, 10g applied in each of 3 mutually perpendicular planes.

  - o Water Spray; Per IEC 60529+A1, 1999, Para 14.2.6, Solid water stream delivered thru 12.5mm nozzle @ 25 gallons/minute @ 9ft for 3 minutes

  - o External Icing; Per Nema-TS2 250-2003, paragraphs 5.6

  - o Corrosion Protection; Per Nema 250-2003, paragraphs 5.10

  - o Humidity; 0-100% N.C per MIL-E-5400T, paragraphs 3.2.24.4

  - o Standards; IP67, ASTM-B117 Marine

14. Certifications

- Safety; CE (24Vac)

- Emissions; FCC Class A

6.31.4 Wiring Requirements

All wiring shall meet the requirements of the national electric code. All wires shall be cut to proper length before assembly. No wire shall be doubled-back to take up slack. Wires shall be neatly laced into cable with nylon lacing or plastic straps. Cables shall be secured with clamps. Service loops shall be provided at all connections.

6.31.5 Design Requirements

The CCTV equipment shall be modular in design to allow major portions to be readily replaced. Modules and assemblies shall be clearly identified with name, model number, serial number and any other pertinent information required to facilitate equipment maintenance.

6.31.6 Fail Safe Provision

The equipment shall be designed such that the failures of the equipment shall not cause the failure of any other unit of equipment.

6.31.7 Camera Mounting Hardware

Camera shall use pole-mounting hardware provided by the dome CCTV camera vendor, capable of mounting to a horizontal traffic signal mast arm. The pole mount shall be affixed to the pole to extend the camera towards the center of the signalized intersection. The dome CCTV camera and mounting hardware shall withstand a wind load of 80 mph when affixed to traffic signal pole without permanent damage to mechanical and electrical equipment.

6.31.8 Connectors and Harnesses

All external connections shall be made by means of connectors. The connectors shall be keyed to preclude improper hookups. All wires to and from the connectors shall be color-coded and/or appropriately marked. In order to assure compatibility and performance compliance, the cables from the dome CCTV camera shall be assembled by the camera manufacturer.

Connecting harnesses of appropriate length and terminated with matching connectors shall be provided for interconnection with the communications system equipment.

All pins and mating connectors shall be gold plated to provide good electrical connection and resist corrosion. Connectors utilizing solder type connections shall have each soldered connection covered by a piece of heat shrink tubing securely shrunk to insure that it protects the connection.

6.31.9 Camera Interface

1. Each camera unit shall have a unique IP address. The unit shall respond to the central command only if it is addressed.

2. Camera shall be able to interface to Ethernet switch

3. Camera controls shall be PTZ Auto, or Manual Focus, Iris, and Power.

4. Control signals shall be EIA/TIA 485. A minimum 9600-baud data rate shall be used.

5. Camera control protocol shall be non-proprietary.

6.31.10 Installation

The CCTV camera system shall be installed as shown on the plans or as specified in these Special Provisions, unless otherwise directed by the Engineer. The mounting standards and specifications shall be provided by the camera manufacturer. The Contractor shall verify the mounting requirements and hole patterns of the camera enclosure and the suitability of the approach depicted in the manufacturer's standards. The Contractor may request approval for alternate mounting details by submitting a shop drawing. The Contractor shall incur complete responsibility for the integrity of all mounting structures.

During mounting of camera enclosures or any other work operation, the Contractor is responsible for avoiding and protecting from damage any existing poles, structures or wiring. All damage to existing poles, structures or wiring shall be repaired by the Contractor at his/her sole expense. The Engineer shall have final authority in determining the extent of repairs that shall be required.

6.31.11 CCTV (Power)

Power shall come from power strip installed by Contractor as part of the Ethernet system.

The Contractor shall coordinate all activities related to service for power with both the City, and any other utility as directed by the Engineer.

6.31.12 Warranty

All components of the CCTV camera system, except the cameras, shall have a minimum 1-year manufacturer's warranty for parts and labor. The cameras shall have a minimum of a 2-year manufacturer's warranty for parts and labor from date of contract acceptance. This warranty does not replace any manufacturer's warranty if greater that what is required herein.

Repair or replacement of defective parts for a period of two (2) years from the date of shipment is required.

6.32 Testing

Testing shall conform to the provisions in Section 82-2.14, "Testing", and these Special Provisions.

The costs of all equipment and materials testing, except as noted otherwise in this section, shall be the Contractor's responsibility.

The Contractor shall allow thirty (30) days for material and equipment testing from the date the material or equipment is delivered to the test site. When the equipment or material being tested has been rejected for failure to comply with these specifications, the Contractor shall allow thirty (30) days

for subsequent retesting. The retesting period shall begin when the corrected equipment or materials are made available at the test site.

The Engineer and Project Inspector shall be notified a minimum of two (2) work days in advance of planned connection of the modified traffic signal to the traffic signal communications system, if the modified traffic signal is to be connected to the traffic signal communications system.

The Contractor shall, at their own expense, arrange to have a signal technician, qualified to work on the controller assembly and employed by the controller assembly manufacturer, or its representative, present at the time the equipment is turned on. The Engineer shall be notified at least two (2) working days prior to the beginning of the functional test period.

The functional test shall not begin on a Friday, Saturday, Sunday, or on the day preceding a legal holiday. The initial turn-on shall be made between 9:00 AM and 3:00 PM. Prior to turn-on, all equipment as shown on the plans shall be installed and operable. This includes the vehicular signals, pedestrian signals, pedestrian push buttons, video detection system, vehicle detectors and safety lighting. All louvers, hoods, and signal heads shall be directed to provide maximum visibility.

Turn-on of new traffic signal systems shall be made only after all traffic signal circuits have been thoroughly tested for continuity, grounds and insulation resistance as specified in said Section 86-2.14. The Engineer shall be notified at least seventy-two (72) hours prior to the intended turn-on or the beginning of the functional test. The Contractor shall arrange to have a signal technician qualified to work on the controller present at the time the equipment is turned on. Controller operation shall be set by the field by the project engineer of the Contractor, subject to field adjustment instructions by the Engineer. Flasher units shall be set "red" for all directions.

6.33 Engineering Control

Control of the work shall be in accordance with Section 5, “Control of Work”, with the following modifications:

1. The Contractor shall notify the engineer forty-eight (48) hours in advance if the time and date that the work will begin on this project.

2. The Contractor shall give twenty-four (24) hours notice, in writing, when they will require the services of the Engineer, or his agent, for laying out any portion of the work.

6.34 Guarantee

Materials and workmanship on electrical and mechanical equipment installed pursuant to said contract shall be guaranteed for a period of one year from the official date of acceptance of completion of the project.

Manufacturers' warranties or guarantees on all equipment shall apply. Should any equipment prove defective or should the system as a whole prove defective due to faulty workmanship, material furnished or methods of installation, or should said system or any part thereof fail to operate as planned due to any of the foregoing causes, the Contractor agrees that the repairs shall be made and such material as necessary shall be furnished and installed within thirty (30) days after receipt of demand form the City. In the event repairs are not made within thirty (30) days, the City shall have the unqualified option to make any needed repairs or replacements itself or by any other contractor. The Contractor agrees to reimburse the City, upon demand, for its expenses incurred in restoring said systems to the conditions specified in said contract, including the cost of any equipment or materials replaced or, upon demand by the City, to replace any such equipment and repair said systems completely without cost to the City so they will operate successfully as originally contemplated.

When the City staff, as necessary, performs emergency repairs, the Contractor shall reimburse all costs including but limited to labor, material and equipment to the City for the defective material or workmanship results in emergency repairs. Emergency repairs will be deemed as those repairs necessary due to malfunctions of equipment that interrupt the normal flow of traffic. Said systems will be deemed defective within the meaning of this guarantee in the event that they fail to operate as originally intended by the manufacturers thereof and in accordance with the plans and specifications included in said contract.

6.35 Above-Ground Work

No above-ground work shall be performed by the Contractor until all materials are on hand. Below-ground work shall be completed per approved construction schedule. All concrete which is removed for the installation of conduit, pull boxes, foundations, etc., shall be immediately brought to finished grade and resurfaced with a minimum two (2) inches temporary asphalt paving. Additional cost for meeting the intent of this specification shall be included in the lump sum bid price and no additional compensation will be allowed.

6.36 Removing and Replacing Improvements

Removal and replacement of improvements shall conform to Section 86-2.02, "Removing and Replacing Improvements", and these Special Provisions. Removal and reconstruction of concrete curb, gutter, sidewalk, access ramps, and driveway approaches shall be to the nearest score line or directed by the Engineer.

6.37 Salvage

All salvaged equipment and materials shall be delivered to the City's Storage Facility at 6031 Hefley Street, Westminster, CA 92683. The controllers and controller cabinets from the traffic signal modifications shall

be delivered to TEAM ECONOLITE's yard at 3360 E. La Palma Avenue, Anaheim, CA 92806.

6.38 Striping, Pavement Markings, Pavement Markers and Curb Markings

The Contractor shall layout and install new striping and markings. All work shall comply with Section 210-1.6, "Paint for Traffic Striping, Pavement Marking, and Curb Marking" and Section 310-5.6, "Painting Traffic Striping, Pavement Markings, and Curb Markings" of the Standard Specifications for Public Works Construction, latest edition.

Traffic Stripes and Pavement Markings

Traffic stripes and pavement markings shall be in accordance with the California MUTCD, except as modified or supplemented herein.

1. Traffic stripes and curb marking shall be painted unless otherwise shown on the plans. Contractor shall repaint any curb markings removed by construction under this contract and as shown on construction plans.

2. The Contractor shall furnish the necessary control points for all striping and markings, and shall be responsible for the completeness and accuracy therefore to the satisfaction of the Engineer.

3. The Contractor shall establish all traffic striping between these points by stringline or other method to provide striping that will vary less than one-halt (½) inch in fifty (50) feet from the specified alignment.

4. When no previously applied figures, markings, or traffic striping are available to serve as a guide, suitable layouts shall be spotted in advance of the pavement permanent paint application. Traffic lines may be spotted by using a rope as a guide for marking spots every five (5) feet, by using a marking wheel mounted on a vehicle, or by any other means satisfactory to the Engineer.

5. The Contractor shall mark to otherwise delineate the traffic lanes in the new roadway or portion of roadway, or detour before opening it to traffic.

6. The Contractor shall provide an experienced technician to supervise the location, alignment, layout, dimensions, and application of the paint.

7. Spotting shall be complete prior to the removal of any existing stripes. Existing stripes and markings shall be removed prior to painting new stripes and markings, but in no case shall any section of the street be left without the proper striping for more than 24 hours, or over weekends or holidays.

8. Unless otherwise noted, existing and conflicting traffic stripes (including raised pavement markers), pavement legends, and markings, within the project limits, shall be removed by wet sandblasting per Section 15-2.02B,

"Traffic Stripes and Pavement Markings," and Section 15-202C, "Pavement Markers," of the Caltrans Standard Specifications.

9. Paint for traffic striping, shall be rapid dry. Crosswalks, stop bars, arrows, and other pavement legends shall be thermoplastic.

10. Ready-mixed paints shall be suitable for use on either asphalt concrete or Portland cement concrete.

11. Paint shall be applied in two (2) coats. Each coat shall be applied no less than one (1) week from application of each previous coat. Repainting shall be applied in one (1) coat.

12. Installation of traffic stripes includes placement of raised pavement markers when called for on the plans.

13. Raised pavement markers shall conform to Section 85 "Pavement Markers."
14.
15. Adhesive for raised pavement markers shall be per Section 85-1.06, "Placement."

6.39 Truncated Dome Panel

Contractor shall install retrofit truncated dome panels or replace existing truncated dome panels in existing 4" thick PCC access ramps, in accordance with section 303-5 and 400-3 of Standard Specifications and Special Provisions.

Truncated dome panels shall conform to Caltrans Revised dual units Standard Plan No. RSP A88A & A88B. Truncated dome panels shall be 3'x4' in size.

Truncated domes shall be "Cast in Place Tactile/Detectable Warning Surface Tile" panels made of vitrified polymer composite construction, embedded type, manufactured by Armor Tile Tactile Systems, Buffalo, New York; or Armor Cast Products Co, N. Hollywood, California.

The orientation of the dome pattern for all panels shall be parallel with the panel edges.

The color of the truncated dome panels shall be Yellow conforming to Federal Color 33538.

Truncated dome panels shall manufactured and installed in accordance with Appendix "A" "Section 09310 Cast-in-Place Tactile/Detectable Warning Surface Tile".

Payment for this item will include the installation of a retrofit truncated dome panel on existing ADA ramp. It includes, if needed, the removal of existing

sidewalk, curb and gutter (from score line to score line), and required adjacent pavement and construction of new curb ramps, includes providing all labor, materials, tools, equipment for saw cutting, horizontal curb cut, excavation, grading, removal, haul-away and preparation of sub-grade aggregate base used under wheel chair ramps, curb and gutter, truncated dome, and installation of new curb ramps inclusive of curb and curb and gutter and adjacent pavement as required, and protection of newly installed improvements against vandalism, shall be paid at the contract lump sum bid price and there shall be no further compensation for this item of work. Payment to install 3'x4' Detectable Warning Surface (Yellow) on existing wheelchair ramp shall be per lump sum bid price and shall be installed per manufacturer's recommendations.

Measurement of Payment

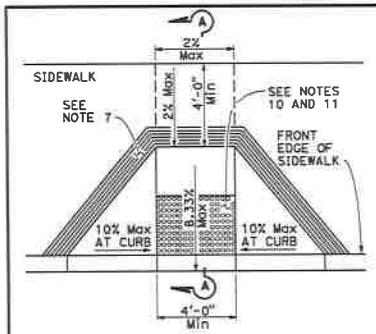
No additional payment will be made for stockpiling or hauling of salvaged equipment and materials.

Traffic signal, safety lighting, signing, and striping shall be complete, notwithstanding discrepancies or incompleteness or inaccuracies between the Standard Specifications, these Special Provisions, and the plans. It shall be the responsibility of the Contractor to provide and install the proper and necessary quantities of items to result in a complete and workable traffic signal system.

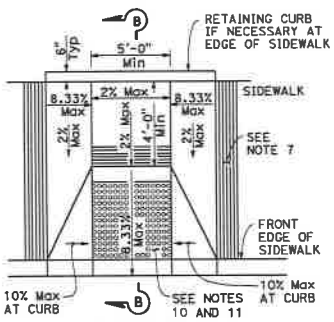
Full compensation for furnishing all labor, materials, and cabling, equipment, tools, equipment and incidentals, and performing all the work required (including traffic control for the traffic signal installation) shall be considered as included in the lump sum price paid for the "Modified Traffic Signal Installation at the intersections of Westminster Boulevard and University Street, Hazard Avenue and Bushard Street, Bushard Street and McFadden Avenue, Ward Street and Bolsa Avenue" including but not limited to the installation of the color Iteris video detection system, signal poles, foundations, all concrete and asphalt work, appurtenances, conduits, pull boxes, striping, and safety lighting items, and no additional compensation will be allowed. The lump sum amount shall include ALL tasks required in Sections 5 and 6 of the contract specifications and as shown on the contract plans.

CALTRANS

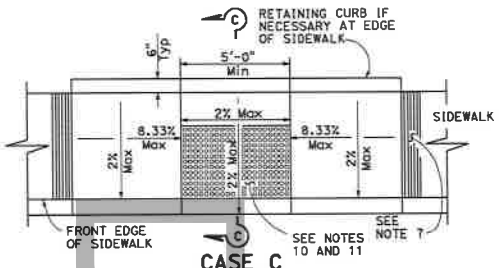
STANDARD DRAWINGS



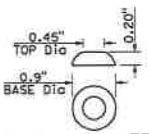
CASE A



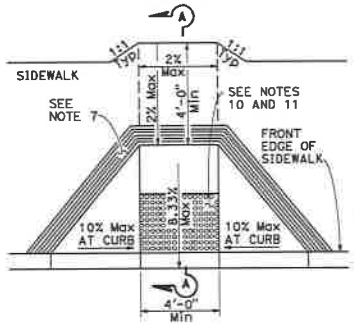
CASE B



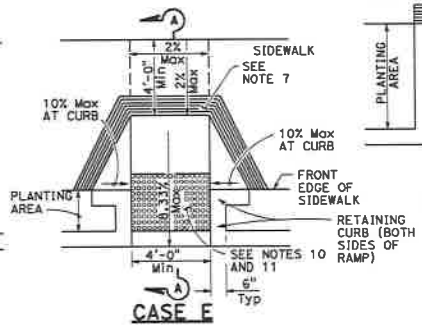
CASE C



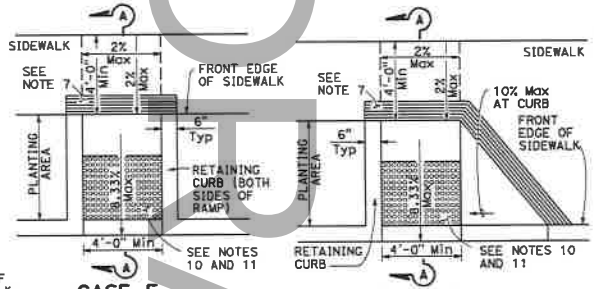
RAISED TRUNCATED DOME



CASE D

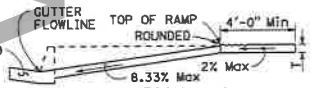


CASE E

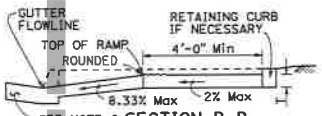


CASE F

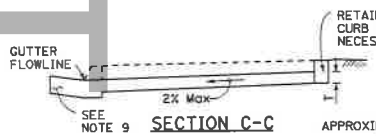
CASE G
See Note 4



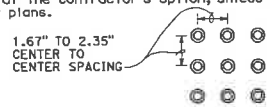
SECTION A-A



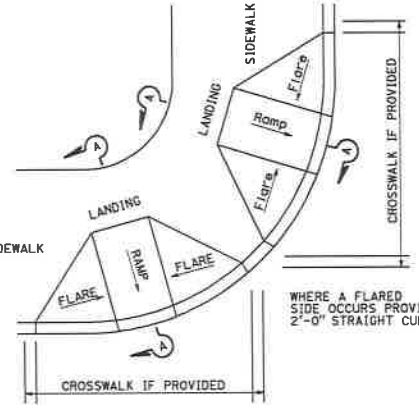
SECTION B-B
Depress entire sidewalk as required



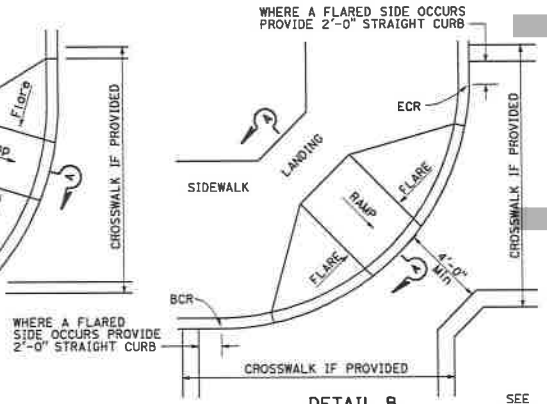
SECTION C-C



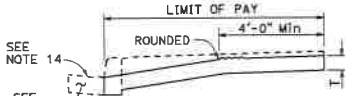
RAISED TRUNCATED DOME PATTERN (IN-LINE)
DETECTABLE WARNING SURFACE
See Note 10



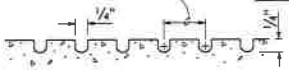
DETAIL A
TYPICAL TWO-RAMP CORNER INSTALLATION
See Note 1



DETAIL B
TYPICAL ONE-RAMP CORNER INSTALLATION
See Notes 1 and 3



RETROFIT DETAIL
Existing curb and sidewalk



GROOVING DETAIL

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET TOTAL No. SHEETS

REGISTERED CIVIL ENGINEER

May 20, 2011
PLANS APPROVAL DATE

Hector David Cardova
No. C41967
Exp. 3-31-12
CIVIL
STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

NOTES:

1. As site conditions dictate, Case A through Case G curb ramps may be used for corner installations similar to those shown in Detail A and Detail B. The case of curb ramps used in Detail A do not have to be the same. Case A through Case G curb ramps also may be used at mid block locations, as site conditions dictate.
2. If distance from curb to back of sidewalk is too short to accommodate ramp and 4'-0" platform (landing) as shown in Case A, the sidewalk may be depressed longitudinally as in Case B, or C or may be widened as in Case D.
3. When ramp is located in center of curb return, crosswalk configuration must be similar to that shown for Detail B.
4. As site conditions dictate, the retaining curb side and the flared side of the Case G ramp shall be constructed in reversed position.
5. If located on a curve, the sides of the ramp need not be parallel, but the minimum width of the ramp shall be 4'-0".
6. Side slope of ramp flares vary uniformly from a maximum of 10% at curb to conform with longitudinal sidewalk slope adjacent to top of the ramp, except in Case C and Case F.
7. The curb ramp shall be outlined, as shown, with a 1'-0" wide border with 1/4" grooves approximately 3/4" on center. See grooving detail.
8. Transitions from ramps and landing to walks, gutters or streets shall be flush and free of abrupt changes.
9. Maximum slopes of adjoining gutters, the road surface immediately adjacent to the curb ramp or accessible route shall not exceed 5 percent within 4'-0" of the top and bottom of the curb ramp.
10. Curb ramps shall have a detectable warning surface that extends the full width and 3'-0" depth of the ramp. Detectable Warning Surfaces shall conform to the details on this plan and the requirements in the Special Provisions.
11. The edge of the detectable warning surface nearest the street shall be between 6" and 8" from the gutter flowline.
12. Sidewalk and ramp thickness, "T", shall be 3½" minimum.
13. Utility pull boxes, manholes, vaults and all other utility facilities within the boundaries of the curb ramp will be relocated or adjusted to grade by the owner prior to, or in conjunction with, curb ramp construction.
14. For retrofit conditions, removal and replacement of curb apron will be at the Contractor's option, unless otherwise shown on project plans.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CURB RAMP DETAILS

NO SCALE

A88A

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

May 20, 2011
PLANS APPROVAL DATE

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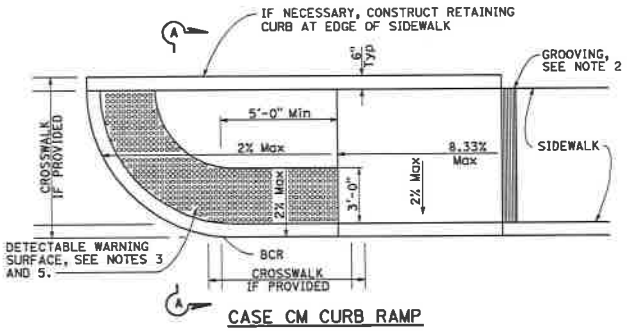
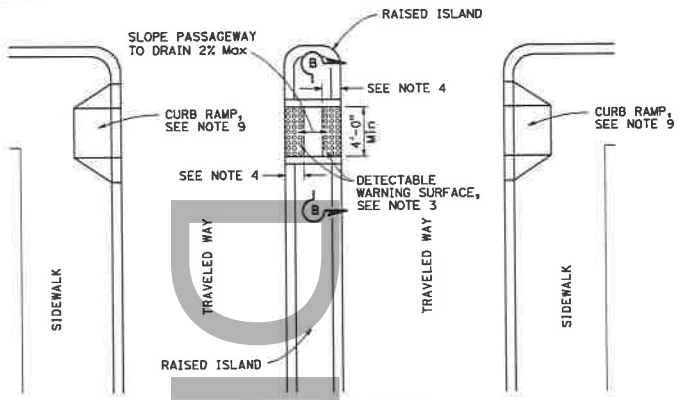
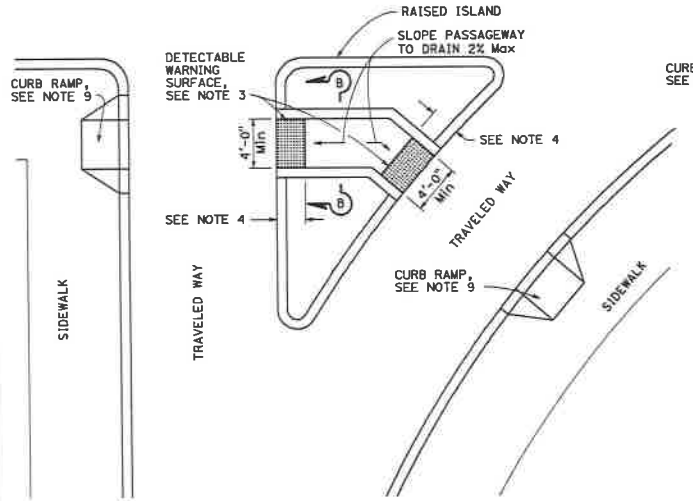


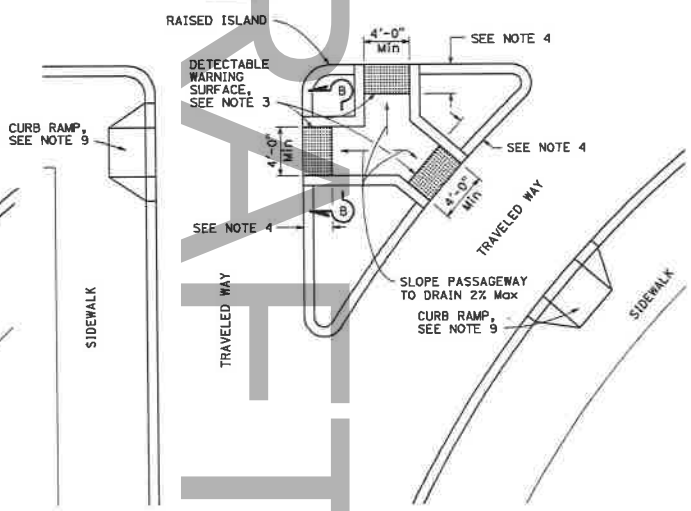
CASE CM CURB RAMP



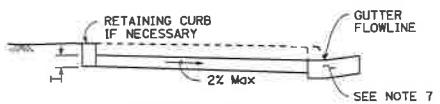
TYPE A PASSAGEWAY



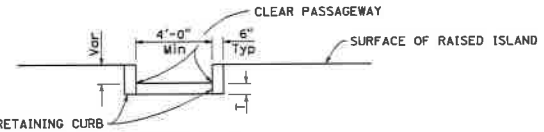
TYPE B PASSAGEWAY



TYPE C PASSAGEWAY



SECTION A-A



SECTION B-B

NOTES:

1. Sidewalk, ramp and passageway thickness, "T", shall be 3½" minimum.
2. For details of grooving used with Case CM curb ramp, see Standard Plan A88A.
3. For details of detectable warning surfaces, see Standard Plan A88A.
4. Where an island passage way length is less than 6'-0", the detectable warning surface shall extend the full width and full depth of the passage way length. Where an island passage way length is greater than or equal to 6'-0", but less than 8'-0", each detectable warning surface shall extend the full width and 2'-0" depth of the passage way length. Where an island passage way length is greater than or equal to 8'-0", each detectable warning surface shall extend the full width and 3'-0" depth of the passage way length.
5. For Case CM curb ramp, the edge of the detectable warning surface nearest the street shall be between 6" and 8" from the gutter flowline.
6. Transitions from ramps to walks, gutters or streets shall be flush and free of abrupt changes.
7. Maximum slopes of adjoining gutters, the road surface immediately adjacent to the curb ramp or accessible route shall not exceed 5 percent within 4'-0" of the top and bottom of the curb ramp.
8. Utility pull boxes, manholes, vaults and all other utility facilities within the boundaries of the curb ramp will be relocated or adjusted to grade by the owner prior to, or in conjunction with, curb ramp construction.
9. For additional curb ramp details, see Standard Plan A88A.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CURB RAMP AND ISLAND PASSAGEWAY DETAILS

NO SCALE

A88B

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

May 20, 2011
PLANS APPROVAL DATE

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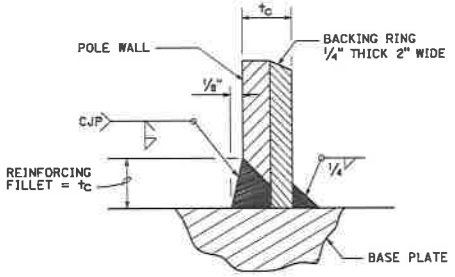
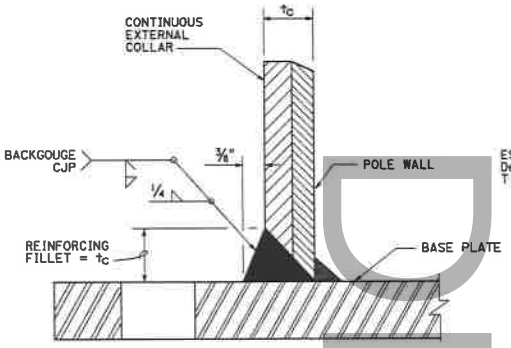
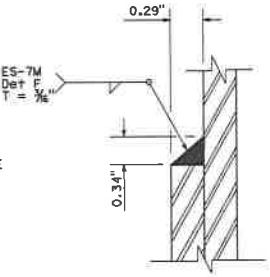


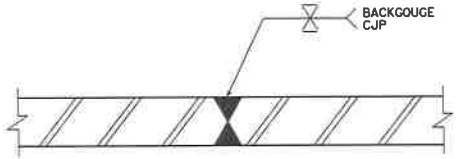
DETAIL B



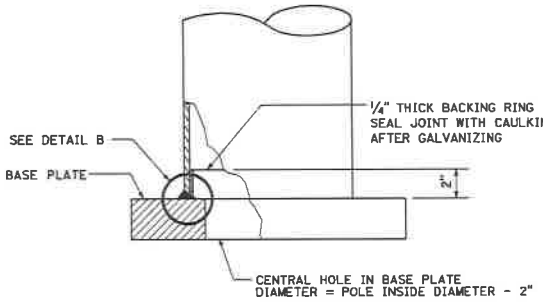
DETAIL C1



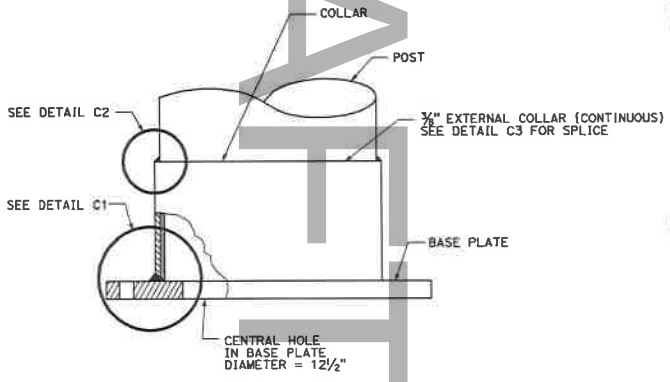
DETAIL C2



DETAIL C3

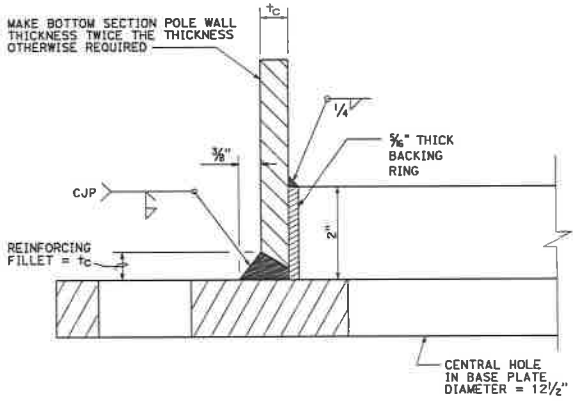


ELEVATION B



ELEVATION C

For alternative base, see Detail C4



DETAIL C4

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ELECTRICAL SYSTEMS (SIGNAL AND LIGHTING STANDARD DETAIL No. 3)

NO SCALE

ES-7D

2010 STANDARD PLAN ES-7D

GARDEN GROVE BOULEVARD CORRIDOR

RFP 8-1910
PROJECT1
EXHIBIT A-1

CITY OF WESTMINSTER

STANDARD DRAWINGS

STRIPING NOTES

1. All existing signs shall remain unless directed differently by the Traffic Engineer.
2. Pavement marking stencils shall match City stencils exactly.
3. All striping and marking not conforming to the approved striping plans shall be removed or as directed by the Traffic Engineer.
4. Striping layout shall be approved by the engineer prior to final painting. Contact Traffic Engineer before "CAT-TRACKING".
5. All striping shall consist of paint and raised pavement markers per the details on the approved striping plans, and the California Manual on Uniform Traffic Control Devices (MUTCD) unless otherwise shown.
6. All striping shall be beaded per Caltrans standards. Two coats of paint are required.
7. All pavement markings and crosswalks shall be thermoplastic.
8. The contractor shall place a blue raised pavement marker in the roadway at each fire hydrant location for entire length of project per direction of the Traffic Engineer.
9. Unless otherwise shown on the plans, all lane lines shall be parallel to the street centerline.
10. All dimensions for lane widths are to the center of the stripe and the face of the curb.
11. Splice new loop detectors to existing lead-in cables in pull boxes.
12. Paint the first three feet of all raised medians with reflective paint. Paint shall be white or as directed by the Traffic Engineer.
13. All traffic loop detector installations shall have a minimum of 7/8" cover.
14. All "CAT-TRACKING" shall be placed prior to loop installation.
15. Place left-turn pocket per City of Westminster Standard 507.
16. Crosswalks shall have ten feet between twelve-inch stripes and shall start at half-delta unless otherwise dimensioned.
17. Yellow reflective markers shall be offset 2" from all stripes per Caltrans Standard Plan A20A and A20B Detail 22, 29, and 32 (no reflective markers shall be placed on the stripes).
18. All curb paintings shall be removed using wet sand blasting method and repainted to match with existing for entire length of project.

WATER NOTES

1. All materials shall conform to the latest revision of AWWA Standards. Construction shall be per the latest edition of the Standard Specifications for Public Works Construction, including any supplements or the City of Westminster Standard Plans.

2. All alternatives to any portion of these specifications must be approved in writing at least forty-eight (48) hours before bid date or any construction.

3. For Residential Tracts: Upon installing meters for new houses, developer shall obtain billing accounts for all meters. Developer shall be responsible for payments on new meter until new owner purchases the property. All newly installed meters shall be "new" or not previously used. All new meters shall have "0" reading upon installation. Any reading on newly installed meter shall be treated as used water upon establishment of new billing account, and shall be added to the initial billing fee. No water usage shall be allowed from an un-metered source for any purpose. Developer shall obtain a temporary construction water meter if needed to use water from a fire hydrant.

4. For Commercial/Industrial Properties: Upon installing meters, developer shall obtain billing accounts for all meters. Developer shall be responsible for payments until new owner purchases the property, or new tenant leases the property. All newly installed meters shall be "new" or not previously used. All new meters shall have "0" reading upon installation. Any reading on a newly installed meter shall be treated as used water upon establishment of new water billing account, and shall be added to the initial billing fee. No water usage shall be allowed from an un-metered source for any purpose. Developer shall obtain a temporary construction water meter if needed to use water from a fire hydrant.

5. All New Construction/Industrial Developments: Developer shall contact the Cross Connection Control Specialist in the Water Division to obtain approval of all proposed backflow prevention devices.

6. All 1" water services shall be Drisco pipe 1", IPS 200 psi PE 3408, or approved equal. A plastic-coated 14-gauge copper tracer wire shall be installed as shown on City Standard #401.

7. All 2" water services shall be Drisco pipe 2", IPS 200 psi PE or approved equal. Riser shall be rigid copper tubing Type "K". A 14-gauge plastic-coated copper tracer wire shall be installed as shown on City Standard #4l3.

8. All water meters shall be bronze, magnetic drive, touch read meters. Meters 5/8" to 2" to read in 100 cubic feet and meters 4" to 6" to read in 500 cubic feet. Meter type to be approved prior to installation by Water Division.

9. Water meter boxes shall be J & R polymer with J & R polymer covers fitted for touch read or approved equal as per City Standard #401.

10. Gate valves shall be Mueller Series A 2360 resilient wedge 250 psig working pressure, 500 psig test pressure, with shear stem or approved equal. Valves to be installed per City Standard #403.

11. Butterfly valves shall be Pratt or approved equal. Butterfly valves shall conform to ANSE/AWWA C504 and shall be flanged, of the size and class indicated. Flanged valves shall have 125-lb or 250-lb flanges complying with ANSI B.16.5. Valves may

be either short-bodied or long-bodied except as otherwise indicated. Shaft seals shall be designed for use with standard split-V type packing or other approved seals, and the interior passage shall not have any excessive obstructions or stops. Cartridge-type valve seats, or valves employing snap rings to retain the rubber seats, will not be acceptable. The rubber seat shall be mounted in the valve body.

12. Butterfly valves shall be installed with operating stem on the street centerline side.
13. Gate and butterfly valves shall be located at BCRs of streets unless otherwise specified.
14. Iron fittings shall be cement mortar lined and coated C110 or C153 or otherwise specified and be installed per City Standard #402.
15. Fire hydrants shall be wet barrel all bronze with 1 ½" operation nuts and caps. Hydrants to have a 6" hole with standard flange drilling per City Standard #404.
16. All valve boxes shall be adjustable, slip cast iron boxes. Tyler 6855 series lids to be marked "Water". It shall be the responsibility of the Contractor to raise all valve boxes to grade after paving per City Standard #403.
17. Pre-cast concrete vaults shall be J&R Concrete or Armour Cast series with polymer covers fitted for touch read meters or equal.
18. Approved water main pipe shall be poly-vinyl chloride PVC-C900 DR-18 vinyl iron, John Mansville Blue Brute, Vinyl Tech White Knight, Diamond Plastic, or approved equal. All ductile iron to be cement mortar lined and coated. A 14-gauge copper trace wire shall be on top of all PVC pipes and wrapped with 10 mil, 2" pipe wrap two (2) times around pipe every five (5) feet.
19. Plastic-coated 14-gauge copper tracer wire from hydrant lateral and lateral service connection to tracer wires on water mains shall be stripped and tied with a brass split bolt connector. The connection to tracer wires shall be taped and completely covered with an electrical insulting coating per Section 300-5 of the National Electrical Code, latest edition.
20. Separation of services – all non-water utilities must have a minimum separation of 3 feet from any Water Utility.
21. All work requiring excavations shall maintain a valid Dig Alert permit in the area.
22. In the event work requiring excavations near City of Westminster water utility lines, excavators shall determine exact subsurface locations (depth) by hand excavation, before the use of power equipment. Pipelines exposed during excavation require inspection by City of Westminster staff.
23. Pipelines exposed during excavation require inspection by City of Westminster staff.
24. Only lateral crossings are permitted within City of Westminster right of ways.
25. All other utilities shall provide a minimum of 12" clearance to be maintained between City of Westminster pipelines and any proposed improvements.
26. Native soil or sand shall be used to surround City of Westminster water pipelines with a minimum 12" cover. (No cement slurry is allowed with 12" of pipelines.)
27. Contractors shall use caution to protect City of Westminster pipelines in place and to avoid encroachments or damage to City of Westminster property. If pipelines are damaged, City of Westminster must be notified immediately so that proper repairs

can be made.

28. Any high water use facility (60 gallons per minute or greater of continuous flow) must install an approved 3" cold water positive displacement touch read meter. The size and manufacturer of the meter to be determined by Water Division Representative prior to installation.

29. All water meters shall be located in sidewalk or parkways behind curb in the City of Westminster right of way.

30. A three (3) foot clearance shall be maintained around all water mains to include: water valves, fire hydrant valves, fire service valves, and water meter valves.

31. A visual inspection shall be made by Water Division Representative on all water main valves, tees, 90's, 45's or other pipeline fittings.

TRAFFIC CONTROL GENERAL NOTES

1. These standard notes and plans shall not relieve the contractor of the responsibility for jobsite conditions during the course of construction or maintenance work, including safety of all persons, vehicles, and property.
2. All work, materials, practices, and principles shall comply with the Caltrans Standard Plans and Specifications latest edition, California Manual of Uniform Traffic Control Devices (MUTCD) latest edition, and the Work Area Traffic Control Handbook (WATCH) latest edition.
3. The California Manual of Uniform Traffic Control Devices (MUTCD) latest edition, and the Work Area Traffic Control Handbook (WATCH) latest edition, shall take precedence in the event of any question regarding the control of these standards.
4. Traffic Control Plans prepared by a registered traffic engineer or registered civil engineer in the State of California may be required if the complexity of the construction and its corresponding traffic control exceed the content of these standards.
5. No deviations or exceptions from these standard notes or plans shall be allowed without prior approval from the Public Works Director/City Engineer.
6. Construction or maintenance activity in the roadway or affecting the public right-of-way shall be limited to the hours between 8:30 AM and 4:00 PM. No temporary traffic devices shall be placed in the roadway until after 8:30 AM and shall be completely removed by 4:00 PM. All excavation areas shall be completely covered with steel plates (with a non-skid surface) and recessed if they are placed on primary and secondary highways as directed by the Public Works Director/City Engineer. Excavation areas may also be temporarily backfilled and surfaced such that all lanes of traffic are restored and fully accessible to the public at the end of each day, unless otherwise authorized.
7. Cones and delineators shall generally be placed on existing lane lines, except as necessary for lane closure tapers.
8. All striping and markings shall conform to the California Manual of Uniform Traffic Control Devices (MUTCD) latest edition.
9. All conflicting striping, markings, and legends shall be completely removed by an approved method prior to any change in the traffic pattern.
10. All existing signing shall be protected in place and free from obstructed view for traffic. In the event that existing signing is contradictory to temporary signing for construction, the contractor shall either completely cover the existing signing or remove the signing and supporting posts entirely and install new signing and supports at the conclusion of construction activities.
11. The contractor shall be responsible for notifying the adjacent property owners.
12. The contractor shall provide access to all adjacent properties at all times except as necessary for construction activities in the immediate vicinity of the work area.
13. Construction operations shall be conducted in a manner such that as little inconvenience as possible is caused to the public and abutting property owners.
14. The contractor shall have all signs, delineators, barricades, etc., properly installed prior to construction.

15. The contractor shall be responsible for maintaining, at all times, all signs, delineators, barricades, etc., to ensure proper flow and safety of traffic.

16. A minimum lane width of 10' shall be maintained at all times, no exceptions. When adjacent to curb lane, raised curb medians, other vertical obstruction, or opposing traffic, the minimum lane width shall be 12'.
17. The contractor shall utilize flagmen during work hours as required by these standard plans and as deemed necessary by the City to assist in maintaining safe traffic flow.
18. Flashing arrow signs (FAS) shall be used for all lane closures and shall be solar powered.
19. The first sign in a series of advanced warning signs shall be equipped with flags.
20. Flashing yellow beacons, Type B, shall be used on all barricades that protect the work area after normal working hours.
21. All signs shall be reflectorized and of standard sizes.
22. The contractor shall be required to replace striping and legends to their original condition and equipment after completion of construction.
23. All delineators shall be 36" minimum portable, reflectorized rubber guide post tubes, orange in color, with weighted bases or sandbag rings and shall be kept in their proper position at all times, and shall be repaired, replaced, or cleaned as necessary to preserve their appearance and continuity.
24. All cones shall be 28" minimum, orange in color, and shall be kept in their proper position at all times, and shall be repaired, replaced, or cleaned as necessary to preserve their appearance and continuity. All cones shall be fitted with 13" minimum reflective sleeves for nighttime traffic control. Maximum spacing between delineators shall be 25'.
25. At least every third cone and/or delineator shall have delineator or cone-mounted directional arrows per the Work Area Traffic Control Handbook (WATCH) latest edition.
26. Barricades shall be used, in lieu of or in addition to rubber guide posts, as required by these standard plans and at the direction of the City, when they are intended to provide additional emphasis in areas where workers are present.
27. C27 (CA) "OPEN TRENCH" signs shall be used in conjunction with Type II barricades during construction and nighttime closures as applicable.
28. Where lights are used to delineate the traveled way through and around the work area, they shall be Type C (steady burn lamps).
29. When a street closure is approved, the contractor shall notify the Police Department, the Fire Department, the local transit district, affected residents and businesses at least one (1) week in advance of the closure.
30. All residential street access restricted by construction or maintenance activities shall be restored at the end of each working day unless otherwise approved by the Public Works Director/City Engineer.
31. Temporary "NO STOPPING" signs shall be posted 100' apart, as necessary during construction operations. When a temporary "NO STOPPING" zone on a street is approved by the City's representative, the contractor shall notify the Police

Department and post “TOW AWAY, TEMPORARY NO STOPPING” at least two (2) working days in advance. The duration of the temporary parking restriction shall be indicated on the signs.

32. When signal timing and/or signal modifications are necessary before or during the construction, and if approved by the Traffic Engineer, the contractor shall notify the City by calling (714) 548-3462 at least three (3) working days in advance of the work to be done in order to coordinate the changes. The contractor shall provide the personnel and equipment to make the signal modifications; the City shall make the necessary signal timing changes.

33. Contractor shall replace all traffic detection devices, signing, striping, markings, and legends damaged during construction to the satisfaction of the City’s representative.

34. These plans indicate traffic control in the work area during construction activities. Additional traffic controls, traffic signs, and/or barricades may be necessary or required in the field. The contractor shall be responsible for the placement of any additional devices necessary as directed by the City’s representative to assure safety to the public at all times during construction.

35. Contractor shall comply with the requirements of the American Disability Act (ADA) as related to pedestrian access and shall maintain pedestrian access at all times per ADA requirements.

36. Install Temporary No Parking Signs (if required) 72 hours prior to the closure.

37. Notification is required at 714-530-6060 at least 36 hours prior to construction and must be acknowledged by the Orange County Transportation Authority (OCTA) dispatch if an OCTA bus stop is to be impacted.

W	12" WHITE PAINTED STRIPE
W8"	WHITE PAINTED STRIPE
SW	SOLID WHITE STRIPE 4" OR 8" WIDE PER PLAN (DETAIL "SW" HEREON.)
BW	4" BROKEN WHITE STRIPE. (DETAIL 8 & 10)*
	WHITE PAINTED ARROW
	EXISTING ARROW (PROTECT)
	INSTALL SIGN AS SHOWN
PL	WHITE PAINTED LEGEND (TYPE SHOWN ON PLAN)
PN	WHITE PAINTED MEDIAN NOSE (RAISED MEDIAN)
PTN	WHITE PAINTED MEDIAN NOSE (PAINTED MEDIAN)
DY	DOUBLE YELLOW STRIPE (DETAIL 21 & 23)*
TW	TWO WAY LEFT TURN LANE (DETAIL 31 & 33)*
(E)	EXISTING

* DETAIL NUMBERS IN PARENTHESES REFER TO DETAILS SHOWN IN THE CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)

NOTE:
1. WHEN TWO DETAIL NUMBERS ARE CALLED OUT, THE CONTRACTOR SHALL PLACE TWO COATS OF PAINT PER THE FIRST DETAIL AND THEN PLACE RAISED PAVEMENT MARKERS PER THE SECOND DETAIL.
2. NON-REFLECTIVE YELLOW MARKERS SHALL BE PLACED ON THE LINE.
3. TWO-WAY YELLOW RETROREFLECTIVE MARKERS SHALL BE PLACED OFF THE SOLID LINE.

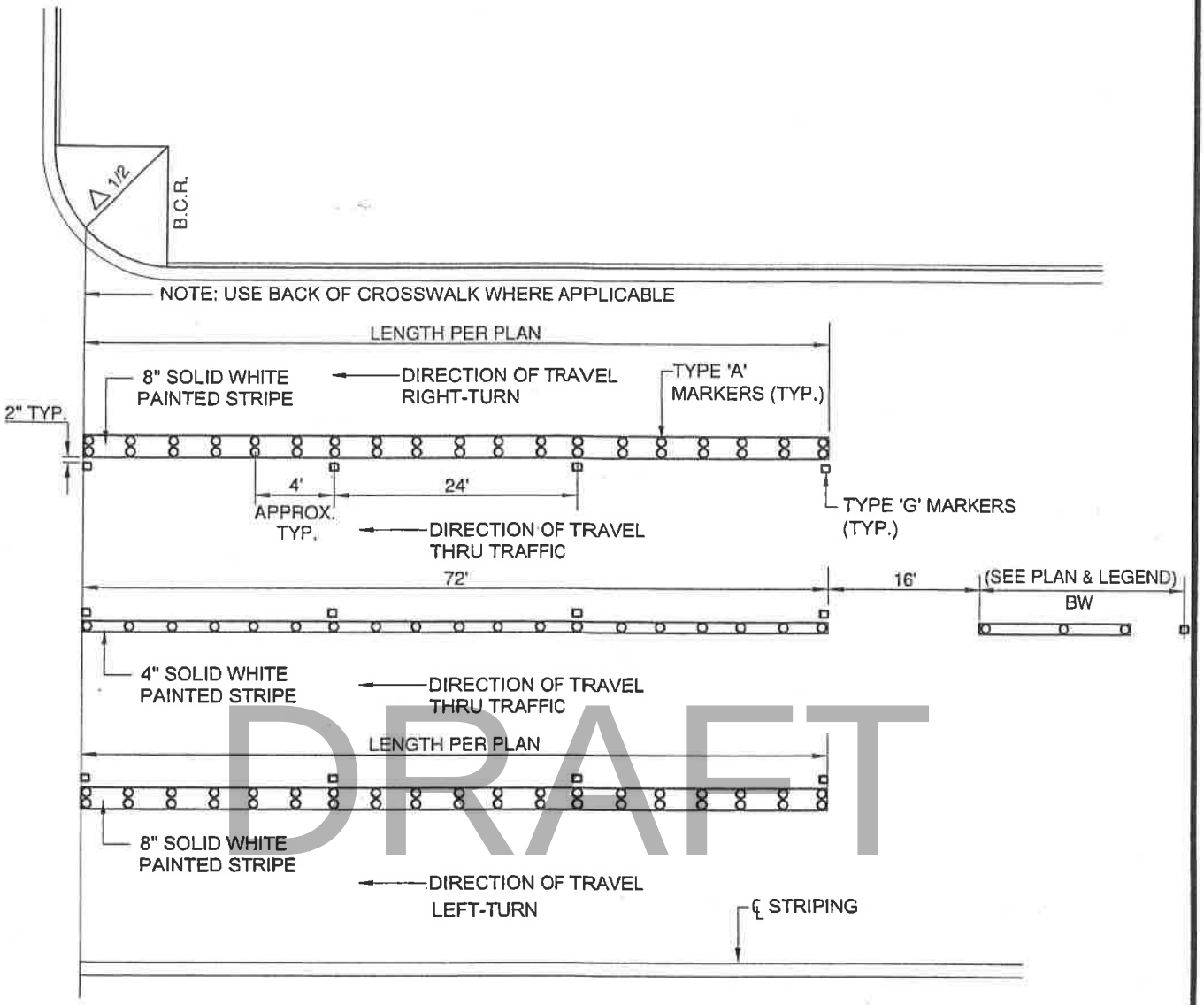
APPROVED:
Kanwan Yousse
P.W. DIRECTOR / CITY ENGINEER
REVISED DATE: 5/15/08

WESTMINSTER FOUNDED 1870 INCORPORATED 1957 CALIFORNIA

City of Westminster
DEPARTMENT OF PUBLIC WORKS

STRIPING LEGEND

STANDARD NUMBER
100



APPROVED:

P.W. DIRECTOR / CITY ENGINEER

REVISED DATE: 5/15/08

City of Westminster

DEPARTMENT OF PUBLIC WORKS

DETAIL
SOLID WHITE STRIPING

STANDARD NUMBER

101

PLAN		SYMBOLS
EXISTING CURB		
FUTURE CURB		
EXISTING CURB & GUTTER		
CONSTRUCT CURB		
CONSTRUCT CURB & GUTTER		
RAIL ROAD		
EXISTING WALK		
FENCE		
BUILDING CORNER		
WALLS	CONCRETE	
	BRICK	
	STONE	
PALM TREE		
TREE		
SHRUB		
HEDGE		
FIRE HYDRANT		F.H.
MANHOLE (EXIST. DASHED)		M.H.
WATER VALVE		
WATER RISER		
WATER OR GAS METER		G W
TRAFFIC SIGNAL		
STREET LIGHT		
FLASHING OR WIG-WAG SIGNAL		
POWER OR TELEPHONE POLE		
POWER POLE ANCHOR		
REFLECTOR PADDLE BOARD		R.P.B.
STAND PIPE		
PIPES	SEWER LINE	S S
	GAS LINE	G G
	WATER LINE	W W
	EX. CULVERT (R.C.P. OR C.M.P.)	
ELECTRICAL		E
TELEPHONE		T
COMMUNITY TELEVISION		V
IRRIGATION LINE		IRR
OIL		O
EX. CONCRETE-EX. SHAPE		
EDGE OF EXIST. PAVEMENT (FREE HAND)		
TRAFFIC SIGNAL PULL BOX		T.S.
STREET LIGHTS		5,800 LM 22,000 LM- O
TRAFFIC DETECTORS		INDUCTIVE LOOP
TRAFFIC SIGNAL CONTROLLER		
CONSTRUCTION CURVE DATA		
REVISION		

APPROVED:

P.W. DIRECTOR / CITY ENGINEER

REVISED DATE: 5/15/08

City of Westminster
DEPARTMENT OF PUBLIC WORKS

STANDARD TOPOGRAPHY LEGEND & ABBREVIATIONS

STANDARD NUMBER 102A

PROFILE

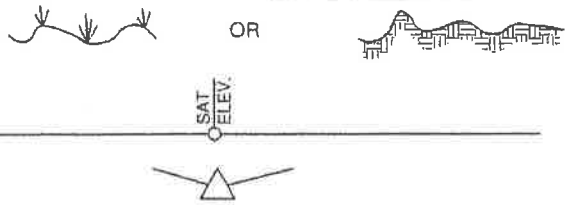
EXISTING GROUND

GRADE BREAK

POINT OF INTERSECTION - P.I. OR

SLOPE (TOP) (TOE)

SYMBOLS



CONTOURS 30 20

STANDARD	ABBREVIATION
DELTA	A
RADIUS	R
SEMITANGENT DISTANCE	T
ARC LENGTH, ALONG CURVE	L
ASPHALTIC CONCRETE SURFACING	A.C.
AGGREGATE BASE	A.B.
AGGREGATE SUBBASE	A.S.
IMPORTED SUBBASE MATERIAL	I.S.M.
RIGHT OF WAY	R/W
CENTERLINE	℄
PROPERTY LINE	P℄
BEGIN CURB RETURN	B.C.R.
END CURB RETURN	E.C.R.
BEGIN CURVE	B.C.
END CURVE	E.C.
POINT OF TANGENCY	P.T.
EDGE OF PAVEMENT	E.P.
EXISTING	EX.
CURB FACE	C.F.
FLOW LINE	F.L.
EDGE OF GUTTER	E.G.
METROPOLITAN WATER DISTRICT	M.W.D.
ART. HIGHWAY FINANCING PROG	A.H.F.P.
ORANGE COUNTY FLOOD CONTROL DISTRICT	O.C.F.C.D.
MIDWAY CITY SANITATION DISTRICT	M.C.S.D.
VERTICAL CURVE	V.C.
MANHOLE	M.H.
CORRUGATED METAL PIPE	C.M.P.
REINFORCED CONCRETE PIPE	R.C.P.
VITRIFIED CLAY PIPE	V.C.P.

APPROVED:

P.W. DIRECTOR / CITY ENGINEER

REVISED DATE: 5/15/08

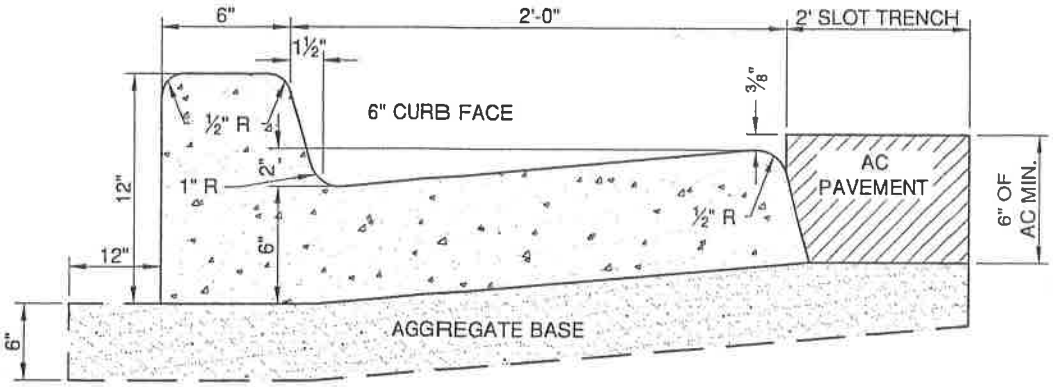
WESTMINSTER CALIFORNIA

City of Westminster
DEPARTMENT OF PUBLIC WORKS

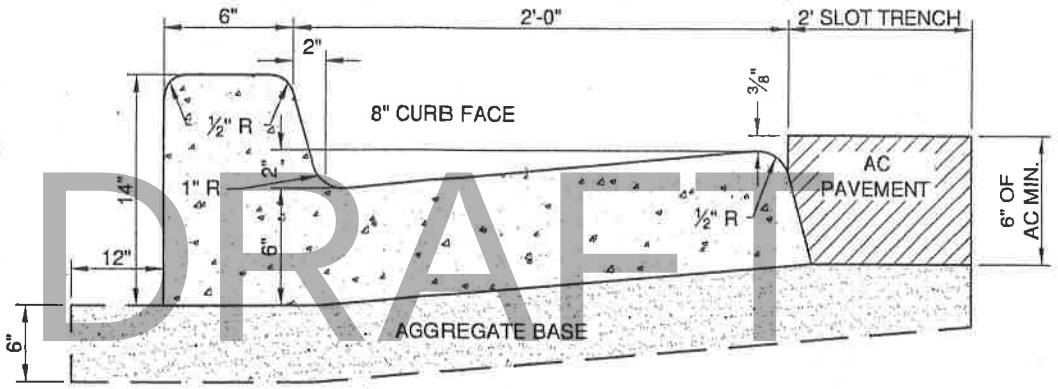
STANDARD TOPOGRAPHY LEGEND & ABBREVIATIONS (CONTINUOUS)

STANDARD NUMBER 102B

TYPE A-1 - 6" CURB FACE



TYPE A-2 - 8" CURB FACE



GENERAL NOTES:

1. TYPE A-2 CURB AND GUTTER SHALL BE USED ON ARTERIAL STREETS; TYPE A-1 CURB AND GUTTER SHALL BE USED ON ALL OTHER STREETS.
2. CONCRETE SHALL BE CLASS 520-C-2500.
3. PROVIDE QUICK JOINT AT 10' INTERVALS OR AS REQUIRED BY THE CITY ENGINEER.
4. FLOWLINE WILL HAVE A MINIMUM SLOPE OF 0.20%.
5. SUBGRADE MUST HAVE A 90% RELATIVE COMPACTION AND AGGREGATE BASE MUST HAVE A 95% RELATIVE COMPACTION.
6. A 2' WIDE "SLOT TRENCH" SHALL BE REMOVED WHEN REMOVING AND REPLACING CURB AND GUTTER. THIS "SLOT TRENCH" SHALL BE REPLACED WITH FULL DEPTH ASPHALT CONCRETE PAVEMENT.

APPROVED:

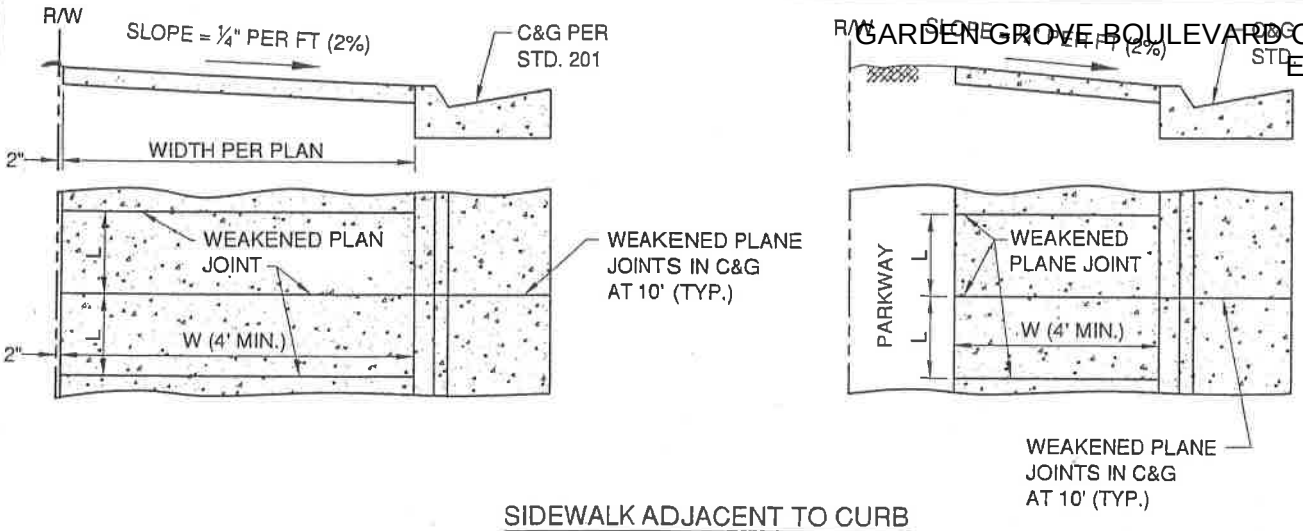
P.W. DIRECTOR / CITY ENGINEER

REVISED DATE: 5/15/08

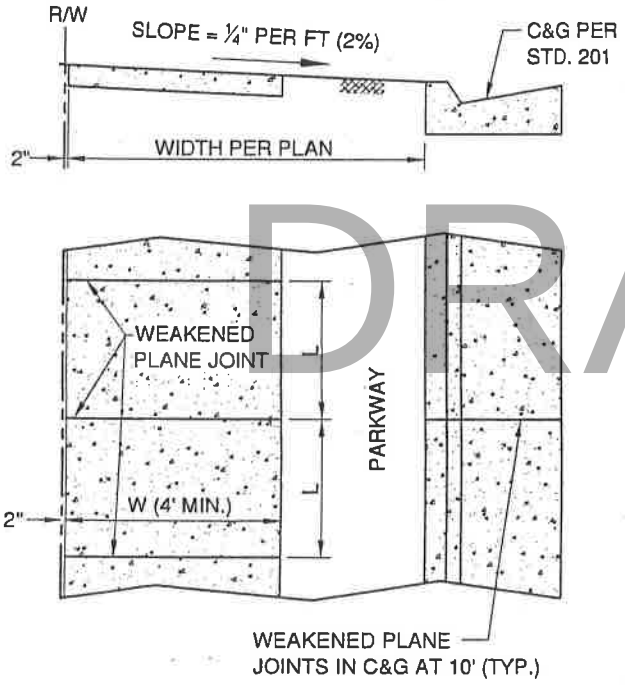
City of Westminster
DEPARTMENT OF PUBLIC WORKS

CURB AND GUTTER

STANDARD NUMBER
201



SIDEWALK ADJACENT TO CURB



SIDEWALK ADJACENT TO R/W

NOTES:

1. RESIDENTIAL L = 10' MAX.
2. SIDEWALK THICKNESS SHALL BE 4" EXCEPT WITHIN ALL DRIVEWAY APPROACHES WHERE THICKNESS SHALL BE 6" MIN.
3. A SAND BEDDING (S.E. ≥30), 4" THICK WITH 90% COMPACTION, SHALL BE PLACED WHERE REQUIRED BY SOILS REPORT OR AS DIRECTED BY THE CITY ENGINEER.
4. SIDEWALK SHALL HAVE A LIGHT BROOM FINISH AS APPROVED BY THE CITY ENGINEER.
5. SURFACE SCORING SHALL MATCH THE ADJACENT PATTERN OR AS DIRECTED BY THE CITY ENGINEER.
6. FOR TREE WELLS SEE STANDARD PLAN NO. 600 AND 601.
7. ALL CONCRETE SHALL BE P.C.C. 520-C-2500.
8. TREE WELLS ARE NOT TO BE LOCATED CLOSER THAN 100' FROM B.C.R.
9. PROVIDE 36" MINIMUM CLEARANCE AROUND OBSTACLES.

APPROVED:

P.W. DIRECTOR / CITY ENGINEER

REVISED DATE: 5/15/08

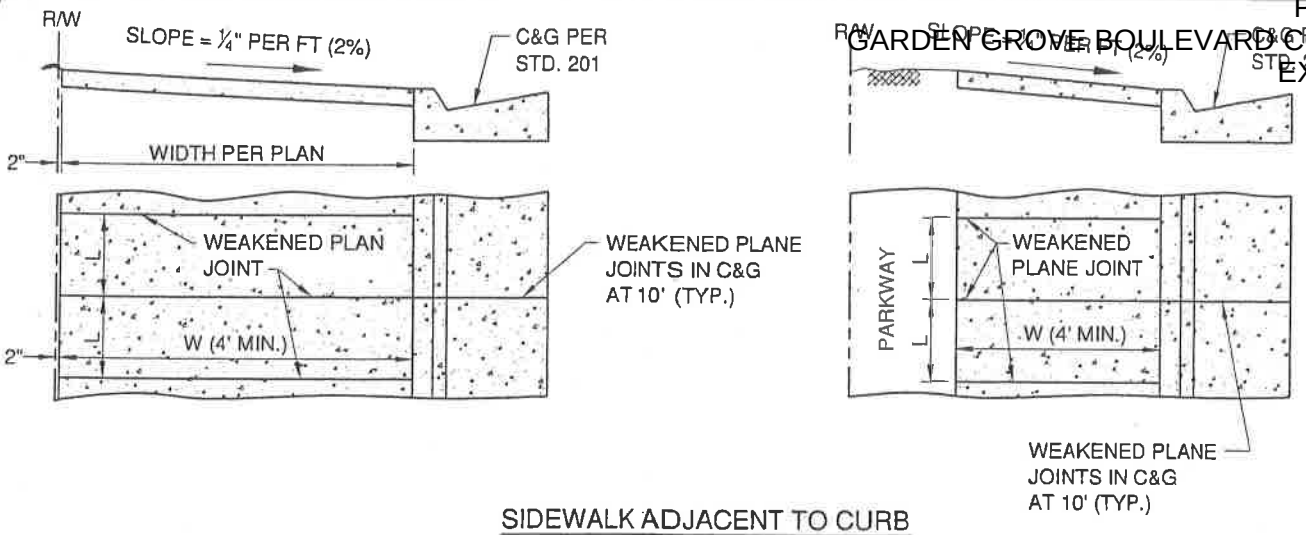
City of Westminster

DEPARTMENT OF PUBLIC WORKS

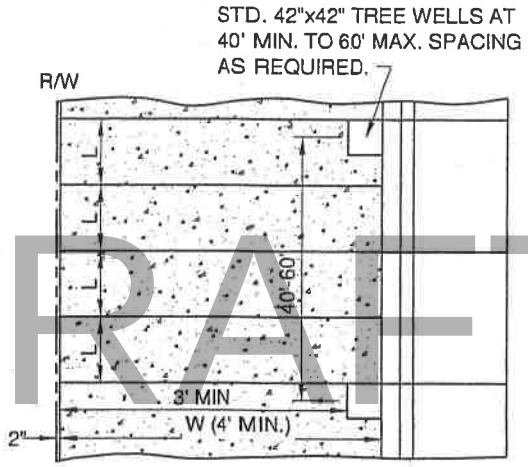
RESIDENTIAL SIDEWALK

STANDARD NUMBER

202



SIDEWALK ADJACENT TO CURB



SIDEWALK WITH TREE WELL

NOTES:

1. ARTERIAL L = 10' MAX.
2. SIDEWALK THICKNESS SHALL BE 4" EXCEPT WITHIN ALL DRIVEWAY APPROACHES WHERE THICKNESS SHALL BE 8" MIN.
3. A SAND BEDDING (S.E. ≥30), 4" THICK WITH 90% COMPACTION, SHALL BE PLACED WHERE REQUIRED BY SOILS REPORT OR AS DIRECTED BY THE CITY ENGINEER.
4. SIDEWALK SHALL HAVE A LIGHT BROOM FINISH AS APPROVED BY THE CITY ENGINEER.
5. SURFACE SCORING SHALL MATCH THE ADJACENT PATTERN OR AS DIRECTED BY THE CITY ENGINEER.
6. FOR TREE WELLS SEE STANDARD PLAN NO. 600 AND 601.
7. ALL CONCRETE SHALL BE P.C.C. 520-C-2500.
8. TREE WELLS ARE NOT TO BE LOCATED CLOSER THAN 100' FROM B.C.R.
9. PROVIDE 36" MINIMUM CLEARANCE AROUND OBSTACLES.

APPROVED:

P.W. DIRECTOR / CITY ENGINEER

REVISED DATE 5/15/08

WESTMINSTER FOUNDED 1871 INCORPORATED 1957 CALIFORNIA

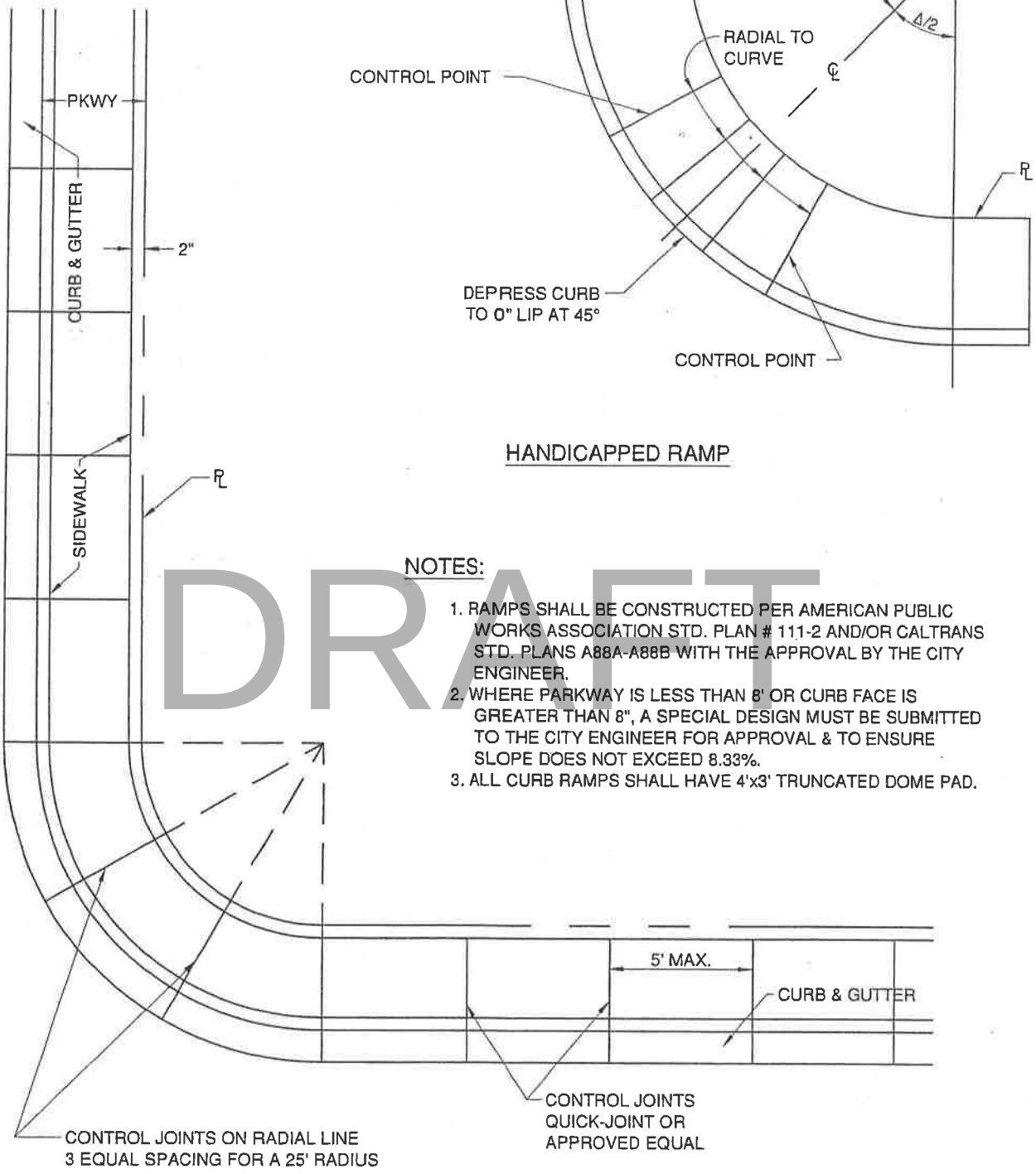
City of Westminster

DEPARTMENT OF PUBLIC WORKS

ARTERIAL SIDEWALK

STANDARD NUMBER

203



HANDICAPPED RAMP

NOTES:

1. RAMPS SHALL BE CONSTRUCTED PER AMERICAN PUBLIC WORKS ASSOCIATION STD. PLAN # 111-2 AND/OR CALTRANS STD. PLANS A88A-A88B WITH THE APPROVAL BY THE CITY ENGINEER.
2. WHERE PARKWAY IS LESS THAN 8' OR CURB FACE IS GREATER THAN 8", A SPECIAL DESIGN MUST BE SUBMITTED TO THE CITY ENGINEER FOR APPROVAL & TO ENSURE SLOPE DOES NOT EXCEED 8.33%.
3. ALL CURB RAMPS SHALL HAVE 4'x3' TRUNCATED DOME PAD.

APPROVED:

P.W. DIRECTOR / CITY ENGINEER

REVISED DATE: 5/15/08

WESTMINSTER INCORPORATED 1957 CALIFORNIA

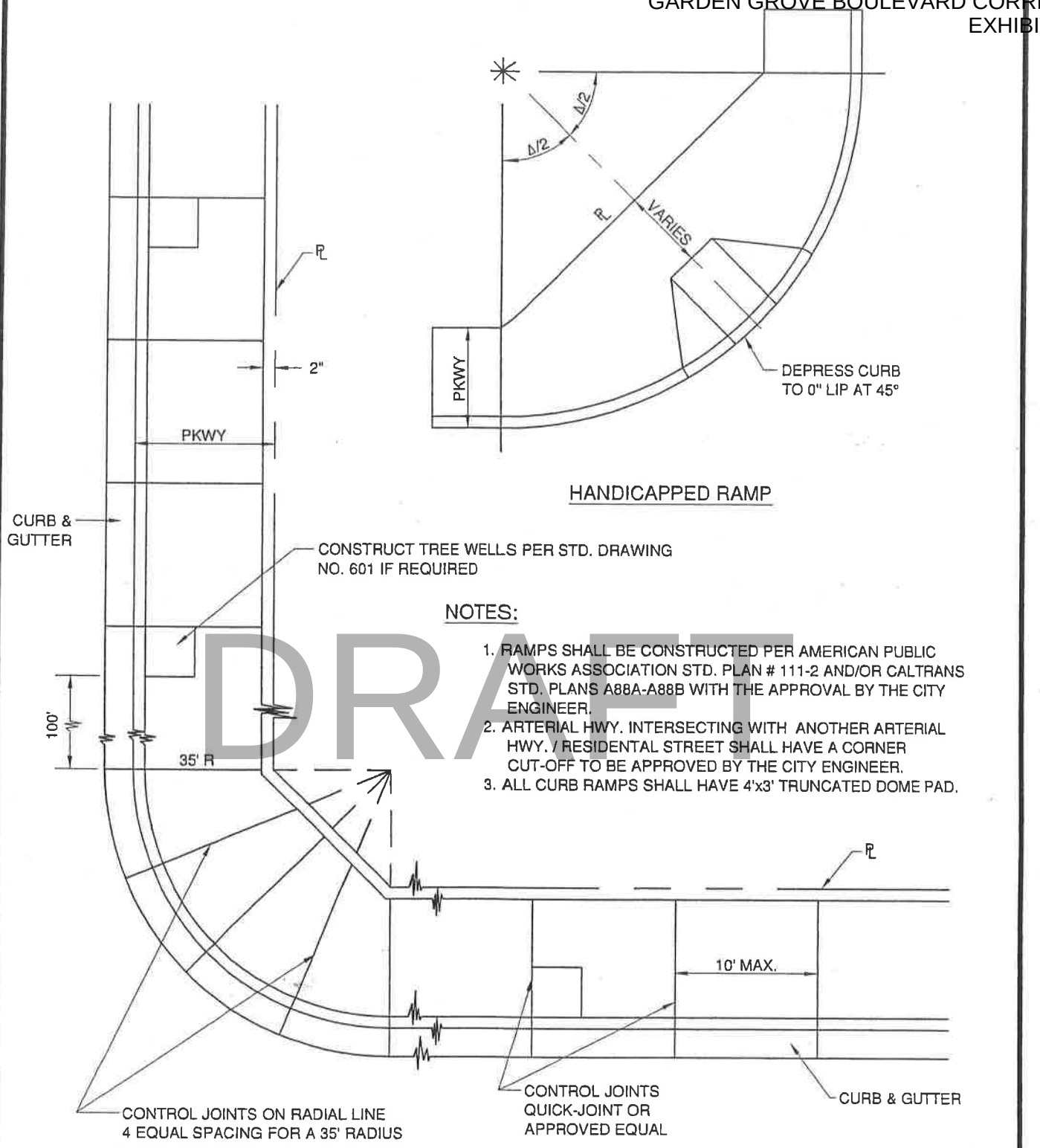
City of Westminster

DEPARTMENT OF PUBLIC WORKS

RESIDENTIAL STREET SIDEWALK RETURN

STANDARD NUMBER

204



HANDICAPPED RAMP

NOTES:

1. RAMPS SHALL BE CONSTRUCTED PER AMERICAN PUBLIC WORKS ASSOCIATION STD. PLAN # 111-2 AND/OR CALTRANS STD. PLANS A88A-A88B WITH THE APPROVAL BY THE CITY ENGINEER.
2. ARTERIAL HWY. INTERSECTING WITH ANOTHER ARTERIAL HWY. / RESIDENTAL STREET SHALL HAVE A CORNER CUT-OFF TO BE APPROVED BY THE CITY ENGINEER.
3. ALL CURB RAMPS SHALL HAVE 4'x3' TRUNCATED DOME PAD.

APPROVED:

P.W. DIRECTOR / CITY ENGINEER

REVISED DATE: 5/15/08

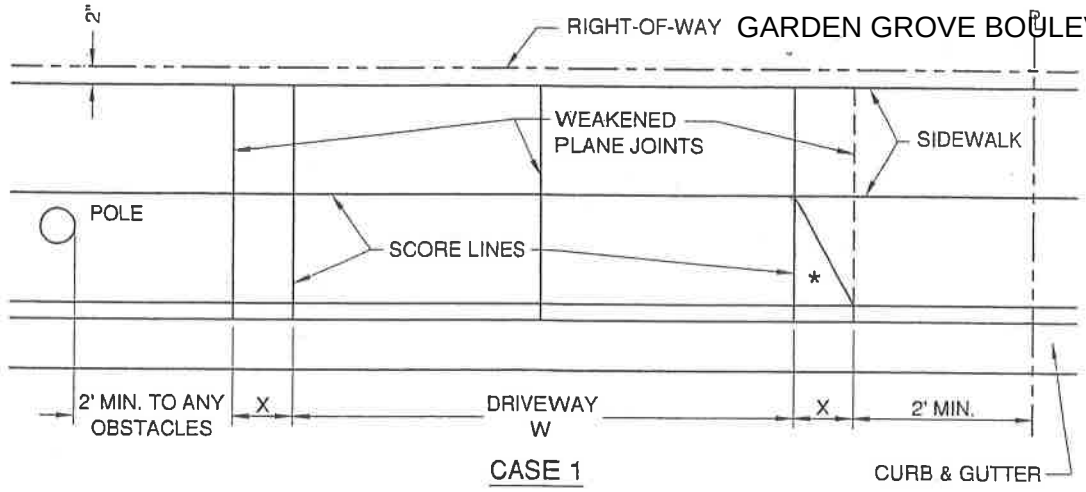
City of Westminster

DEPARTMENT OF PUBLIC WORKS

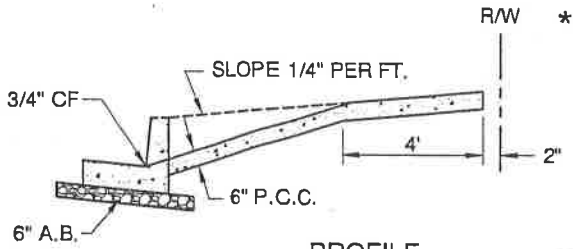
ARTERIAL STREET
SIDEWALK RETURN

STANDARD NUMBER

205

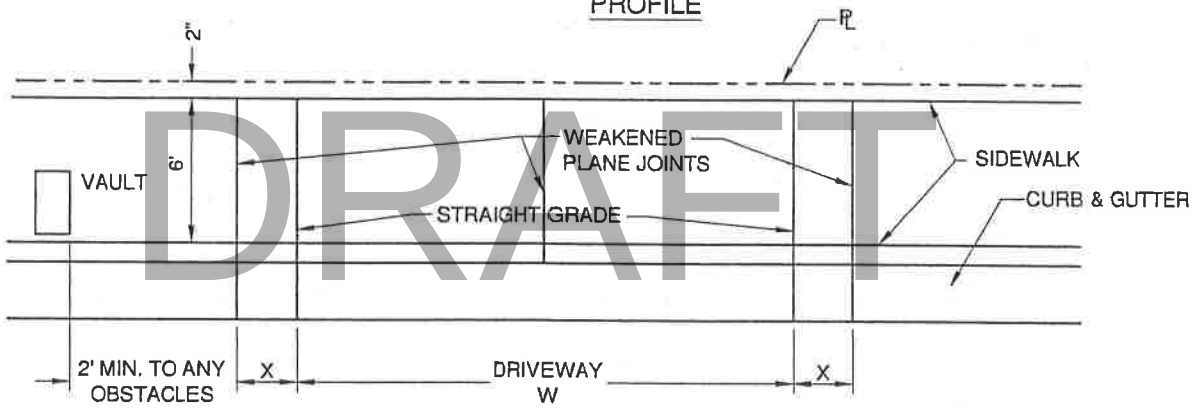


CASE 1

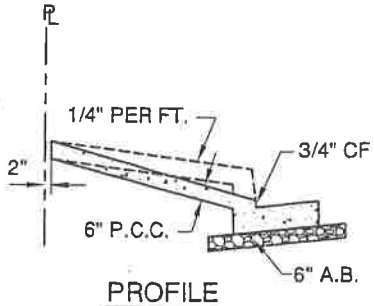


* FLARE TO BE USED ONLY WHEN MATCHING OPPOSITE SIDE

PROFILE



CASE 2



PROFILE

NOTES:

1. CONCRETE SHALL BE 520-C-2500.
2. DRIVEWAYS SHALL NOT ENCROACH INTO CURB RETURNS.
3. CURB FACE ≤ 6"; X = 3' / CURB FACE > 6"; X = 4'.
4. THERE SHALL BE A MINIMUM OF 22' OF FULL HEIGHT CURB BETWEEN APPROACHES ON SAME PROPERTY WITH THE APPROVAL OF THE CITY ENGINNER.
5. W = MINIMUM OF 12', MAXIMUM OF 20', WIDER "W" MAY BE REQUIRED BY THE CITY ENGINEER.
6. THERE SHALL BE A MINIMUM OF 2' OF FULL HEIGHT CURB FROM PROPERTY LINE.
7. HORIZONTAL CURB CUTS ARE ALLOWED IF THE EXISTING CURB AND GUTTER ARE IN GOOD SHAPE IN THE OPINION OF THE CITY ENGINEER.
8. MAXIMUM SLOPE FOR THE DRIVEWAY APPROACH SHALL BE 12%.
9. EXISTING AC SHALL BE REMOVED BY SAWCUTTING AT A MINIMUM DISTANCE OF TWO FEET FROM LIP OF GUTTER.
10. MINIMUM COMPACTION FOR SOIL UNDERNEATH DRIVEWAY APPROACH SHALL BE 90%.
11. DRIVEWAY APPROACH SHALL BE A MINIMUM OF 2' AWAY FROM CURB RETURN.

APPROVED:

P.W. DIRECTOR / CITY ENGINEER

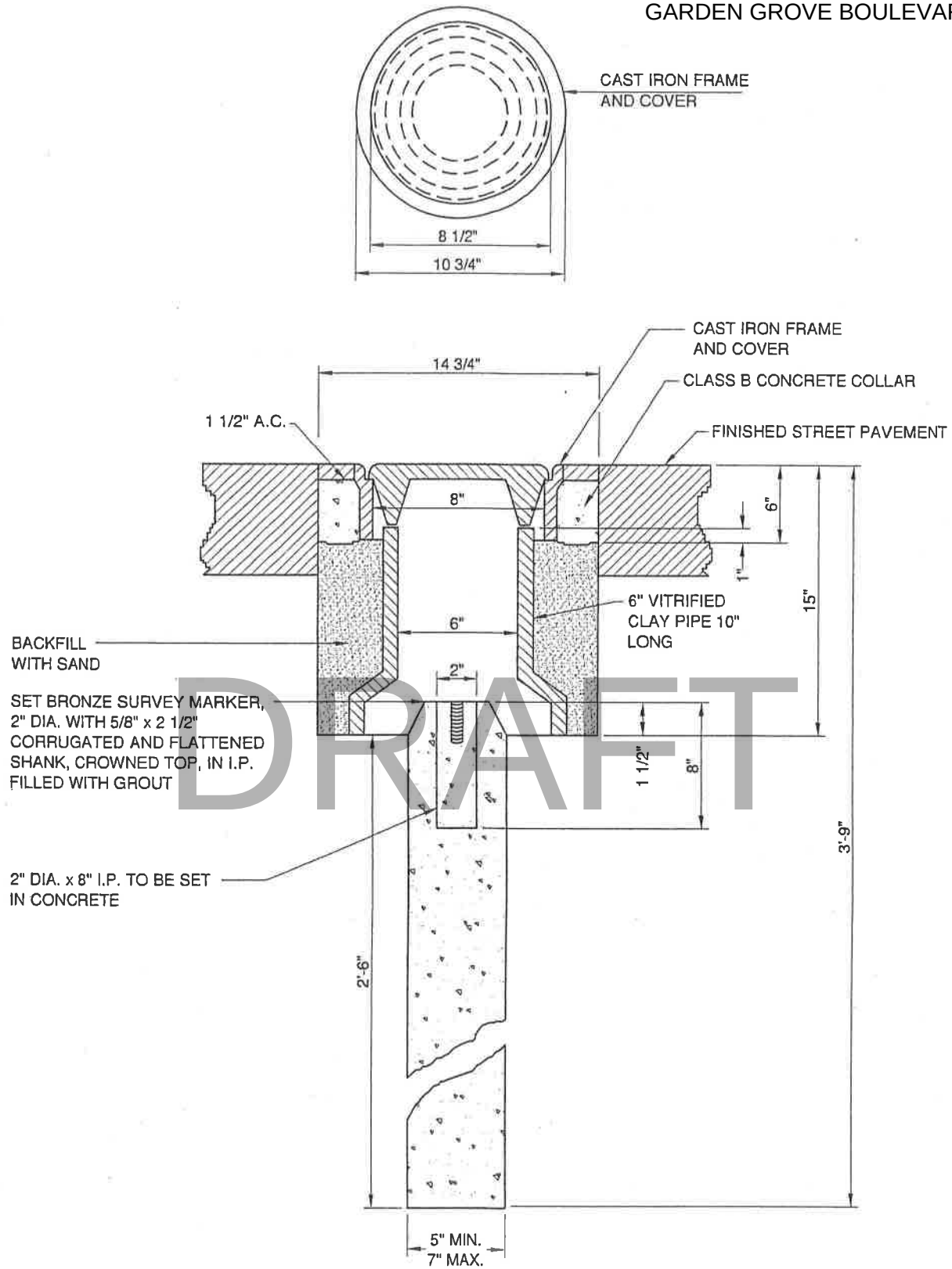
REVISED DATE: 5/15/08

City of Westminster

DEPARTMENT OF PUBLIC WORKS

RESIDENTIAL DRIVEWAY APPROACH

STANDARD NUMBER 208



APPROVED:

P.W. DIRECTOR / CITY ENGINEER

REVISED DATE: 5/15/08

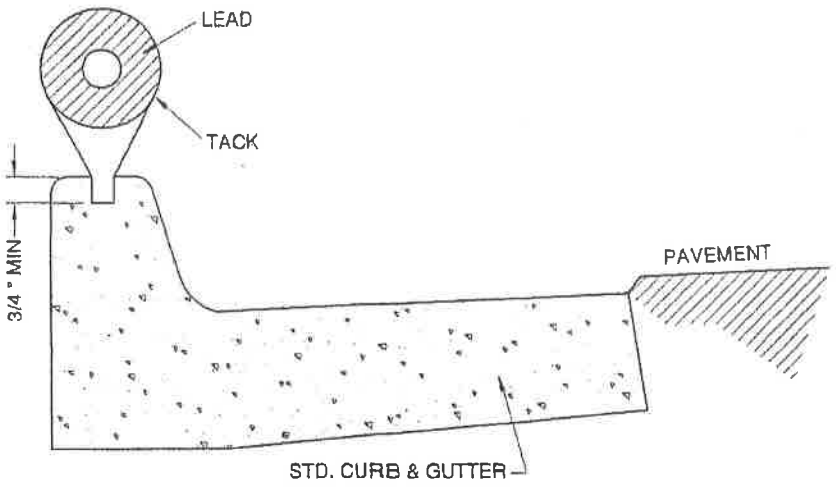
City of Westminster

DEPARTMENT OF PUBLIC WORKS

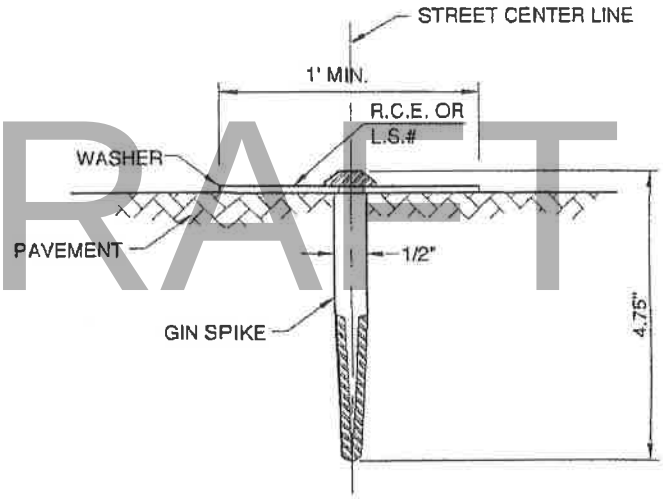
SURVEY MONUMENT TYPE "A"

STANDARD NUMBER

603



CENTER LINE TIE POINTS



NOTES:

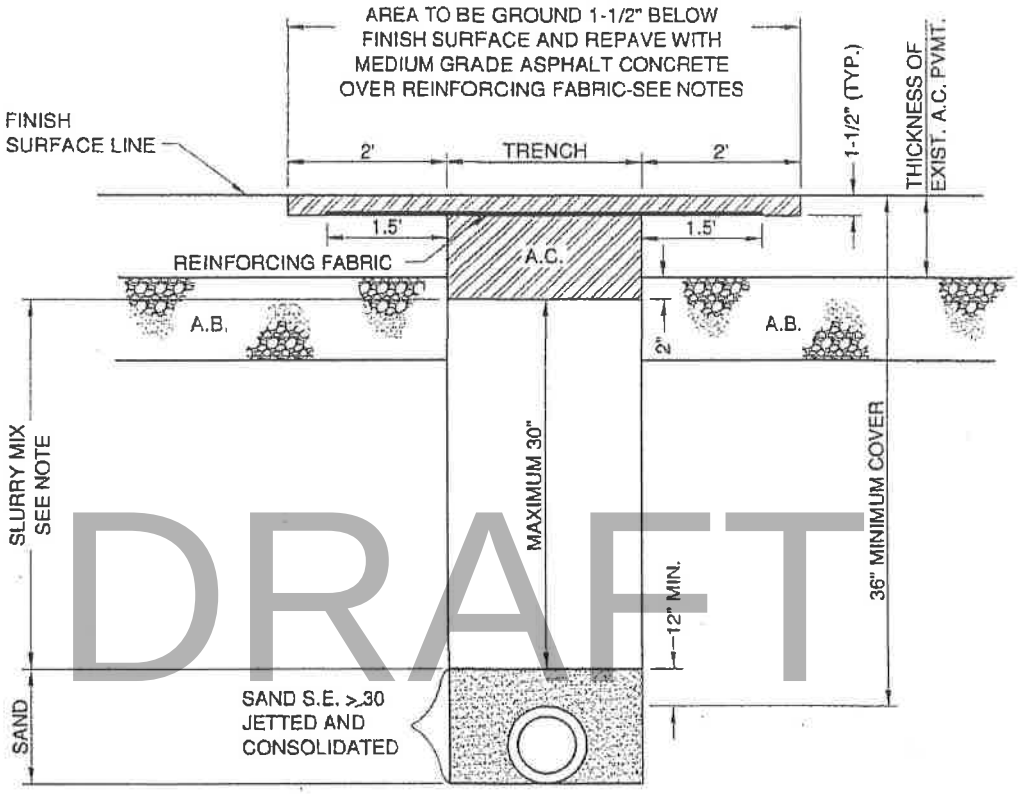
1. ALL TIE POINTS SHALL BE LEAD AND TACKS. LEAD SHALL BE A MIN. OF 3/4" DEEP AND TACKS TO BE MADE OF BRASS.
2. ALL INTERSECTIONS AND CENTER LINE CONTROL POINTS SHALL BE GIN SPIKE.
3. ALL CONTROL POINTS SHALL HAVE A MIN. OF 4 TIES, WITH TIES PLACED SUCH THAT A PROPER ANGLE IS OBTAINED FROM THE TIE TO THE CONTROL POINT AS DETERMINED BY THE CITY ENGINEER.

APPROVED:
Marwan Khouse
P.W. DIRECTOR / CITY ENGINEER
REVISED DATE: 5/15/08

City of Westminster
DEPARTMENT OF PUBLIC WORKS

CENTERLINE TIES

STANDARD NUMBER
604



APPROVED:

P.W. DIRECTOR / CITY ENGINEER

REVISED DATE: 5/15/08

City of Westminster

DEPARTMENT OF PUBLIC WORKS

UTILITY EXCAVATION

STANDARD NUMBER

609

STANDARD DRAWING # 609
UTILITY EXCAVATION IN THE PUBLIC RIGHT OF WAY

The intent of these standards is to assure the best repair possible and reduce adverse impacts for the Public from road roughness, closures, and time to do work. IT MUST BE DONE SAFELY!

Notes

1. **Slurry Backfill**: Use 1.5 sack slurry with two (2) percent calcium chloride. If steel pipe is used then use non-chloride accelerator. Slurry shall be a maximum of thirty (30) inches deep, and shall be placed to the depth of two (2) inches below existing A.C. pavement.

2. **Pavement:** The trench shall be paved for the thickness of the existing paving plus a depth of two (2) inches, twenty-four (24) hours after slurry has been placed. The A.C. pavement shall be placed directly over the slurry with no aggregate base. The A.C. pavement in the trench plus two (2) feet each side of the trench, shall be ground a depth of one and one-half (1.5) inches below finish surface, and paved with a medium grade A.C. over reinforcing fabric.

   Latex rubber asphalt concrete or other type of asphalt concrete material may be required based on existing conditions.

3. **Reinforcing Fabric:** The trench, plus one and one-half (1.5) feet on each side, shall be covered with reinforcing fabric prior to paving.

4. **Cold Mix:** Use of cold mix (UPM) to temporarily repair excavations the same day, in order to allow traffic flow on smooth transitions, is generally allowable. If cold mix is to be used, use (UPM) or approved equal, following the City Engineer's approval. It shall be a minimum thickness of three (3) inches for residential streets and six (6) inches for arterial and secondary arterials, and kept in good and safe condition.

5. **Slurry Seal**: Longitudinal continuous excavation shall be sealed using Type II slurry seal and cracks sealed, for the width of any affected lanes following the A.C. repairs, to the satisfaction of the City Engineer.

6. **Sand**: Sand shall be used for bedding and as cover for installed pipes. A minimum cover of twelve (12) inches of sand shall be used. On water service laterals, maintain twelve (12) inches of sand above the lateral, even when the elevation varies as the lateral is closer to the edge of gutter. Sand shall have an sand equivalence of greater than or equal to thirty (30). Sand shall be placed in maximum one foot lifts or less thickness as necessary to be able to achieve the necessary consolidation. It shall be jetted and consolidated to the satisfaction of the City Engineer.

7. **NPDES Requirements:** Streets shall be kept clean at all times. The City may require mechanical sweeping. The contractor shall maintain a clean work area, and prevent any material prohibited by the NPDES permit and the City's Water Quality Ordinance from entering the storm drain system.

   The contractor shall meet all NPDES requirements during construction. All erosion control measures shall be taken during construction, to the satisfaction of the City Engineer. If no proper erosion control measures are taken on site, City may require that all operations cease and the encroachment permit may be revoked until proper measures have been taken to the satisfaction of the City Engineer.

8. **Traffic Control Plan**: Contractor (or applicant) shall submit traffic control plans complying with the California Manual on Uniform Traffic Control Devices (MUTCD), in advance for review and approval prior to excavating within the Public Right of Way, unless the excavation is an emergency, and then comply with the WATCH Manual.

STANDARD DRAWING # 609
UTILITY EXCAVATION IN THE PUBLIC RIGHT OF WAY
Notes (Continued)

9. **CAL-OSHA:** Contractor shall follow and will be responsible to obtain a Cal-OSHA permit when required.

10. **Steel Plates**: When steel plates are used, they shall be used per Caltrans Standards, with the following modification: Method Two (2) shall be applied to all arterial and secondary arterials. Steel plates shall be doweled into the ground, and/or welded together to eliminate movement. The City Engineer may recommend additional safety measures if it is deemed necessary. Steel plates shall always have cold mix around all edges. Recessing of steel plates shall be performed as required by the City Engineer on arterial and secondary arterial streets for planned activities requiring more than twenty-four (24) hours for open travel ways.

    a) Planned activity: Planned activities shall be cleared through the Engineering Division to be working in the Public Right of Way under an approved schedule. Steel plates can remain at one location for twenty-four (24) hours, then shall be removed. If unforeseen conditions arise, then follow emergency procedures below.

    b) Emergency procedures: When an unforeseen condition arises, steel plates can be maintained at a location for up to seventy-two (72) hours.

11. **Potholing/Temporary Excavating**: If potholing is the result of an investigation for a planned activity or for temporary excavations, cold mix (UPM) or approved equal could be used temporarily with suitable backfill, flush with adjacent existing asphalt. Following completion of the activity, standard excavation for permanent repair shall be followed. This will be done the same day as the excavation to reduce adverse impacts to roadway use. The City Engineer may require, based on the existing street condition, that excavation repair includes grinding along the edges, as per standard utilities excavation repair.

12. **Boring**: Boring shall be considered as a continuous trench as far as excavation repair. Potholes located intermittently will not be treated as separate excavations but as a continuous excavation. The City shall reserve the right to require boring or open trench as the situation may arise, to the satisfaction of the City Engineer.

13. **Moratorium on Newly Resurfaced Streets**: Excavation shall generally not be permitted in any street that has been resurfaced in the past five years. No permit will be granted to excavate in the Public Right of Way except for lateral extensions to customers/repairs less than one thousand five hundred (1,500) feet, or as approved by the City Council. Approved excavations in new streets shall require full lane or full width of the street, as determined by the City Engineer, with grind and overlay repairs. In case of an emergency, applicant shall obtain the City Engineer's approval for appropriate repair measures as soon as possible.

14. **Contractor Identification**: Anyone working within the Public Right of Way shall be identified with the entity's name, to be visible from both directions of travel lanes.

15. **Variances:** The City Engineer may consider variances as requested in advance, that meet the intent of these specifications.

16. **Lane Closure:** Multiple lane closures will normally be prohibited.

17. **Work Hours:** Arterial and secondary arterial streets work hours shall be restricted to 9:00 a.m. until 3:00 p.m. No traffic control shall be placed before 9:00 am and shall be removed by 3:00 p.m. Residential and secondary streets work hours shall be restricted to 7:00 a.m. until 4:00 p.m.

STANDARD DRAWING # 609
UTILITY EXCAVATION IN THE PUBLIC RIGHT OF WAY
Notes (Continued)

18. **Insurance:** Anyone working within the Public Right of Way shall comply with the City's insurance requirements, prior to obtaining an encroachment permit.

19. **Encroachment Permit**: Anyone excavating within the Public Right of Way shall be required to obtain an encroachment permit prior to start of any excavation.

20. **Underground Service Alert**: Section 4216/4217 of the Government Code requires a DigAlert Identification Number be issued before an "Encroachment Permit" will be valid. For your DigAlert I.D. Number, Call Underground Service Alert, Toll Free: 1-800-422-4133, two working days before you dig.

CALTRANS STANDARD
TEMPORARY STEEL PLATE BRIDGING WITH A NON-SKID SURFACE

Highway encroachment work involving excavations shall be identified during the review process of the permit applications package. It is recognized that to accommodate excavation work, steel plate bridging may be necessary. All permit conditions for use of steel plate bridging should be set forth in the special provisions of the permit.

Consideration of steel plate bridging in the review process should take into account the following factors:

1. Traffic volume and composition
2. Duration and size of the proposed excavation
3. Weather conditions

When it is determined in the review process that shoring will be a part of the permitted operation, the shoring shall conform to Caltrans standards.

When backfilling operations of an excavation in the traveled way, whether transverse or longitudinal, cannot be properly completed within a work day, steel plate bridging with a non-skid surface and shoring may be required to preserve unobstructed traffic flow. In such cases, the following conditions shall apply:

1. Steel plate bridging on freeways is not allowed.
2. Steel plates used for bridging must extend a minimum of twelve (12) inches beyond the edges of the trench.
3. Steel plate bridging shall be installed to operate with minimum noise.
4. The trench shall be adequately shored, per Caltrans Standards, to support the bridging and traffic loads.
5. Temporary paving with cold asphalt concrete shall be used to feather the edges of the plates, if plate installation by Method Two (2) is used.
6. Bridging shall be secured against displacement by using adjustable cleats, shims or other devices.

As required by Caltrans, steel plate bridging and shoring shall be installed using either Method One (1) or Two (2):

Method One (1) For speeds more than 45 mph:

The pavement shall be cold planed to a depth equal to the thickness of the plate and to a width and length equal to the dimensions of the plate.

Method Two (2) For speeds 45 mph or less:

Approach plate(s) and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of two (2) dowels pre-drilled into the corners of the plate and drilled two (2) inches into the pavement. Subsequent plates are butted to each other. Fine graded asphalt concrete shall be compacted to form ramps, maximum slope eighty-five (85) percent with a minimum twelve (12) inches taper to cover all edges of the steel plates. When steel plates are removed, the dowel holes in the pavement shall be backfilled with either graded fine or asphalt concrete mix, concrete slurry, or equivalent slurry satisfactory to the Caltrans' representative.

The contractor shall be responsible for maintenance of the steel plates, shoring and asphalt concrete ramps.

Unless specifically noted in the provisions of the permit, steel plate bridging should not exceed four (4) consecutive working days in any given week. Backfilling of excavations shall be covered with a minimum three (3) inches temporary layer of cold asphalt concrete.

The following table shows the required minimal thickness of steel plate bridging required for a given trench width:

TRENCH WIDTH	MINIMUM PLATE THICKNESS
0.3 m (1.0')	13 mm (1/2")
0.45 m (1.5')	19 mm (3/4")
0.6 m (2.0')	22 mm (7/8")
0.9 m (3.0')	25 mm (1")
1.2 m (4.0')	32 mm (1¼")

NOTE: For spans greater than four (4) feet, a structural design shall be prepared by a registered Civil Engineer and approved by Caltrans.

Steel plate bridging shall be steel plates designed for HS20.44 truck loading per Caltrans Bridge Design Specifications Manual. . The permittee shall maintain on the steel plate a non-skid surface having a minimum coefficients of friction equivalent to 035 as determined by California Test Method 342 (see Caltrans Standards). If a different test method is used, the permittee may utilize standard test plates with known coefficients of friction available from each Caltrans District Materials Engineer to correlate skid resistance result to California Test Method 342.

A Rough Road Sign (W33) with black lettering on an orange background, may be used in advance of steel plate bridging. This is to be used with any other required construction signing.

CITY OF WESTMINSTER

IISNS PANEL

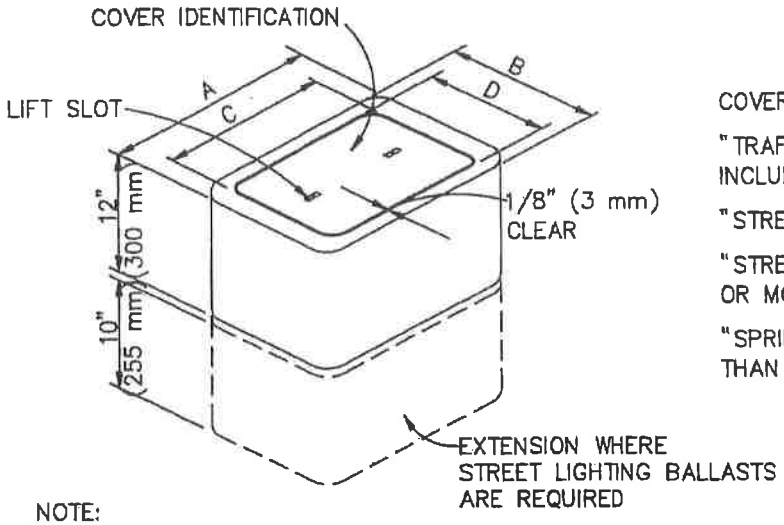
DRAFT

Internally Illuminated Street Name Sign Panel (96-Inch)

APWA

STANDARD PLANS

DRAFT



COVER IDENTIFICATION:

"TRAFFIC SIGNAL" – TRAFFIC SIGNAL CIRCUITS, INCLUDING THOSE WITH STREET OR SIGN LIGHTING.

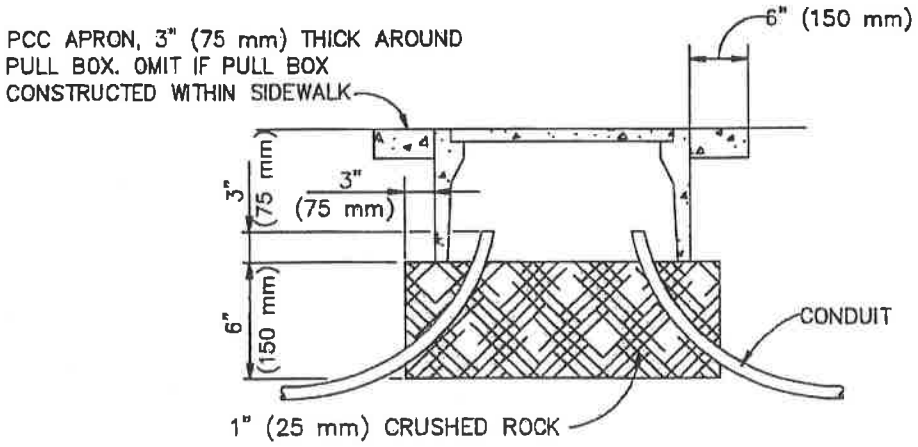
"STREET LIGHTING" – CIRCUITS LESS THAN 600V.

"STREET LIGHTING–HIGH VOLTAGE" – 600V OR MORE.

"SPRINKLER CONTROL" – CIRCUITS LESS THAN 50V.

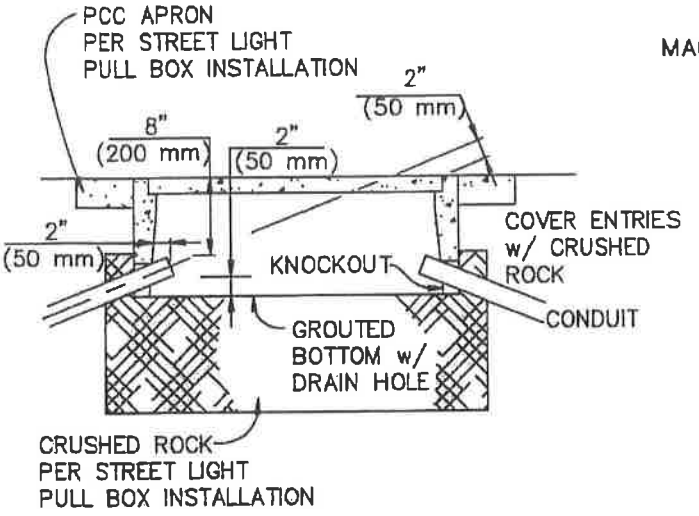
NOTE:
BOXES SHALL BE PCC AND COVERS SHALL BE NON–BOLTDOWN TYPE UNLESS OTHERWISE NOTED.

PULL BOX NO.	TYPE	DIMENSIONS (mm)			
		OUTSIDE		COVER	
		A	B	C	D
3 1/2	PCC	19" (485)	13" (330)	15" (380)	10" (255)
5	PCC	25" (635)	15" (380)	21 3/4" (550)	11 3/4" (300)
6	PCC	34" (865)	22" (560)	29 3/4" (755)	17 3/4" (450)
3 1/2	PLASTIC	16 3/8" (415)	11" (280)	15 3/8" (390)	10" (255)
5	PLASTIC	24" (610)	14 11/16" (375)	23" (584)	13 11/16" (350)
6	PLASTIC	31 1/2" (800)	18 5/8" (475)	30 1/2" (775)	17 3/4" (450)

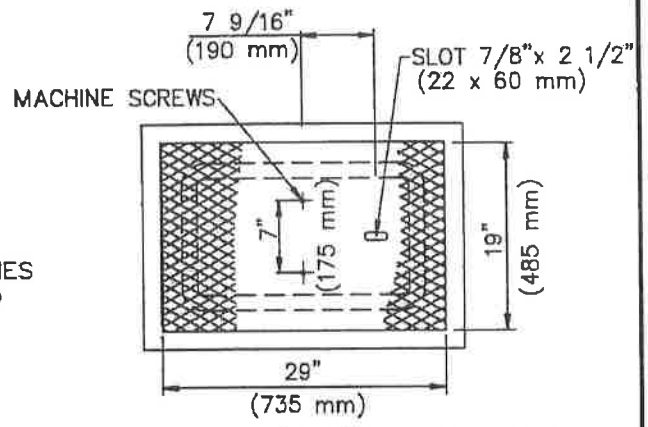


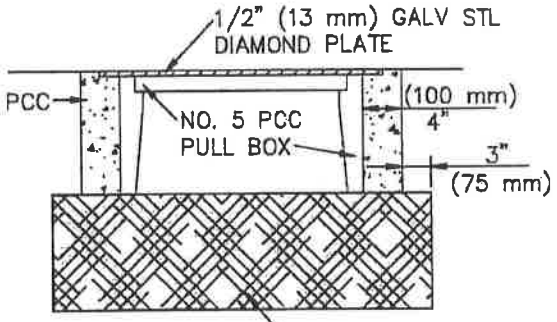
STREET LIGHT PULL BOX INSTALLATION

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION		
PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 2005 REV. 2009	**PULL BOXES**	STANDARD PLAN **405–1**
	USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION	SHEET 1 OF 2



TRAFFIC SIGNAL
PULL BOX INSTALLATION

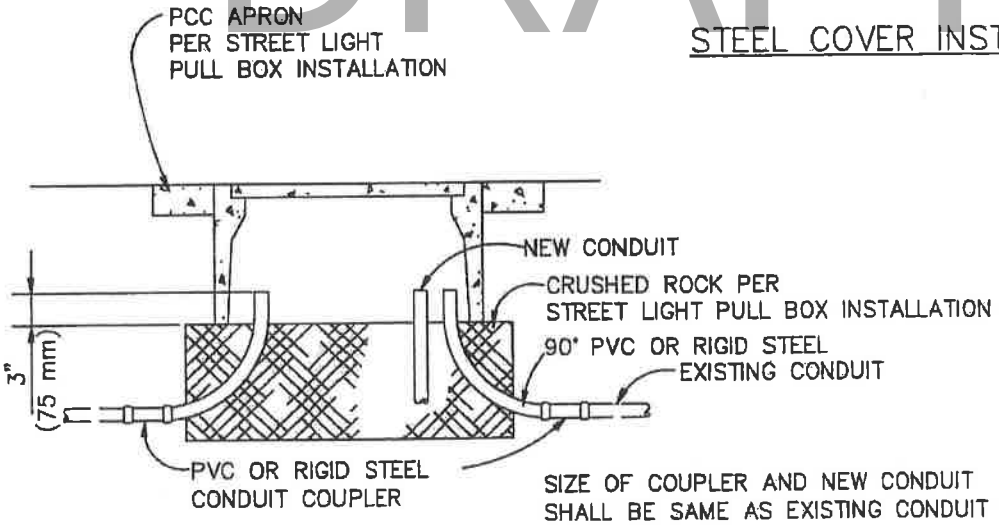




CRUSHED ROCK
PER STREET LIGHT
PULL BOX INSTALLATION

ATTACH STL PLATE TO PCC COVER
WITH 2 BRASS MACHINE SCREWS,
1/4" (6 mm) 20 NC-2 FLAT HEAD,
IN 1 1/4" (32 mm) HOLES w/ EXPANSION SHIELDS

STEEL COVER INSTALLATION



STREET LIGHT CONDUIT INTERCEPT

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION	STANDARD PLAN
PULL BOXES	405-1
	SHEET 2 OF 2

OC PUBLIC WORKS

STANDARD PLANS

DRAFT

SECTION I. MATERIALS

(All references to "Standard Specifications" in these Standard Plans shall refer to the Standard Specifications for Public Works Construction (the Greenbook) unless otherwise specifically noted.)

Portland cement concrete shall meet the requirements of Section 400, "ALTERNATE ROCK PRODUCTS, ASPHALT CONCRETE, PORTLAND CEMENT CONCRETE AND UNTREATED BASE MATERIAL," of the Standard Specifications and these special provisions.

Aggregate used in concrete shall not contain any deleterious amounts of gypsum, pyrite, zeolites, or any unstable or amorphous silica including chert, opal, chalcedony, volcanic glass, synthetic siliceous glass, cristobolite, tridymite, vein quartz, highly metamorphic quartz, optically strained quartz, microfractured quartz, microcrystalline quartz, or rocks including cryptocrystalline siliceous volcanic rocks or siliceous shale.

The sodium sulfate loss requirement and the gradation x-value submittal required of Section 400-1.3.1, "General," may be waived by the Engineer. Engineer shall mean the County of Orange Resources & Development Management Department (RDMD) Chief Engineer, or his authorized agent acting within the scope of his authority.

The cement type requirement, Section 201-1.2.1, "Portland Cement" shall be Type II, III, V or IP (MS) as determined by the Engineer. Type II, III, V or IP (MS) cements shall conform to ASTM C150 and the low alkali requirements of Table 1A therein. Type IP (MS) cement shall also conform to the requirements for Type IP (MS) cement of ASTM C595, and shall be comprised of an intimate mixture of Type II cement and not more than 20% by mass of a pozzolanic material.

For the mitigation of Alkali-Silica Reaction potential, 20% by mass of the required portland cement in concrete shall be replaced with fly ash:* Up to a total of 30% fly ash of the required portland cement may be used in a prequalified mix design per Section 201-1.1.3, "Concrete Specified by Compressive Strength" of the Standard Specifications. The total mass of Portland Cement may be reduced by 5% if an approved water reducer is added. Fly ash shall conform to Section 201-1.2.5, "Fly Ash." (Note: the cement total mass of portland cement and 20% fly ash and approved water reducer shall be the same as found in the "Concrete Class" portion of TABLE 201-1.1.2 (A) in Section 201-1.1.2, "Concrete Specified by Class and Alternate Class."

Concrete specified by Alternate Class shall be per Section 201-1 and TABLE 201-1.1.2 (A) except that where fly ash is used or required and additional fly ash equal to 5% of the required portland cement mass shall be added to amounts listed in the TABLE for Alternate Class. Alternate Class concrete which will be used for non-structural applications-i.e. pavement, curb, gutter, sidewalks pipe bedding, back-fill, CLSM, etc.-may also include reclaimed concrete material in accordance with SECTION V. RECYCLED HYDRAULIC CONCRETE of these Special Provisions.

Pozzolan shall conform to ASTM C618, Class F. Class C pozzolan may be used if approved by the RDMD Materials Engineer, in accordance with Section 201-1.2.5, "Fly Ash"

In determining the maximum amount of free water that may be used in concrete, pozzolan shall be considered to be cement. In determining the amount of total cement, cement shall be the total mass of fly ash and portland cement. The total amount of portland cement in the total mass shall not exceed 700 lbs. per cubic yard.

The Cleanness Value requirement of Section 200-1.4, "Coarse Aggregate for Portland Cement Concrete," shall be replaced with the following:

Tests	Test Method	Requirements
Cleanness Value	Calif. 227	
Individual Test		70 min.
Moving Average		75 min.

The Sand Equivalent requirement of Section 200-1.5.3, "Sand for Portland Cement Concrete," shall be replaced with the following:

Tests	Test Method	Requirements
Sand Equivalent	Calif. 217	
Individual Test		70 min.
Moving Average		75 min.

Evaluation of Moving Average for Sand Equivalent and Cleanness Value results shall conform to the provisions of Section 400-1.4, "Statistical Testing."

In lieu of the provisions of Section 300-11.3.1, "Concrete" for concreted (grouted) stone slope protection (riprap) shall be 660-EFW-3250P.

SECTION II. GENERAL PROVISIONS

Add to Section 303-1.2, "Subgrade for Concrete Structures," of the Standard Specifications, the following: If the plans and specifications for the project provide for the construction of gravel (drain) material, which will be the subgrade for the concrete, Contractor shall furnish Type 90N geotextile fabric on top of the gravel (drain) material as a separator. The placement of steel reinforcement and of concrete shall follow the installation of the geotextile fabric as closely as possible. The gravel (drain) material shall be kept free from

water to prevent any portion of concrete material being deposited in water. A range of locally available gradations, D1 through D5, is given in the table below for selection by the Design Engineer for compatibility with the subgrade. If no gradation or thickness is specified, the gravel (drain) shall be 1.0 ft. thick and D3 grading.

The Contractor shall place gravel (drain) material under culvert inverts, pier extension footings, and other locations as shown on the plans, in order to provide a stable subgrade and to permit the flow of groudwater.

The composition of gravel (drain) material shall conform to the following grading requirements when determined by Test Method No. California 202:

Screen or Sieve Size	D1	D2	D3	D4	D5
3"		100	100	100	100
1 ½"	100	95-100	90-100	90-100	85-100
1"			65-100		5-60
¾"	90-100	50-100	50-90	20-60	0-30
⅜"	60-100	15-55	0-50	0-20	0-5
No. 4	5-50	0-25	0-10	0-5	
No. 8	0-10		0-5		
No. 16	0-5				
No. 200		0-3			
Approximate	(No. 4 Rock)	(No. 3 & No. 4 1:1)	(No. 3 Rock)	(No. 2 & No. 3 1:1)	(No. 2 Rock)

The approximate compositions are given for information purposes only; the grading limits specified above shall control.

The Contractor shall excavate to the subgrade dimensions and grades shown on the plans or as directed by the Engineer. Where a firm foundation is not encountered due to soft, spongy or other unstable material or by groundwater, all such unstable material shall be removed and replaced with gravel (drain) material, compacted backfill, or Type 180N geotextile fabric below the gravel material as a separator, at the direction of the Engineer.

Add to Section 303.1.3, "Forms," the following:
Tangent sections for formed wall surface shall result in concrete surface free of any unevenness greater than ¼ inch when checked with a ten foot straightedge.

Forms for covered conduit or open channel curved sections shall be constructed along the arc of the curve. The finished surface shall follow the arc of the curve.

If permitted by the Engineer, covered conduit curved sections may use chord panel. Ends of the chord panel shall be on the arc of the curve.

Add to Section 303-1.7.1, "General," of the Standard Specifications, the following:

Reinforcing steel shall be of the same grade throughout the structure. Aluminum and plastic support for reinforcement shall not be used.

Bars shall be accurately spaced as shown on the plans, and spacing of the first bar immmediately adjacent to a transverse construction joint shall be one-half the required spacing shown on the plans. In no case shall the clear distance between parallel bars be less than 2.5 diameters of the bar or a minimum of two inches.

Unless otherwise shown on the plans, embedment of reinforcing steel (other than stirrups and spacers) shall be 1 ½ inches clear for #8 bars and smaller, and shall be two inches clear for #9 bars or larger. Where placement of reinforcing steel requires alternate bars of different size, embedment requirements shall be governed by the larger bar. Stirrups and spacers shall be embedded not less than one inch clear depth. Measurement of embedment shall be from the outside of the bar to the nearest concrete face.

Tack welding or butt welding in reinforcing bars will not be permitted.

Add to Section 303-1.7.2, "Splicing," the following:

Reinforcing bars may be continuous at locations where splices are shown on the plans, at the option of the Contractor. The location of splices, except where shown on the plans, shall be determined by the Contractor as approved by the Engineer based upon using available commercial lengths where practicable.

Unless otherwise shown on the plans or approved by the Engineer, splices in adjacent reinforcing bars shall be staggered. The minimum distance between staggered splices for reinforcing bars #11 or smaller shall be the length required for a lapped splice in the bar.

Splices shall consist of placing the reinforcing bars in contact and wiring them together in such a manner as to maintain the alignment of the bars and to provide minimum clearances.

No lapped splices will be permitted at locations where the concrete section is not sufficient to provide minimum clear distance of two inches between the splice and the nearest adjacent bar. The clearance to the surface of the concrete shall not be reduced.

Where grade 60 reinforcing bars are required, the length of lapped splices shall be as follows: Reinforcing bars #8 or smaller, shall be lapped at least 45 diameters of the smaller bar joined, and reinforcing bars #9, #10, and #11 shall be lapped at least 60 diameters of the smaller bar joined, except when otherwise shown on the plans.

Where bundled bars are specified, splices shall conform to the following:

1. In bundles of two bars, the length of lapped splice shall be 1.2 times the length of single bar lapped splice.
2. In bundles of three bars, the length of lapped splice shall be 1.33 times the length of single bar lapped splice.

Spiral reinforcement shall be lapped at least 80 diameters. Spiral reinforcements at splices and at ends shall be terminated by a 135 degree hook with a 10 inch hook around an intersecting bar.

Splices of tensile reinforcement at points of maximum stress shall be avoided; however, any proposed deviation from splices shown on the plans shall be submitted to the Engineer for approval.

Add to Section 303-1.8, "Placing Concrete," the following:

Concrete for girder spans shall be placed in not less than two operations and the last operation shall consist of placing the top deck slab. At least five days shall elapse between each operation, unless otherwise permitted by the Engineer.

When concrete is to be deposited in a member less than 16 inches in width, the use of double belting to prevent segregation of the concrete shall be permitted. In lieu of pipes or tremies, each belt shall extend equidistant into the forms to a point where concrete shall not fall more than six feet. When placed in the forms, the belts shall be aligned directly opposite each other.

Add to Section 303-1.8.6, "Joints," the following:

Unless otherwise specified, transverse construction joints shall be placed in all reinforced sections at intervals of not less than 10 feet or more than 50 feet. The joints shall be in the same plane for the entire structure, and for concrete thickness greater than 6 inches shall be keyed as directed by the Engineer.

Construction of all reinforced concrete sections (including inverts) shall be by the alternate panel method, and no continuous placement through joints will be permitted. After placement of all concrete in a panel or a section on one side of the joint has been completed, placement of concrete on the other side of the joint shall be delayed as directed by the Engineer; but in no event shall the delay be less than eight hours.

In lieu of saw cutting, as specified in Section 201-3" EXPANSION JOINT FILLER AND JOINT SEALANTS," joint sealant grooves shall be formed as shown on the plans and as directed by the Engineer.

Add to Section 303-1.9, "Surface Finishes," the following:

The longitudinal and transverse channel invert elevation shall not vary from true line and grade more than ½ inch. The unevenness shall not be more than 1/4 inch when checked with a 10-foot straightedge. Top of channel wall and channel side slope elevation shall not vary from true line and grade more than 1/2 inch. Unevenness shall not be more than 1/2 inch when checked with a 10-foot straightedge.

Any surfaces which fail to conform to the above tolerances shall be ground in accordance withthe best standard practice until tolerances are met. Grinding shall not reduce the concrete cover on reinforcing steel to less than 1½ inches. Portions of inverts which cannot be corrected satisfactorily by grinding shall be removed and replaced.

Except as specified above, vertical or horizontal position of structures as shown on the plans or as specified in these specifications, shall not vary more than ½ inch from true position. Elevation at inlet lips shall not vary more than 1/4 inch from elevations shown on the plans when checked with a 10-foot straightedge.

The 10-foot straightedge or template shall be furnished by the Contractor and shall be readily available prior to placing concrete.

Add to Section 303-1.9.2, "Ordinary Surface Finish," the following:

Ordinary Surface Finish shall not apply to rock pockets which, in the opinion of the Engineer, are of such an extent or character as to affect the strength of the structure materially or to endanger the life of the steel reinforcement. In such cases, the Engineer may declare the concrete defective and require the removal and replacement of the portion of the structure affected.

Add to Section 303-5.5.1, "General," the following:

The top and face of the finished curb shall be true and straight, and the top surface shall be of uniform width, free from humps, sags, or other irregularities. When a straightedge 10-foot is led on the top or face of the curb, or on the surface of the gutters, the surface shall not vary more than 0.01-foot from the edge of the straightedge, except at grade changes or curves.

SECTION III. REQUIREMENTS FOR SEA WATER OR SULFATE SOILS CONTACT

Unless otherwise shown on the plans or as required in the special provisions, the manufacture and curing of Portland Cement concrete under the following conditions shall apply:

A proposed mix design shall be submitted to the RDMD Materials Engineer for approval. This mix design shall have the following characteristics:

A. General:
   1. The thickness of concrete over the reinforcement shall be 3 inches where the concrete is deposited against the earth without forms, and 2 inches if formed.
   2. Forms shall not be removed prior to 24 hours after concrete placement and in no event sooner than as specified in Sections 303-1.4.5, "Channels and Conduits" and Section 303-1.5, "Removal of Forms for Box Sections."
   3. Soil Sulfate content shall be determined by California Test Method 417 (1978) modified to a 10:1 dilution.

B. Sea Water or Brackish Water Contact:
   1. 800-C-5000CPS, Type V cement.
   2. The cement content shall include 25% Class F fly ash.
   3. The water:cement ratio shall be 0.45.
   4. The mix shall contain reinforcing fibers in accordance with manufacturer instructions.

C. Moderate Exposure Sulfate Soils Contact:
Soluble SO4 content of soil from 1,500 to 10,000 ppm :

1. 658-CME-4500P, Type V cement
2. A substitution of 20% Class F fly ash of the required cement content shall be made
3. The water:cement ratio shall be 0.45

D. Severe Exposure Sulfate Soils Contact:
Soluble SO4 content of soil that Exceeds 10,000 ppm:

1. 750-CSE-5000P, Type V cement
2. A substitution of 20% Class F fly ash of the required cement content shall be made
3. The water:cement ratio shall be 0.45

SECTION IV. AIR-PLACED CONCRETE

Air-placed concrete shall comply with Section 303-2, AIR PLACED CONCRETE and these special provisions.

The Concrete Class shall be 660-EFW-3250.
The strength of air-placed concrete shall be determined from cores cut from test panels in accordance with the fourth paragraph of Section 303-2.4, "Tests."

SECTION V. RECYCLED HYDRAULIC CONCRETE

Reclaimed concrete material may be used in concrete mixtures in accordance with this section when approved by the RDMD Materials Engineer. Reclaimed concrete material may be either:

1.) Reclaimed plastic portland cement concrete (RPPCC)

Or

2.) Reclaimed non-plastic portland cement concrete materials

The contractor is required to maintain suitable equipment to classify, document, and proportion reclaimed concrete material used in concrete mixtures. The addition and characteristics of reclaimed concrete material will be monitored in such a manner so to ensure that the final portland cement concrete composite conforms to the specifications for its Class and use. The RDMD Materials Engineer will approve all new or newly implemented processes.

All mixtures incorporating reclaimed concrete material will be represented by mix designs in accordance with Section 201-1.1.1,

"General." The contractor shall evaluate all mix designs by laboratory or field trial batches. Each trial batch shall conform to the materials, proportions, and slump as proposed by the mix design. When approved by the Engineer, trial batches may be placed in the Work at designated locations where concrete of lower quality is specified. Concrete so placed will be considered for the purpose of payment to be the type of concrete specified at that location. A minimum of ten test cylinders shall be molded from the trial batch at the maximum water content indicated by the mix design. Five of the cylinders shall be tested at 7 days so to establish 7-day average compressive strength information. The remaining five cylinders shall be tested at no more than 28 days after molding and the average compressive strength of the five cylinders for field test batches shall be at least 600 psi greater than the specified strength. For laboratory prepared test batches the compressive strength of the five cylinders shall be 1,000 psi greater than the specified stregth. The minimum strength of any one cylinder shall not be less than the specified strength. Changes in source of materials or established procedures may require new trial batches.

Reclaimed concrete material shall not be used for SEA WATER OR SULFATE SOILS CONTACT mixtures and is not normally recommended for use in portland cement concrete where architectural aesthetics are a concern.

RECLAIMED PLASTIC PORTLAND CEMENT CONCRETE (RPPCC).

A maximum of 15% by volume of reclaimed plastic portland cement concrete conforming to this section may be incorporated into fresh portland cement concrete. Each weighmaster certificate shall show the exact volume of RPPCC in addition to the weighmaster certificate requirements of Section 201-1.4.3, "Transit Mixers."

RPPCC may be any un-hardened portland cement concrete provided its design strength is 2000 psi or greater, its constituent material conforms to Section 201-1.2, "Materials," and it has not attained or has been delayed from attaining initial set either by time or by the incorporation of set-delaying chemical admixtures. When set-delaying chemical admixtures are used, they will be used at the manufacturers recommended dosage rates and have a proven history of specifically maintaining and extending both plasticity and set. The contractor will maintain process documentation, mix designs, and supportive concrete test data and shall provide the information to the Engineer upon request.

RPPCC will be proportioned by volume in accordance with Section 201-1.3, "Proportioning." RPPCC may be added at any point during the

proportioning process that results in a consistent, uniform, and homogeneous final product. For design and proportioning purposes, all RPPCC will be considered as a 2000 psi mixture, consisting of 470 pounds of cementitious material. Additional portland cement will be added to achieve the minimum portland cement content and/or strength as required for a mixture's Class and use. The quantity and/or constituent materials of the RPPCC shall be monitored and proportioned such that the final portland cement concrete gradation conforms to the requirements of Section 201-1.3.2, "Combined Aggregate Gradings."

RECLAIMED NON-PLASTIC PORTLAND CEMENT CONCRETE MATERIALS

Non-Plastic Portland Cement Concrete Materials shall consist of an individual amount of or a combination of materials resulting from the reclaiming of portland cement concrete. Before reclamation, these materials shall conform to Section 201-1.2, "Materials." The reclaimed materials shall be designated as either reclaimed aggregates (RA) or reclaimed water (RW).

A maximum of 30% RA by weight of total aggregate may be incorporated

graded portland cement concrete and/or reclaimed, naturally occurring mineral aggregates. Reclaimed naturally occurring mineral aggregates may contain minor residual amounts of portland cement concrete components as a result of reclamation. When crushed portland cement concrete is used as RA, it shall, when combined with non-reclaimed aggregates at the proposed percentage of use conform to Section 201-1.2.2, "Aggregates," and these special provisions. When less than 15% RA by weight of total aggregate is used, the requirements of Section 201-1.2.2, "Aggregates," may be waived provided the final portland cement concrete gradation conforms to the requirements of Section 201-1.3.2, "Combined Aggregate Gradings."

A maximum of 35% RW by weight of batch water may be incorporated into fresh portland cement concrete. RW may consist of non-deleterious amounts of hydrated and un-hydrated portland cement, admixtures, minor amounts of fly ash and fine aggregate. The reclamation process for RW shall include a mechanism to ensure uniformity and homogeneity of the RW.

RA and RW will be proportioned by weight in accordance with Section 201-1.3, "Proportioning." RA and RW may be added at any point during the proportioning process that results in a consistent, uniform, and homogeneous final product.

SECTION I. MATERIALS

Untreated base materials shall meet the requirements of Section 400 and these special provisions.

In lieu of the second sentence of Section 200-2.5.1., at least 65 percent, by weight, of the material retained on the No. 4 sieve shall be crushed particles as determined by Test Method No. California 205.

Evaluation of gradation and sand equivalent test results shall conform to the provisions of Section 400-1.4. The gradation and sand equivalent requirements of Sections 200-2.3., 200-2.4., 200-2.5., and 200-2.6. shall be the moving average requirements. Individual test requirements for gradation and sand equivalent shall be as determined by the RDMD Materials Lab.

SECTION II. GENERAL PROVISIONS

Add to Section 301.2.1., "General," the following:

Untreated base material for pavement, cross gutters, spandrels and similar types of improvements, shall be constructed of material as specified herein.

The material grading shall be either Coarse or Fine as specified in Section 200-2.5.2., "Grading," of the Standard Specifications, at the option of the Contractor. Changes from one grading to another shall not be made during the progress of the work, unless permitted by the Engineer.

Revise Section 301-2.2., "Spreading," as follows:

Delete the last two sentences in Paragraph 2 and add the following:

At the time untreated base material is spread, it may have a moisture content sufficient to obtain the required compaction. Such moisture shall be uniformly distributed throughout the material.

Tailgate spreading by dump trucks will not be permitted except for spot dumping and in areas not readily accessible to spreading equipment.

ORANGE COUNTY RESOURCES & DEVELOPMENT MANAGEMENT DEPARTMENT

Approved _____
H. I. Nakasone, Chief Engineer

Adopted: Res. 91-1481 Revised: Res. 96-546; 06-010

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1804
SHT. 1 OF 1

SPECIAL PROVISIONS-UNTREATED BASE MATERIALS

SECTION I. MATERIALS

(All references to "Standard Specification" in these Standard plans shall refer to the Standard Specifications for Public Works Construction (the Greenbook) unless otherwise specifically noted.)

Asphalt concrete (AC) shall meet the requirements of Section 400 of the Standard Specifications and these Special Provisions. Coarse aggregate shall consist of material of which at least 75% by mass shall be crushed particles in lieu of the requirements of Section 400-4.2.3, "Coarse Aggregate."

The viscosity grade of paving asphalt shall be AR 4000 or AR 8000 as determined by the Engineer. Engineer shall mean the County of Orange Resources & Development Management Department (RDMD) Chief Engineer, or his authorized agent acting within the scope of his authority. Copies of test reports on paving grade asphalt, as defined by Section 203-1.3, "Test Reports and Certification," shall be available for each shipment.

Proposed Asphalt Concrete Job Mix Formula(s) shall be determined by Calif. Test Method #367, Method for Recommending Optimum Bitumen Content (Hveem Method). Job Mix Formulas and supporting California Test Method #367 test data shall be submitted to the RDMD Materials Engineer for approval annually in January unless otherwise approved by the RDMD Materials Laboratory. In no case shall the Job Mix Formula, and its supporting test data, be more than two years old. The aggregates used for determining the proposed Job Mix Formulas shall be from the same source as will be used in actual production. Changes in aggregate source or bitumen source or viscosity grade shall not be permitted unless a pre-approved Job Mix Formula for the changed aggregate or bitumen source(s) is on file with the RDMD. Submittals of all Job Mix Formulas for approval shall be made at least 20 days prior to intended use.

As a general guideline the required gradation for Orange County asphalt concrete mix designs will be as follows:

ARTERIAL HIGHWAYS

¾" (III-B-2) Base Course
½" (III-C-2) Surface Course
¾" (III-B-3) Surface Course *

NON-ARTERIAL STREETS

¾" (III-B-3) Base Course
½" (III-C-2) Surface Course

BIKE TRAIL (OFF ROAD)

½" (III-C-3) Base and Surface Course
⅜" (III-D) Surface Course *

ASPHALT CONCRETE DIKES

3/8" (III-D-AR8000) Surface Course Mix with one percent additional binder in a mix design approved by RDMD Materials Laboratory

* Use only when required by the Engineer.

ORANGE COUNTY RESOURCES & DEVELOPMENT MANAGEMENT DEPARTMENT

Approved _____
H. L. Nakasone, Chief Engineer

Adopted: Res. 77-92 Revised: Res. 78-791; 82-718; 91-1481; 96-546; 04-095; 06-010

STD. PLAN 1805

SPECIAL PROVISIONS - ASPHALT CONCRETE

SHT. 1 OF 5

Asphalt Concrete load tickets shall clearly show the mix designation for the approved Job Mix Formula.

The gradation for the project Asphalt Concrete Job Mix Formula shall be within the specification range as set forth in Section 400-4," ASPHALT CONCRETE" and TABLE 400-4.3 (C) "TYPE III ASPHALT CONCRETE." Deviations from the approved percentage passing each applicable Job Mix Formula sieve size shall be limited to following and in no case shall the sum of the absolute values of the deviations exceed 15:

ACCEPTABLE DEVIATION FROM JOB MIX FORMULA

Sieve	Acceptable Deviation
1"	±3%
¾"	±5%
⅜"	±6%
No. 4	±6%
No. 8	±5%
No. 30	±5%
No. 200	±3%

Delete the third paragraph of Section 203.6.6.1, "General," and add the following: The binder ratio, pounds of binder per 100 pounds of dry aggregate shall not vary by more than 0.4 above or below the target binder ratio (Optimum Bitumen Content) in the approved mix design.

Asphalt Concrete suppliers shall maintain records of each aggregate and bitumen shipment received. Bitumen records shall include viscosity grade test data for AR grading. These records shall be maintained current and be readily accessible to the Engineer at the plant site upon request. The records shall include but not be limited to: aggregate or bitumen source of origin, location received and the date shipped.

The sand equivalent and Stabilometer-Value (S-Value) requirements of Section 400-4.3, "Combined Aggregates," shall be the moving average requirements. Individual test requirements for sand equivalent and S-value shall be as determined by the RDMD Materials Lab.

SECTION II. GENERAL PROVISIONS

Add to Section 302-5.1, "General," the following: The combined aggregate grading for asphalt concrete placed on miscellaneous areas shall conform to the gradation for the asphalt concrete placed on the traveled way, unless otherwise directed by the Engineer. The amount of asphalt binder used in the asphalt concrete placed in gutter, gutter flares, overside drains, and aprons at the ends of drainage structures, unless otherwise directed by the Engineer, shall be increased one percent by mass of the aggregate over the amount of asphalt binder used in the asphalt concrete placed on the traveled way.

The asphalt concrete to be place in areas which are designated on the plans as miscellaneous areas may be spread in one layer. The material shall be compacted to the required lines, grades and cross-sections.

Dikes shall be shaped and compacted with an extrusion machine or other equipment capable of shaping and compacting the material to the required cross-sections.

In advance of placing asphalt concrete dike on asphalt surfacing, the surface shall be broomed clean of all loose and extraneous material and a tack coat shall be applied.

If the finished surface of the asphalt concrete on the traffic lanes does not meet the specified surface tolerances, it shall be brought within tolerances by either: (1) abrasive grinding and grooving (followed by fog seal on the areas which have been ground), (2) placing an overlay of asphalt concrete, or (3) removal and replacement. The method shall be selected by the Engineer.

Delete Section 302-5.3, "Prime Coat," and substitute the following: When specified or required by the Engineer, a prime coat consisting of Grade SC-70 or SC-250 liquid asphalt shall be applied to the surface of the prepared base or subbase prior to placing asphalt concrete at the rate between 0.10 and 0.25 gallon per square yard.

Modify Section 302-5.4, "Tack Coat" as follows: A tack coat of SS-1h type emulsified asphalt, where stipulated on the plans and specifications or required by the Engineer, shall be applied in accordance with Section 302-5.4. Paving Asphalt may be used only when approved by the Engineer. Paving asphalt when, approved, shall be spread in accordance with previsions of Section 203-1, "Paving Asphalt."

Add to Section 302-5.5, "Distribution and Spreading." the following: Tarpaulins shall be used to cover all loads, when directed by the Engineer.

Unless otherwise permitted by the Engineer, the top layer of asphalt concrete for shoulders, tapers, transitions, road connections, private drives, curve widenings, turnouts left turn pockets and other such areas, shall not be spread before the top layer of asphalt concrete for the adjoining through lane has been spread and compacted. At locations where the number of lanes is changed, the top layer for the

through lane shall be paved first. Tracks or wheels of spreading equipment shall not be operated on the top layer of asphalt concrete in any area until final compaction has been completed or unless directed by the Engineer.

Unless otherwise specified in the approved Pavement Design Report, the top layer of asphalt concrete shall not exceed 0.20-foot in compacted thickness. Each lane of the top layer, once commenced, shall be placed without interruption.

Unless specifically provided for in the Special Provisions, bottom dumps shall not be used in the paving operation for top layer paving of asphalt concrete on arterial highways.

All screed extensions for paving machines shall be provided with a tamper, roller or other suitable compacting devices.

Unless otherwise approved by the Engineer, the paving machines shall have a suitable operational joint compacting device in place and use when placing the top layer of asphalt concrete on arterial highways.

Add to Section 302-5.6, "Rolling," the following: Three-wheeled rollers as specified in Section 302-5.6.1 "General," shall not be permitted. Pneumatic rollers shall be required on lower layers only. Pneumatic rollers may be used for intermediate rolling on finish course paving for Arterial Highways with the approval of the Engineer.

Rolling for compaction of asphalt concrete shall not be permitted after the temperature of the mat surface falls below 160°F. Intermediate rolling of the finish course paving with a pneumatic roller shall not be permitted after the temperature of the mat surface falls below 175°F.

For subdivision and permit work within the County, the final or surface layer of the asphalt concrete shall not be placed until all on-site improvements have been completed, including all grading and until all unacceptable concrete is removed and replaced at the direction of the Engineer.

All manhole, valve and vault covers shall be finished 1/4 " below finished grade.

When specified or directed by the Engineer, a fog seal of SS-1h or CSS-1h type emulsified asphalt shall be applied to the finished surface of asphalt concrete pavement at a rate of 0.05 to 0.10 gallon per square yard as determined by the Engineer. Additional water shall be added to the material and mixed therewith in such a proportion that the resulting mixture will contain not more than 50% of the added water, the exact quantity of added water shall be determined by the Engineer. The rate of application of the resulting mixture shall be that the undiluted emulsion will be spread at the specified rate. Prior to placement of the fog seal, all dirt, mud, trash, or other loose material shall be cleaned from the area to be covered. All asphalt concrete paving in local and private streets shall require a fog seal.

SECTION III. DEEP LIFT PAVING

In addition to the provisions of Sections I and II for asphalt concrete pavement, the following provisions shall be adhered to when constructing asphalt concrete pavement, deep lift section, where shown on the plans or specified by the Engineer.

Asphalt concrete base shall be spread at a temperature of not less than 230°F nor more than 300°F unless a higher temperature is ordered by the Engineer and shall be spread and compacted in layers not to exceed 0.50-foot in compacted thickness. When more than one layer of base course is required, the layers shall be of equal thickness. The following shall apply to spreading:

1. Each layer shall be spread with an approved spreading device which will deposit a uniform layer for minimum of one traffic lane width. A motor grader shall not be used as the spreading device.
2. The minimum temperature of asphalt concrete for completion of the initial breakdown compaction shall be 225°F.
3. Initial or breakdown compaction shall be performed with two-or-three-axle tandem roller with a mass of no less than 12 tons.
4. For County-funded construction contracts, the initial or breakdown rolling shall be immediately followed by a motor grader with additional material to level irregularities and provide a uniform surface for subsequent layers. Additional rolling shall proceed directly behind the motor graders with a pneumatic-tired roller while the temperature of the asphalt concrete is above 180°F.
5. For subdivision and permit work within the County, when three or more courses are required, depths of the next course shall be painted for the top two courses at intervals not to exceed 50 feet as directed by the Engineer.
6. The subsequent layers of asphalt concrete shall not be spread when the underlying layer is above 150°F.

SECTION IV. BIKE TRAIL PAVING

The amount of asphalt binder used in the asphalt concrete placed for Off Road Bike Trail Paving shall be increased one percent by mass of the aggregate over the amount of the asphalt binder used in the asphalt concrete if placed as roadway paving. • Asphalt concrete pavement for the bike trail may be placed in one lift by a self-propelled machine. All other provisions of Section I and II shall apply.

• S-Value requirements will be determined by the RDMD Materials Engineer.

SECTION V. RUBBERIZED ASPHALT GAP GRADED MIXES

Proposed Job Mix Formulas shall be established by Calif. Test Method #367, Method for Recommending Optimum Bitumen Content (Hveem Method) as set forth in SECTION I herein. Aggregate gradations, binder and rubber content shall be as generally set forth in the Standard Specifications.

ORANGE COUNTY RESOURCES & DEVELOPMENT MANAGEMENT DEPARTMENT

Approved _____
H. I. Nakasone, Chief Engineer

Adopted: Res. 77-92 Revised: Res. 78-791; 82-718; 91-1481; 96-546; 04-095; 06-010

STD. PLAN 1805

SPECIAL PROVISIONS - ASPHALT CONCRETE

SHT. 5 OF 5

SECTION I. STRUCTURAL EXCAVATION AND BACKFILL

(All references to "Standard Specifications" in these Standard Plans shall refer to the Standard Specifications for Public Works Construction (the Greenbook) unless otherwise specifically noted.)

Delete the third paragraph in Section 300-3.3, "Foundation Material Treatment" of the Standard Specifications, begining "Where the original..." and substitute the following:

Relative compaction of not less than 95% shall be obtained for embankment under bridge and retaining wall footings without pile foundations within the limits established by inclined planes sloping 1.5 Horizontal to 1 Vertical out and down from lines one foot outside the bottom edges of the footing:

Add to Section 300-3.5, "Structural Backfill," the following paragraphs:

Backfill at bridge abutments shall have a relative compaction requirement of not less than 95%

Compaction equipment or methods which may cause excessive displacement or may damage structures, such as sleeve tampers (stompers), shall not be used.

SECTION II. SUBGRADE TOLERANCES

Section 301-1.4, "Subgrade Tolerances," shall be deleted, and the following shall be added:

Subgrade for pavement, sidewalk, curb and gutter, driveways, or other roadway structures shall not vary more than 0.05 foot from the specified grade and cross section. Subgrade for subbase or base materials shall not vary more than 0.10 foot from the specified grade and cross section. Variations within the above-specified tolerances shall be compensating so that the average grade and cross-section specified are met.

ORANGE COUNTY RESOURCES & DEVELOPMENT MANAGEMENT DEPARTMENT

Approved _____
H. I. Nakasone, Chief Engineer

Adopted: Res. Revised: Res. 04-095; 06-010

STD. PLAN 1806

SPECIAL PROVISIONS - EARTHWORK

SHT. 1 OF 1

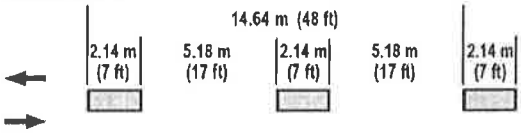
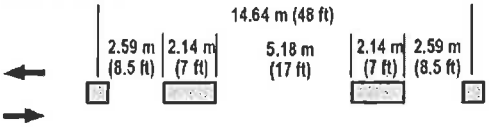
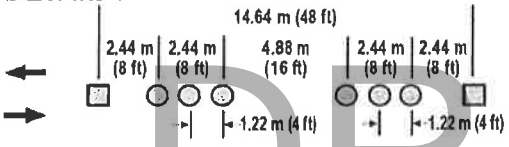
CALIFORNIA

MUTCD

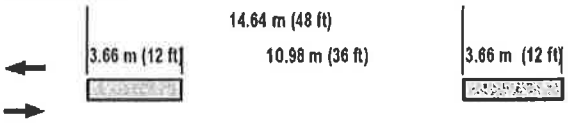
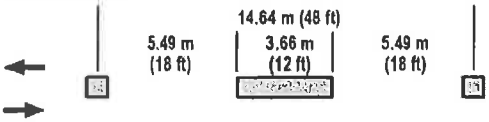
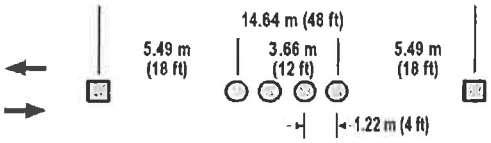
DRAFT

Figure 3A-101 (CA). Centerlines - 2 Lane Highways

FOR SPEEDS 65 km/h (40 mph) OR LESS

	POLICY
DETAIL 1 	Centerline pattern for use on two-lane streets and highways (normally used on local streets and highways).
DETAIL 2 	Centerline pattern with pavement markers for use on two-lane streets and highways.
DETAIL 3 ***(Deleted)***	
DETAIL 4 	Alternate to Detail 2. For use at problem locations where it is difficult to place and maintain centerline because of moisture, sand, etc.

FOR SPEEDS 70 km/h (45 mph) OR MORE

DETAIL 5 	Centerline pattern for use on two-lane streets and highways (normally used on local streets and highways).
DETAIL 6 	Centerline pattern with pavement markers for use on two-lane streets and highways.
DETAIL 7 	Alternate to Detail 6. For use at problem locations where it is difficult to place and maintain centerline because of moisture, sand, etc.

LEGEND

100 mm (4 in) Yellow — Two-Way Yellow Retroreflective Markers

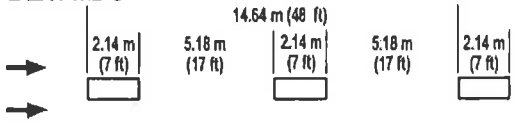
Direction of Travel — Non-Retroreflective Yellow Markers

NOT TO SCALE

Figure 3A-102 (CA). Lane Lines - Multilane Highways

FOR SPEEDS 65 km/h (40 mph) OR LESS

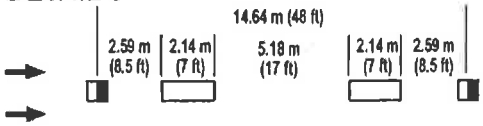
DETAIL 8



POLICY

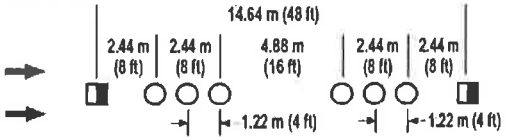
Lane Line pattern for use on multilane streets and highways (normally used on local streets and highways).

DETAIL 9



Lane Line pattern with pavement markers for use on multilane streets, highways and freeway ramps.

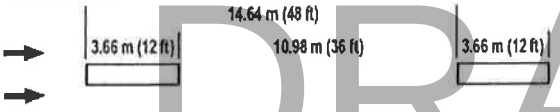
DETAIL 10



Lane Line pattern with pavement markers for use on multilane streets, highways and freeway ramps.

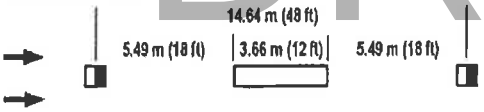
FOR SPEEDS 70 km/h (45 mph) OR MORE

DETAIL 11



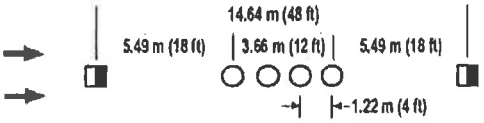
Lane Line pattern for use on multilane streets and highways (normally used on local streets and highways).

DETAIL 12



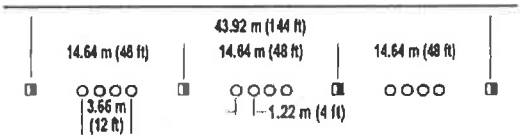
Lane Line pattern with pavement markers for use on multilane conventional streets and highways, State freeways, expressways, freeway ramps, freeway to freeway connectors and collector roads. See Detail 14A.

DETAIL 13

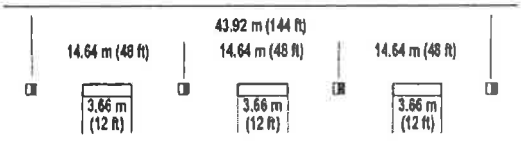


Lane Line pattern with pavement markers for use on State freeways, expressways, freeway ramps, freeway to freeway connectors and collector roads. See Detail 14.

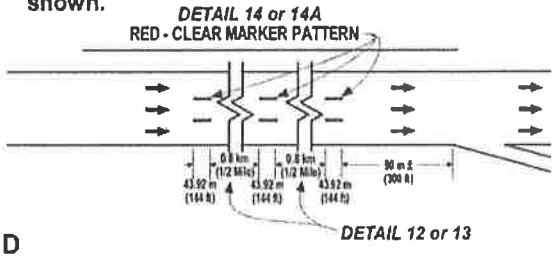
DETAIL 14



DETAIL 14A



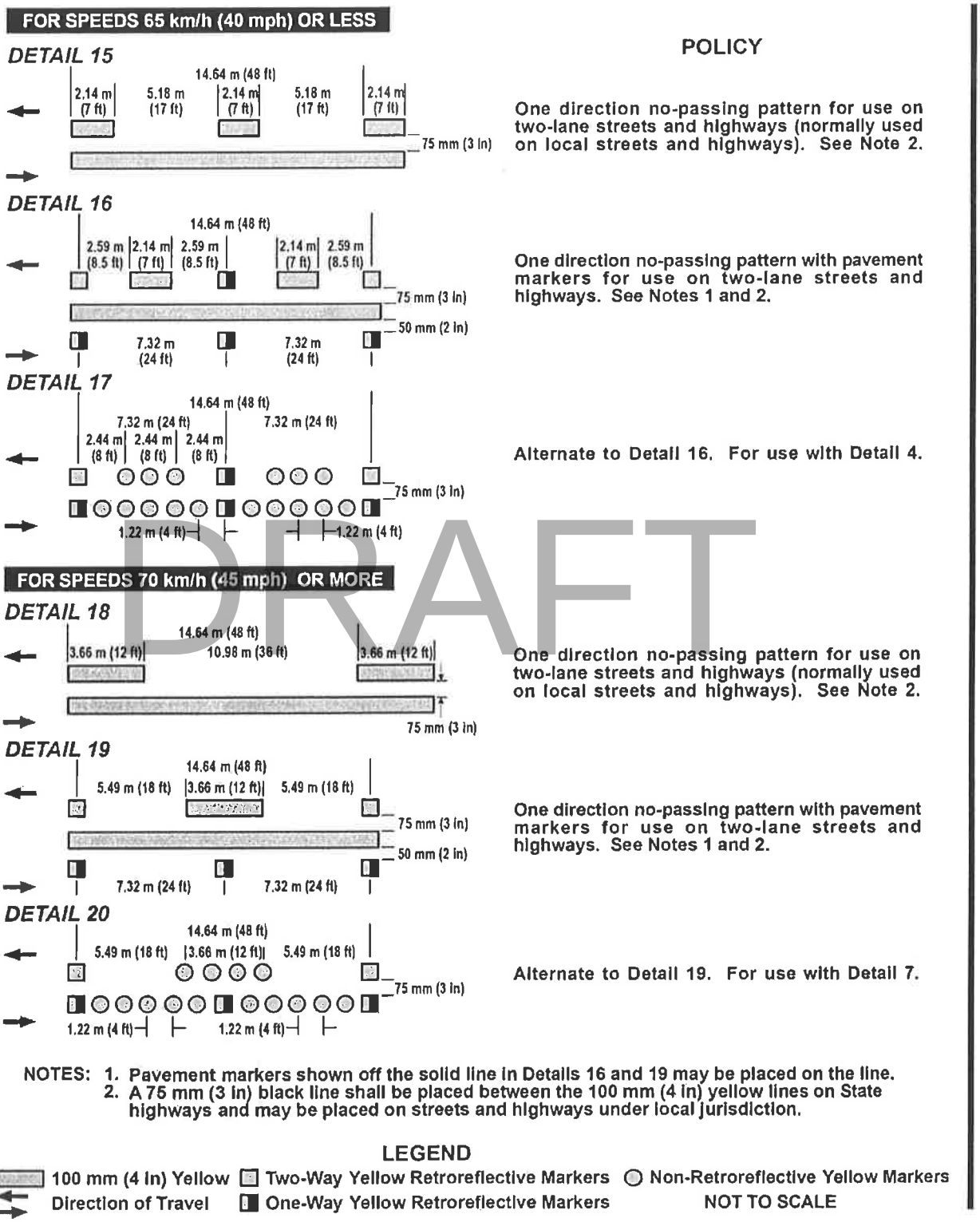
Lane Line pattern with red-clear pavement markers shall be used on freeways approaching exit ramps. Detail 14 is used with Detail 13 and Detail 14A is used with Detail 12, in a pattern of four red-clear pavement markers, at intervals as shown.



LEGEND

100 mm (4 in) White
Direction of Travel
One-Way Clear Retroreflective Markers
Red-Clear Retroreflective Markers
Non-Retroreflective White Markers
NOT TO SCALE

Figure 3A-103 (CA). No Passing Zones - One Direction



POLICY

One direction no-passing pattern for use on two-lane streets and highways (normally used on local streets and highways). See Note 2.

One direction no-passing pattern with pavement markers for use on two-lane streets and highways. See Notes 1 and 2.

Alternate to Detail 16. For use with Detail 4.

One direction no-passing pattern for use on two-lane streets and highways (normally used on local streets and highways). See Note 2.

One direction no-passing pattern with pavement markers for use on two-lane streets and highways. See Notes 1 and 2.

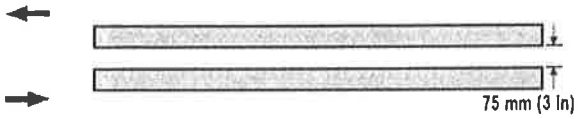
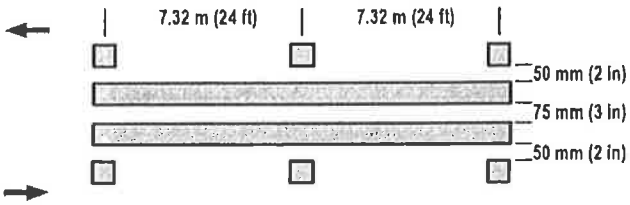
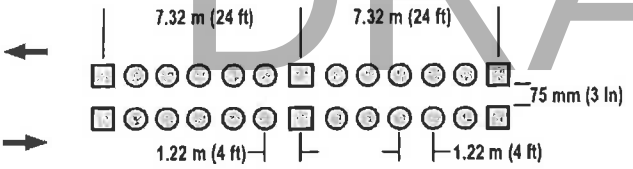
Alternate to Detail 19. For use with Detail 7.

NOTES: 1. Pavement markers shown off the solid line in Details 16 and 19 may be placed on the line.
2. A 75 mm (3 in) black line shall be placed between the 100 mm (4 in) yellow lines on State highways and may be placed on streets and highways under local jurisdiction.

LEGEND

100 mm (4 in) Yellow
Direction of Travel
Two-Way Yellow Retroreflective Markers
One-Way Yellow Retroreflective Markers
Non-Retroreflective Yellow Markers
NOT TO SCALE

Figure 3A-104 (CA). No Passing Zones - Two Direction

	POLICY
DETAIL 21 	Two-direction no-passing pattern for use on two-lane streets and highways (normally used on local streets and highways). See Note 2.
DETAIL 22 	Two-direction no-passing pattern with pavement markers for use on two-lane streets and highways. See Notes 1 and 2.
DETAIL 23 	Alternate to Detail 22. For use with either Detail 4 or Detail 7.

NOTES: 1. Pavement markers shown off the solid line in Detail 22 may be placed on the line.
2. A 75 mm (3 in) black line shall be placed between the 100 mm (4 in) yellow lines on State highways and may be placed on streets and highways under local jurisdiction.

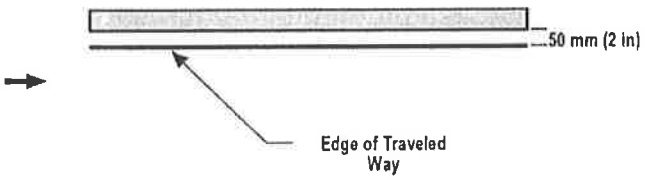
LEGEND

- 100 mm (4 in) Yellow
- Two-Way Yellow Retroreflective Markers
- Direction of Travel
- Non-Retroreflective Yellow Markers

NOT TO SCALE

Figure 3A-105 (CA). Left Edge Lines for Divided Highways

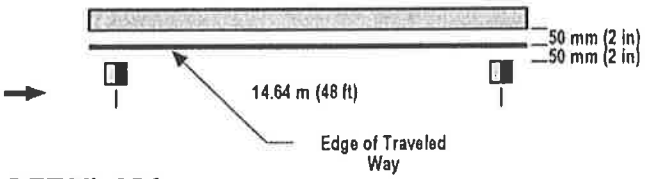
DETAIL 24



POLICY

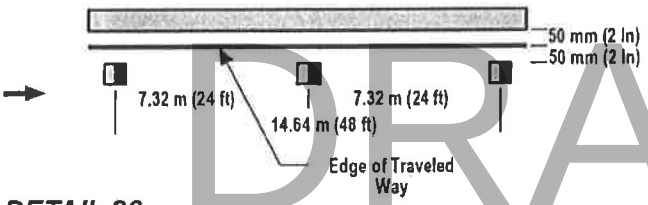
Left Edge Line pattern for use on streets and highways (normally used on local streets and highways).

DETAIL 25



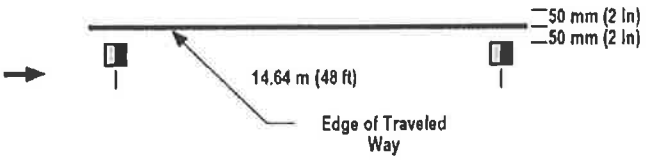
Left Edge Line for use on State highways.

DETAIL 25A



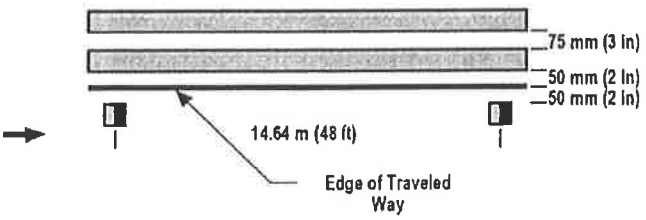
Left Edge Line for use on freeway ramps and connectors.

DETAIL 26



Alternate to Details 24 and 25 when there is adequate contrast between travelled way and shoulder.

DETAIL 27



Alternate to Detail 25. A double solid yellow line may be used for more emphasis when motorists tend to use the shoulder for a through lane, or where encroachments onto the shoulder occasionally occur. See Note 1.

NOTE: 1. A 75 mm (3 in) black line shall be placed between the 100 mm (4 in) yellow lines on State highways and may be placed on streets and highways under local jurisdiction.

LEGEND

100 mm (4 in) Yellow
One-Way Yellow Retroreflective Markers
Direction of Travel
NOT TO SCALE

Figure 3A-106 (CA). Right Edge Line and Right Edge Line Extension Through Intersections

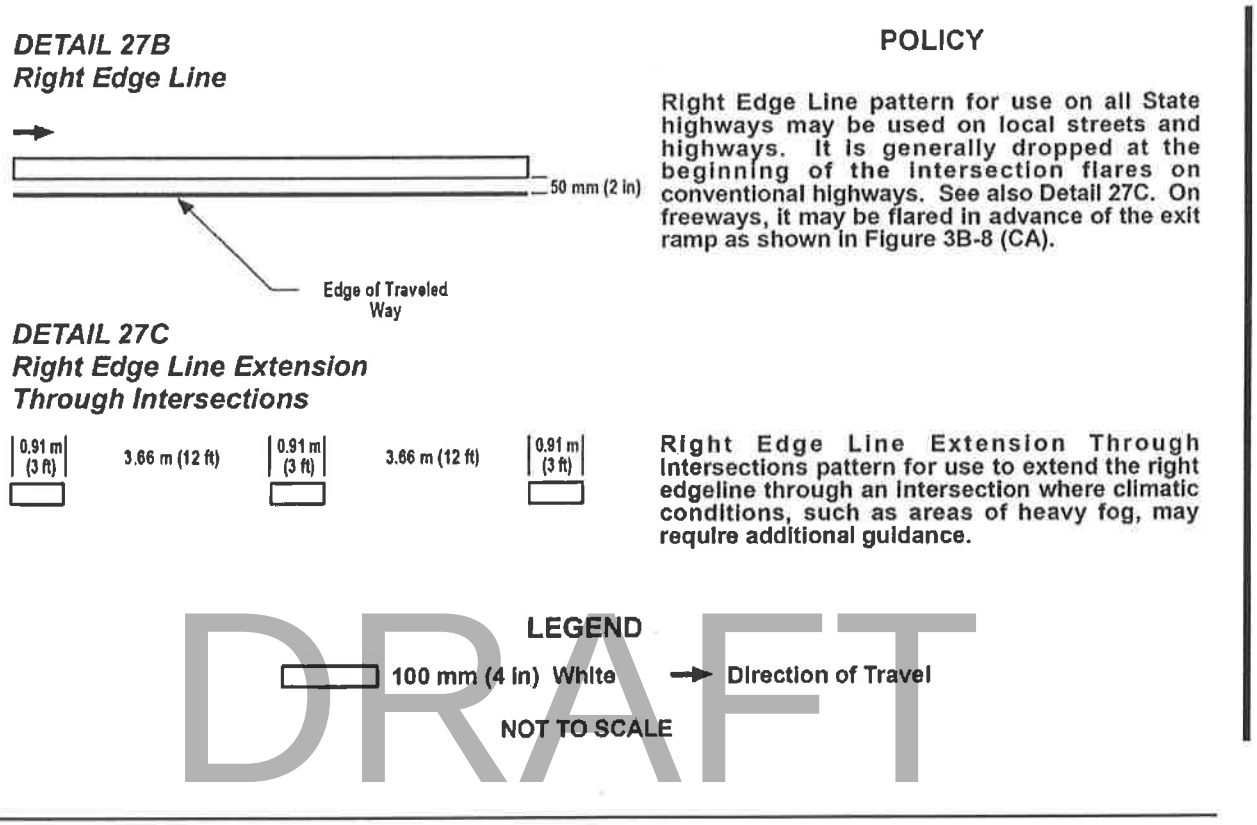


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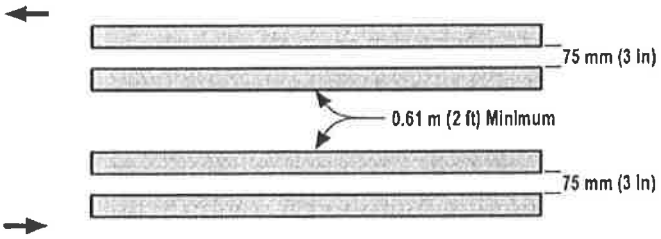
Figure 3A-107 (CA). Median Islands

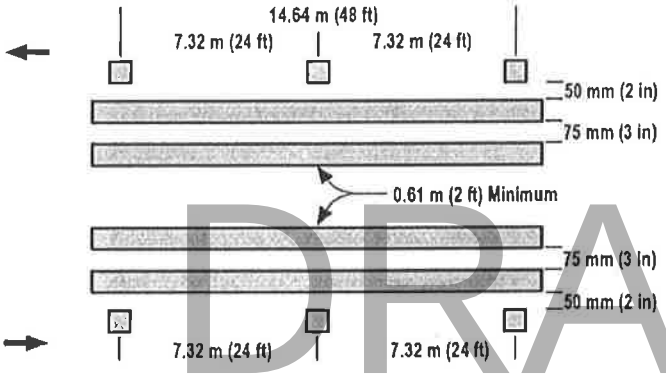
DETAIL 28



POLICY

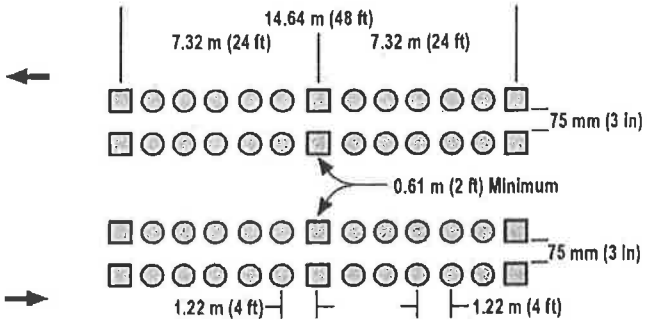
Double Left Edge Line pattern for use on all-paved sections of streets and highways (normally used on local streets and highways). See Note 2.

DETAIL 29



Double Left Edge Line pattern with pavement markers for use on all-paved sections of streets and highways. See Notes 1 and 2.

DETAIL 30



Alternate to Detail 29. For use at problem locations where it is difficult to place and maintain lines because of moisture, sand, etc.

NOTES: 1. Pavement markers shown off the solid line in Detail 29 may be placed on the line.
2. A 75 mm (3 in) black line shall be placed between the 100 mm (4 in) yellow lines on State highways and may be placed on streets and highways under local jurisdiction.

LEGEND

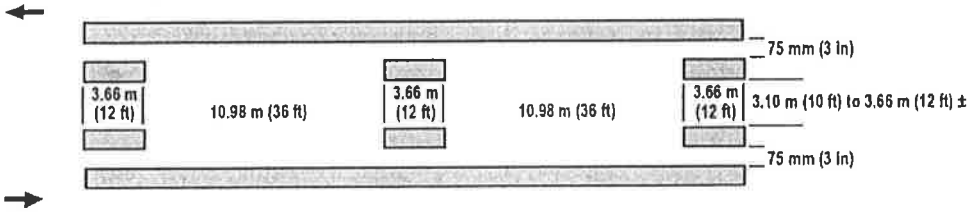
100 mm (4 in) Yellow
Direction of Travel
Two-Way Yellow Retroreflective Markers
Non-Retroreflective Yellow Markers

NOT TO SCALE

Figure 3A-108 (CA). Two-Way Left-Turn Lanes

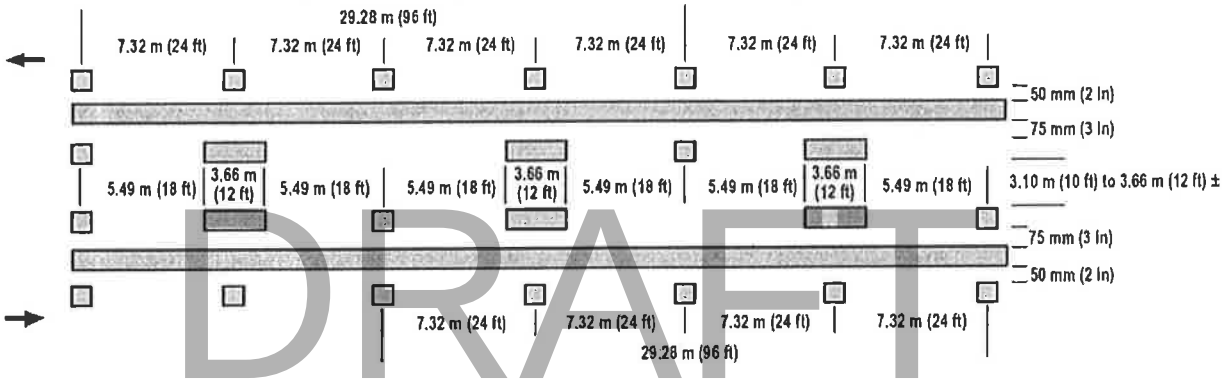
DETAIL 31 **POLICY**

Two-way left-turn lane pattern for use on streets and highways (normally used on local streets and highways). See Note 2.



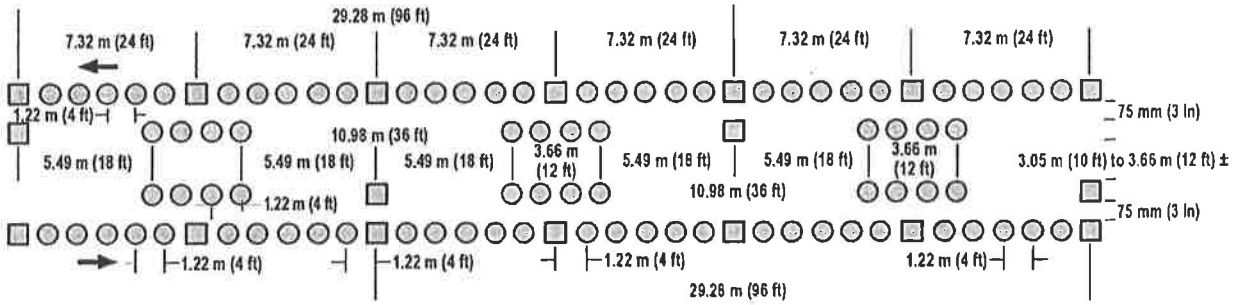
DETAIL 32 **POLICY**

Two-way left-turn lane pattern for use on streets and highways. See Note 2.



DETAIL 33 **POLICY**

Two-way left-turn lane pattern for use on streets and highways.



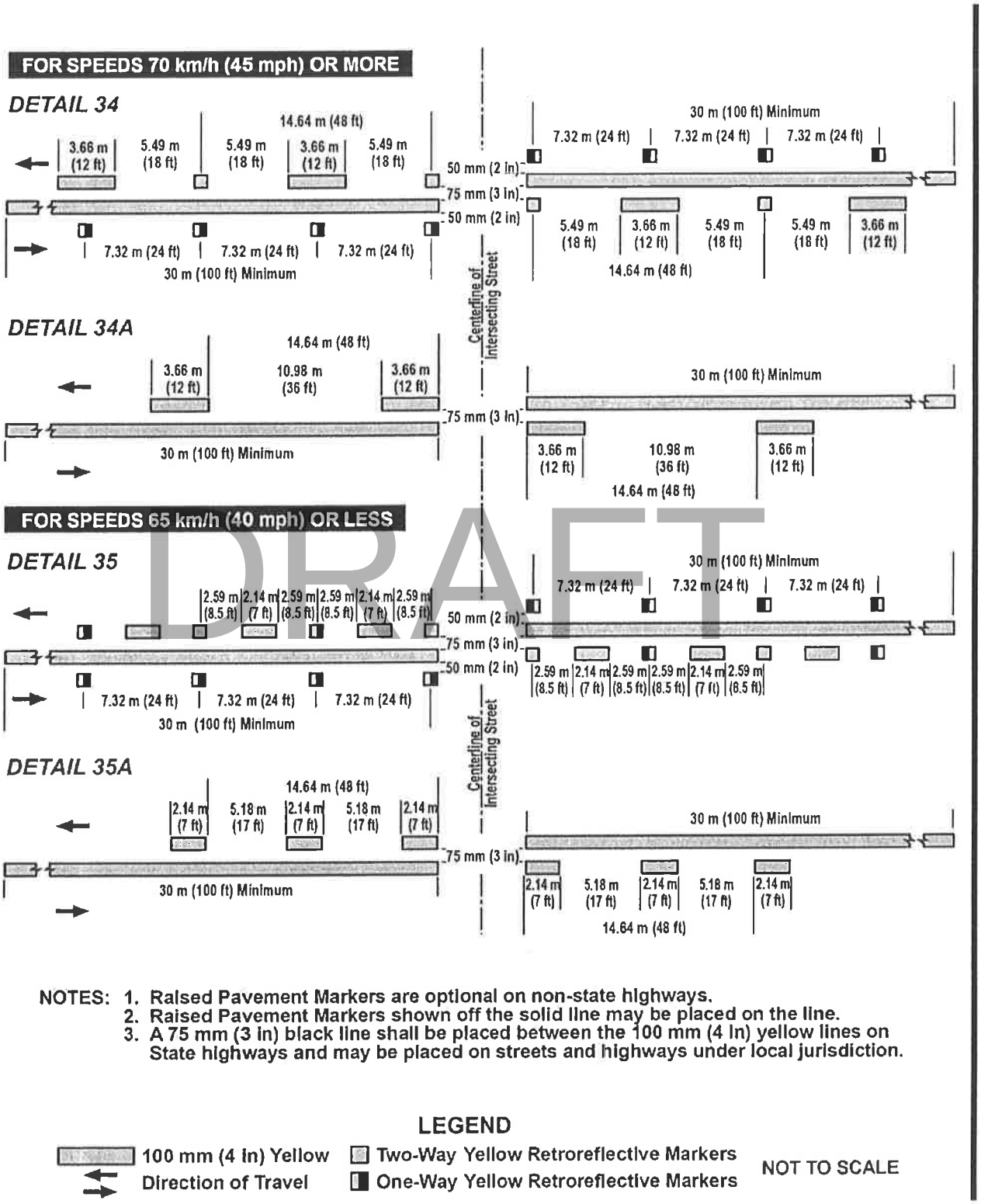
NOTES: 1. Pavement markers shown off the solid line in Detail 32 may be placed on the line.
2. A 75 mm (3 in) black line shall be placed between the 100 mm (4 in) yellow lines on State highways and may be placed on streets and highways under local jurisdiction.

LEGEND

100 mm (4 in) Yellow — Two-Way Yellow Retroreflective Markers
Direction of Travel — Non-Retroreflective Yellow Markers

NOT TO SCALE

Figure 3A-109 (CA). Intersection Markings



NOTES:
1. Raised Pavement Markers are optional on non-state highways.
2. Raised Pavement Markers shown off the solid line may be placed on the line.
3. A 75 mm (3 in) black line shall be placed between the 100 mm (4 in) yellow lines on State highways and may be placed on streets and highways under local jurisdiction.

LEGEND

100 mm (4 in) Yellow
Direction of Travel
Two-Way Yellow Retroreflective Markers
One-Way Yellow Retroreflective Markers
NOT TO SCALE

Figure 3A-110 (CA). Freeway Exit and Entrance Ramp Channelizing Line (Sheet 1 of 2)

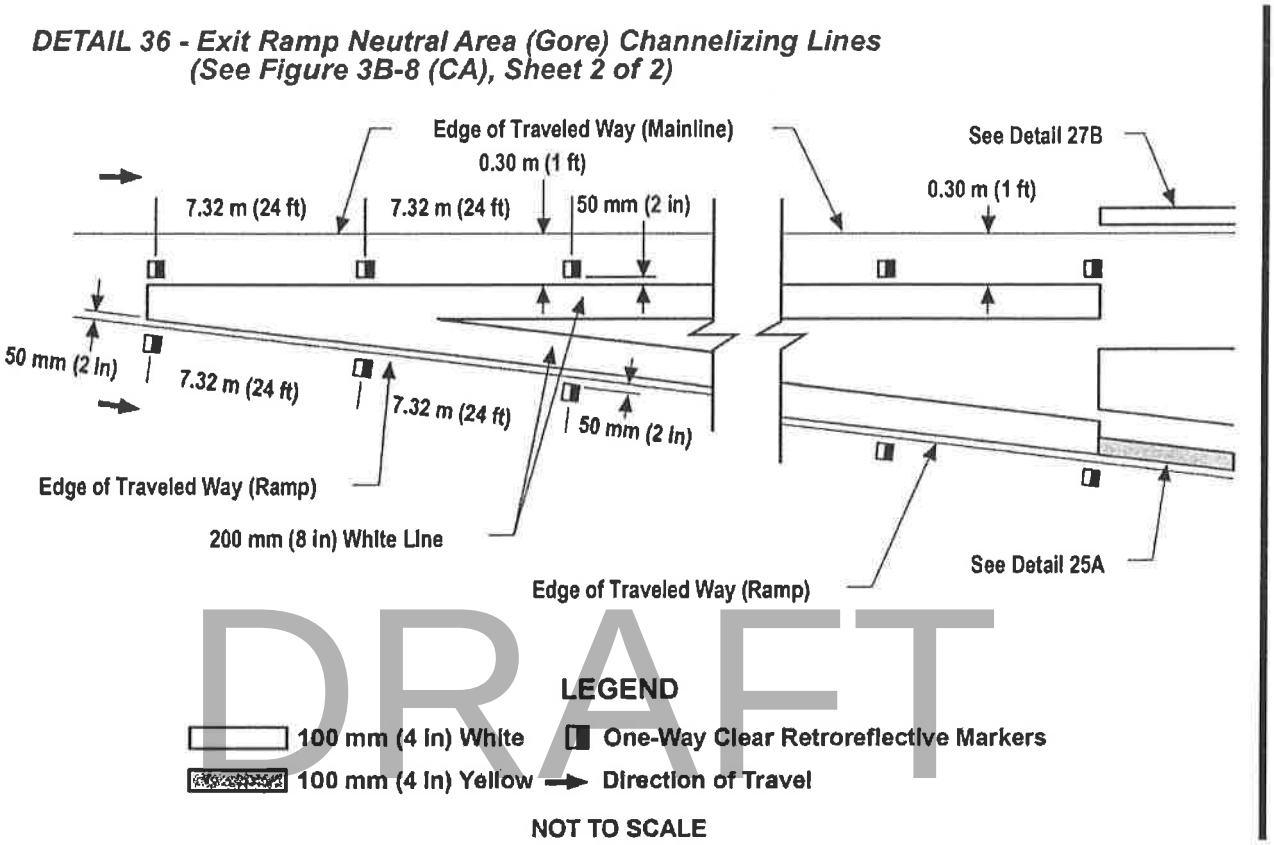


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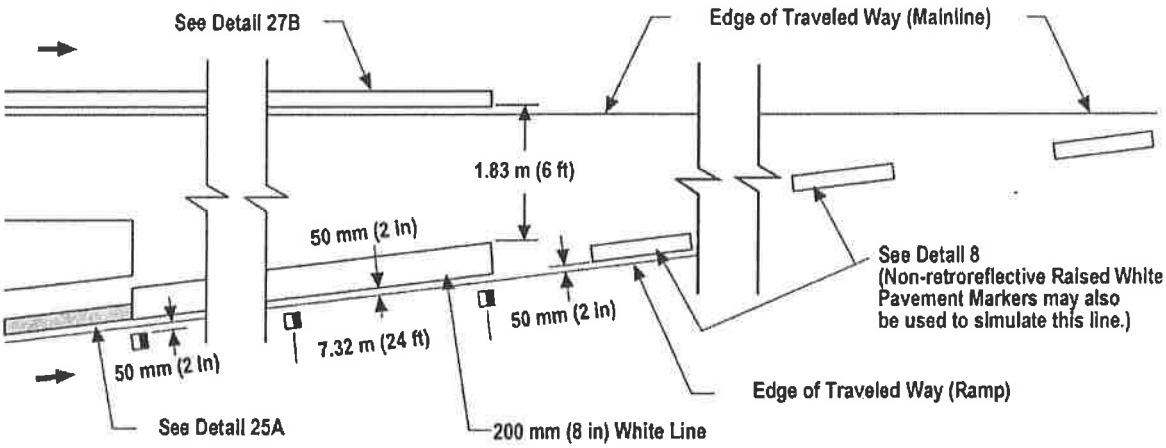
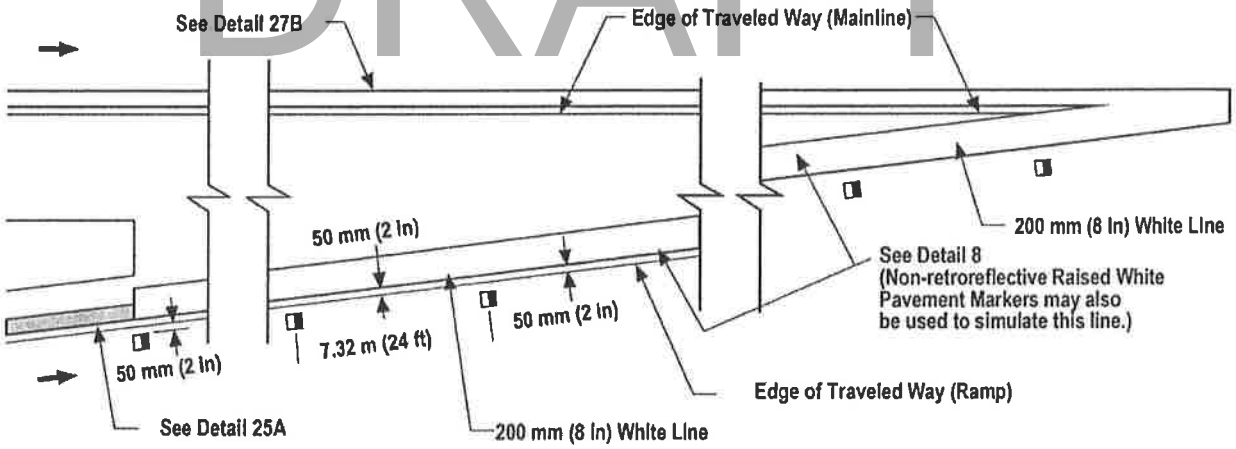
Figure 3A-110 (CA). Freeway Exit and Entrance Ramp Channelizing Lines (Sheet 2 of 2)

DETAIL 36A - Entrance Ramp Neutral Area (Merge) Channelizing Lines (See Figure 3B-9 (CA), Sheet 1 of 2)



DETAIL 36B - Entrance Ramp Neutral Area (Acceleration Lane) Channelizing Lines (See Figure 3B-8 (CA), Sheet 3 of 3)



LEGEND

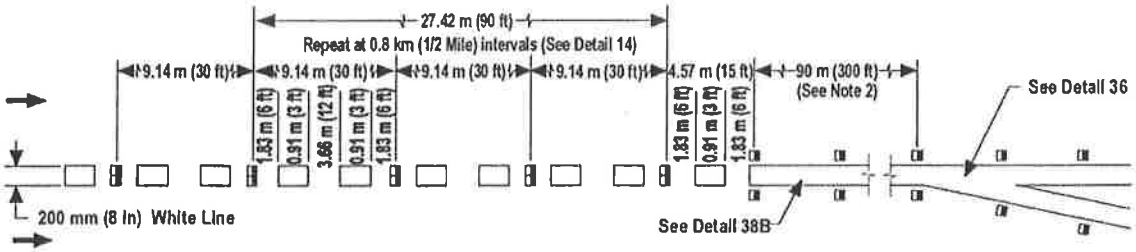
100 mm (4 in) White — One-Way Clear Retroreflective Markers
100 mm (4 in) Yellow — Direction of Travel

NOT TO SCALE

Figure 3A-111 (CA). Lane Drop Markings

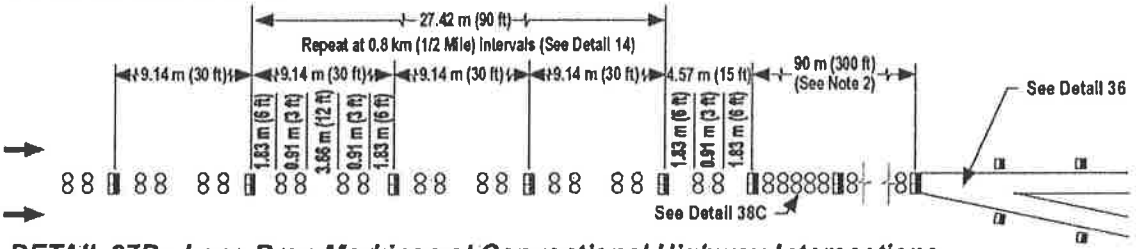
DETAIL 37 - Lane Drop Markings at Exit Ramps

Marking pattern for use on mandatory lane drops at freeway exit ramps and freeway to freeway connectors.



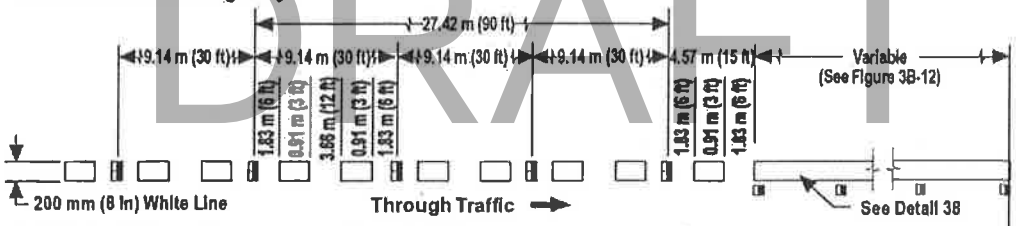
DETAIL 37A - Alternate to Detail 37

For use with Detail 10 and 13.



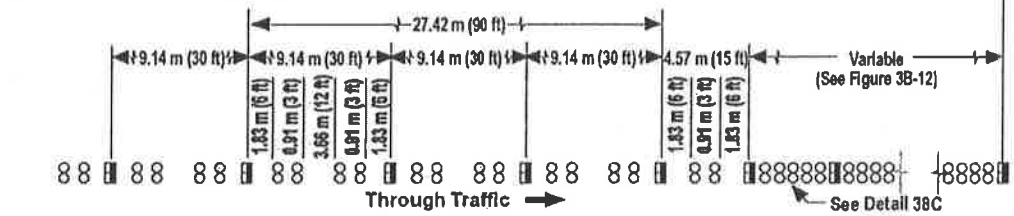
DETAIL 37B - Lane Drop Markings at Conventional Highway Intersections

Marking pattern for use on mandatory turn lanes at intersections. Pavement markers shown are optional on local streets and highways.



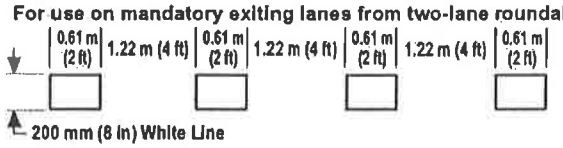
DETAIL 37C - Alternate to Detail 37B

For use with Detail 10 and 13.



DETAIL 37D - Lane Drop Line For Two-Lane Roundabouts

For use on mandatory exiting lanes from two-lane roundabouts.



NOT TO SCALE

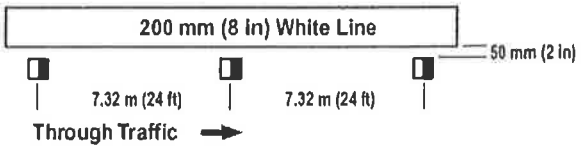
NOTES: 1. Pavement markers shown off the solid line in Detail 37 may be placed on the line.
2. The Solid Channelizing Line shown in Detail 37 and 37A may be omitted on short auxiliary lanes where weaving length is critical.

LEGEND

- Non-Retroreflective White Markers
- One-Way Clear Retroreflective Markers
- Direction of Travel
- Red-Clear Retroreflective Markers

Figure 3A-112 (CA). Channelizing Line and Lane Line/Centerline Extensions

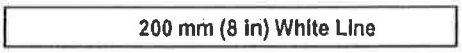
DETAIL 38 - Channelizing Line



POLICY

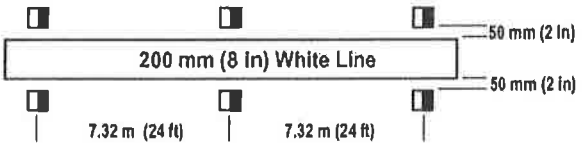
Typical channelizing line for use on Left-Turn or Right-Turn lanes on State highways. Pavement Markers when used should be place on the through traffic side only.

DETAIL 38A - Channelizing Line



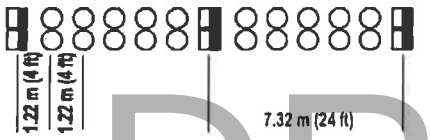
Typical channelizing line for use on Left-Turn or Right-Turn lanes on local streets and highways and freeway off-ramp terminals.

DETAIL 38B - Channelizing Line at Exit Ramps



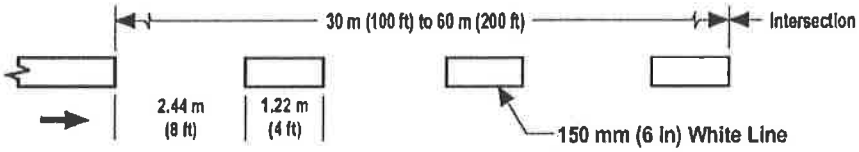
Typical channelizing line for use on Exit Ramps. Pavement Markers as shown may also be placed on the line.

DETAIL 38C - Alternate to Detail 38 and 38B



DETAIL 39 - Bike Lane Line

DETAIL 39A - Bike Lane Intersection Line

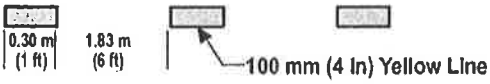


DETAIL 40 - Lane Line Extension Through Intersections

The Lane Line Extension Through Intersections line is used to extend the lane line through an intersection that might otherwise be confusing to the motorist.

DETAIL 40A - Alternate to Detail 40

DETAIL 41 - Centerline Extension Through Intersections



The Centerline Extension Through Intersections line is used to extend the centerline through an intersection that might otherwise be confusing to the motorist.

DETAIL 41A - Alternate to Detail 41

NOT TO SCALE

LEGEND

White Line
Yellow Line
Non-Retroreflective White Markers
Non-Retroreflective Yellow Markers
Direction of Travel
One-Way Clear Retroreflective Markers

ADA RETROFIT RAMP

DRAFT

SECTION 09310
Cast In Place Tactile/Detectable Warning Surface Tile

PART 1 – GENERAL

1.01 SUMMARY

A. Provide the finish work of this section where scheduled on drawings and specified herein, and as needed for a complete and proper installation.

B. Related requirements: General provisions of the Contract Documents affecting The work of this section includes, but not necessarily limited to, the general conditions and related sections of Division 1 of the project manual.

C. Related sections: Division 2, Section 02620 Concrete curbs, gutters, walks and paving.

1.02 DESCRIPTION

A. Furnish and install a cast-in place Tactile/Detectable warning tile that is replaceable without the need to demolish the concrete pavement at a later date. An approved manufacturer of this type of warning system is Answer Industries, (www.answerindustries.com) or submit alternate manufacturer to be approved as equal.

1.03 CODES AND STANDARDS

A. Americans with Disabilities Act (ADA): Provide tactile warning surfaces which Comply with the detectable warning surfaces on walking surfaces section of the ADA (Title 49 CFR TRANSPORTATION, Part 37.9 STANDARDS FOR ACCESSIBLE TRANSPORTATION FACILITIES, Appendix A, Section 4.29.2 DETECTABLE WARNINGS ON WALKING SURFACES.

B. California Code of Regulations (CCR): Provide only approved DSAAC detectable warning products as provided in the California Code of Regulations (CCR). Title 24, Part 1, Articles 2, 3, and 4 and Part 2, Section 205 definition of "Detectable Warning". Section 1127B for "Curb Ramps" and Section 1133B.8.5 for "Detectable Warning at Hazardous Vehicle Areas".

C. An approved manufacturer, whose products are fully compliant to the above referenced Standards is Answer Industries, (www.answerindustries.com) or submit other manufacturer to be approved as equal.

1.04 SUBMITTALS

A. Comply with the pertinent provisions of the General Conditions and Section 01340.

B. Product Data: Provide Manufacturer's literature describing products, installation hardware, and installation procedures.

C. Engineered drawings showing size of domes, spacing of domes, thickness of panel and any other pertinent information needed to prove product is in full compliance with documents referenced in Subsection 1.03 above.

D. Samples: Samples of each type and color required. Samples shall demonstrate hardware used that provides replacement of panel, at later date, that does not require demolition of concrete pavement. Submit (2) samples of each color with a minimum sample size of 12"x12".

E. Material Test Reports: Chart and or test reports from one or more qualified independent laboratories shall be provided. The report shall indicate that the materials proposed for use are in compliance, meeting or exceeding the stated requirements and ASTM values as shown in the Answer Industries "Physical Properties Chart" provided in this section.

F. Answer Industries Physical Properties Chart:

CHARACTERISTIC	VALUE	SPECIFICATION
COMPRESSIVE STRENGTH (PSI)	23,000	ASTM D 695
FLEXURAL STRENGTH (PSI)	24,000	ASTM D 790
WATER ABSORPTION	0.13% @ 2 WKS	ASTM D 570
SLIP RESISTANCE	> 0.80 WET/DRY	ASTM C 1028
FLAME SPREAD INDEX	15	ASTM E 84
SMOKE DEVELOPED	145	ASTM E 84
SALT SPRAY (120 HRS)	UNDETECTABLE	ASTM B 117
CHEMICAL STAIN EFFECTS	UNDETECTABLE	ASTM D 1308
ABRASION RESISTANCE	564	ASTM C 501
ACCELERATED WEATHERING	UNDETECTABLE	ASTM G 28
TENSILE STRENGTH (PSI)	12,000	ASTM D 638
ROCKWELL HARDNESS	122	ASTM D 785
FREEZE/THAW/HEAT	UNDETECTABLE	ASTM C 1028

1.05 DELIVERY

B. Tiles shall be suitably packaged or crated to prevent damage from shipment or handling. Sturdy wrappings shall protect finished surfaces and each tile shall be identified by manufacturer's name.

C. Tiles shall be delivered to location at building site for storage prior to installation.

1.06 WARRANTY

A. Tactile Tiles shall be guaranteed in writing, from the manufacturer, for a period of five (5) years from date of final completion. Guarantee shall warrant to the Owner that the tiles are free from defects in workmanship and material including deformation, breakage and delamination from the date of acceptance of the project.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Composite Tactile Tiles shall be made of a Polyester/Vinyl Ester Reinforced Compression Molded material which is colorfast and UV stable. Raised truncated domes shall have a nominal diameter of 0.9 ", a nominal height of 0.2 ", and a nominal center-to-center spacing of 1.6" to 2.4 ". They shall be in full compliance with the "ADA Regulations for Detectable Warning Tiles". Panels must continue to conform to ADAAG spacing requirements when panels are installed in a side by side manner.

B. Color: Standard color is yellow conforming to Federal Color No. 33538 and shall be homogeneous throughout the tile. Color compliance shall be achieved through the homogeneous composite material and not rely on any type of painted or coated surface to achieve color compliance. Tiles shall be available in other colors, such as black, gray and brick red to provide for the ADAAG 4.29.2 70% contrast in light reflectance between the detectable warning and adjoining surface option.

C. Dimensions: Panels shall be available in the following dimensions. Tolerances shall be in accordance with industry standards.

NOMINAL PANEL DIMENSIONS					
LENGTH & WIDTH (INCHES)	12 X 12	24 X 48	24 X 60	36 X 48	36 X 60
THICKNESS (INCLUDING NON-SLIP FEATURES)			.50		
PANEL THICKNESS			.28		
DOME HEIGHT			.20		

D. Hardware: All attachment hardware shall be shown to be corrosive resistant and stable in environmental conditions so as not to effect the attachment of the tile to the surface substrate for the warranty period.

2.02 MANUFATURERS

A. Available Manufacturers: Subject to compliance with the afore mentioned requirements in this section, manufacturers offering products that may be incorporated in this sections Work include, but are not limited to, the following:

B. Polyester/Vinyl Ester Reinforced Composite Cast-In-Place Replaceable Tactile Tile specified is based on Answer Industries "Answer -Tile Replaceable Detectable Warning Panel System". Other manufacturers of field-tested products which are subject to compliance with all afore mentioned specifications and requirements shall be submitted for approval as "Approved Equal".

C. Products shall be shown to conform to the "Buy America Act".

PART 3 – EXECUTION

3.01 INSTALLATION

A. During concrete placing and Tactile Tile installation, please be sure that all safety procedures have been reviewed and set in place in full compliance with all OSHA and industry safety standards.

B. The concrete shall be placed in full compliance with the project plans and specifications, including all state and local building codes. Special care needs to be taken to place concrete in strict compliance with ADA slope and cross flow specifications.

C. The concrete shall be supplied and placed in accordance with Section 02620 Concrete Curbs, Gutters.

D. Once the concrete has been placed and floated, in compliance with the project documents, be sure to check the slope and cross flow with an electronic level to be sure you are in compliance with the ADA codes.

E. Install the tactile tile panels per approved manufacturer's recommendations and installation instructions.

F. Following the panel placement, review all installation tolerances, check again with an electronic level, and make any necessary adjustments before the concrete begins to set.

G. Once you are satisfied that the panel placement is correct, finish concrete walks per standard finishing procedures. Be sure not to stand or lean on the panels during the finishing procedures so that the panel remains in installation location and tolerances.

H. Clean all debris and concrete laitance from the panel before the concrete can cure.

3.02 CLEANING and PROTECTION

A. Clean tiles prior to scheduled date of substantial completion inspection. Clean tactile tile per manufacturer's written recommendations.

--- End of Section ---

LED SIGNAL MODULES

DRAFT

Maintained Minimum Luminous Intensity for LED Signal Modules
Candlepower Values - Candelas (cd)

Vertical Angle Down	Horiz. Angle Left & Right	8-inch Signal			12-inch Signal		
		Red	Yellow	Green	Red	Yellow	Green
2.5°	2.5°	133	267	267	339	678	678
	7.5°	97	194	194	251	501	501
	12.5°	57	113	113	141	283	283
	17.5°	25	48	48	77	154	154
7.5°	2.5°	101	202	202	226	452	452
	7.5°	89	178	178	202	404	404
	12.5°	65	129	129	145	291	291
	17.5°	41	81	81	89	178	178
	22.5°	18	37	37	38	77	77
	27.5°	10	20	20	16	32	32
12.5°	2.5°	37	73	73	50	101	101
	7.5°	32	65	65	48	97	97
	12.5°	28	57	57	44	89	89
	17.5°	20	41	41	34	69	69
	22.5°	12	25	25	22	44	44
	27.5°	9	16	16	16	32	32
17.5°	2.5°	16	32	32	22	44	44
	7.5°	14	28	28	22	44	44
	12.5°	10	20	20	22	44	44
	17.5°	9	16	16	22	44	44
	22.5°	6	12	12	20	41	41
	27.5°	4	9	9	16	32	32

City of Westminster

TS Cabinet Specifications

TRAFFIC-ACTUATED CONTROLLER

The Contractor shall furnish and install, latest Caltrans approved McCain Model 2070 controller with BiTran 2033 Firmware Version 1.135, 8-line display, Ethernet capability, traffic signal controller assembly and all auxiliary equipment necessary to provide the intended operation, or approved equal. The Model 2070 traffic signal controller assembly shall conform to the latest Caltrans Transportation Electrical Equipment Specifications (TEES). The fourth paragraph of §86-3 of the CSS shall apply to Type 2070 traffic signal controller assemblies.

The Contractor shall provide a qualified technician from the manufacturer to assist on the day of the signal turn-on. Controller operation and preliminary timing shall be set by the field Engineer and the equipment manufacturer, subject to field adjustment instructions by the Engineer. Flasher units shall be set "red" on the intersections specified in the project.

TRAFFIC-ACTUATED CONTROLLER CABINET

The solid-state traffic-actuated controller cabinet, auxiliary equipment, and components shall conform to the provisions in Section 86-3.07, 3.08, and 3.09 of the Standard Specifications and these Special Provisions. The Contractor shall furnish McCain Model 333L Controller cabinet or approved equal. The cabinet shall meet all Caltrans and FHWA functional requirements to accommodate Caltrans approved 170 cabinet assembly. The cabinet shall also fit the foot print of the NEMA Type P cabinet.

The cabinet shall include 19” EIA rack to provide space for UPS and ITS applications, detector and preempt test switch panel, intersection display panel, communication panel, red monitoring kit, and cabinet diagnostic kit or prom.

The cabinet shall be aluminum, with standard anti-graffiti and natural color. The cabinet’s main door shall be equipped with 3 points Corbin locks and an auxiliary door equipped with lock for police key. Two keys shall be furnished for each lock. Each police key shall have a shaft at least 4.445 centimeters in length.

The cabinet shall be provided with a fluorescent lighting fixture mounted on the inside top of the cabinet near the front edge. Fixture shall be provided with a cool white lamp operated from a normal power factor UL listed ballast. An "On-Off" switch shall be operated by opening and closing the cabinet door. Machine screws used for mounting equipment on door or walls of the cabinet shall have nuts on the side. Conduit shall enter the controller cabinet at the front. All cabinet switches and auxiliary equipment shall be labeled with permanent printed or engraved labels to match the phasing on the plans.

Testing of traffic signal equipment, including controller unit, fully-wired cabinet and auxiliary equipment as specified in Section 86-3.01, "Controllers", shall be performed by a qualified testing laboratory. Charges for testing will be paid for by the Contractor. The Contractor will deliver and pick up the equipment from the testing laboratory.

In the event traffic signal equipment submitted for testing does not comply with specifications, the Contractor shall remove said equipment for repair within five (5) working days after notification that the equipment is rejected. In the event the equipment is not removed within said period, it may be shipped to the Contractor at its expense.

The period of time between notification of the Contractor of equipment noncompliance until the corrected equipment is returned to the test site and the required retesting period shall not be considered part of the testing period. All testing subsequent to rejection of the equipment for failure to comply with specification requirements will be at the expense of the Contractor. Deductions to cover the cost of such testing will be made from any monies due or which may become due the Contractor under this contract.

Switches shall be provided in the common keyed outer panel of the cabinet to accomplish the following functions by police, civil defense, and other personnel authorized to have a common key:

a. Signal power on/off

b. Signal conversion to flashing

With the signal flash switch in the "flashing" position, the controller unit shall remain energized.

After installing the new controller cabinet, the Contractor shall complete all new connections in the controller cabinet to provide fully operational traffic signal system per the Engineer’s direction and as shown on construction plans.

VEHICLE DETECTION

Video Detection System

The Contractor shall furnish and install Iteris Vantage Edge 2 Vehicle Detection Processors with RZ-4 Advanced Wide Dynamic Range COLOR cameras and Vantage Lens Adjustment Module with carrying case (type of case to be selected by the Engineer). All cablings and all appurtenances complete for all approaches to the intersection shall be included.

General

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

1. System Hardware

The video detection system shall consist of up to six COLOR video cameras, a video detection processor (VDP) capable of processing from one to six video sources and a pointing device; including poles, mounts, brackets and sun shields for eliminating glare.

2. System Software

The system shall include software that detects vehicles in multiple lanes using only the video image. Detection zones shall be defined using only an on board video menu and a pointing device to place the zones on a video image. Up to 144 detection zones shall be available. A separate computer shall not be required to program the detection zones.

Functional Capabilities

1. The VDP shall process video from up to 6 video sources simultaneously. The sources can be video cameras or S-VHS video tape players. The video shall be input to the VDP in RS170 format and shall be digitized and analyzed in real time. A separate microprocessor for each video input shall be used.

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

3. Detection zones shall be programmed via an on board menu displayed on a video monitor and a pointing device connected to the VDP. The menu shall facilitate placement of detection zones and setting of zone parameters or to view system parameters. A separate computer shall not be required for programming detection zones or to view system operation.

4. The VDP shall store up to three different detection zone patterns. The VDP can switch to any one of three different detection patterns within one (1) second of user request via menu selection with the pointing device.

5. The VDP shall detect vehicles in real time as they travel across each detection zone.

6. The VDP shall have an RS232 port for communications with an external computer. The VDP RS232 port shall be multi-drop capable.

7. The VDP shall accept new detection patterns from an external computer through the RS-232 port when the external computer uses the correct communications protocol for downloading detection patterns. A Windows™-based software designed for local or remote connection and providing video capture, real-time detection indication and detection zone modification capability shall be provided with the system.

8. The VDP shall send its detection patterns to an external computer through the RS-232 port when requested when the external computer uses the correct communications protocol for uploading detection patterns.

9. The camera system shall be able to transmit an NTSC video signal, with minimal signal degradation, up to 1,000 (one thousand) feet under ideal conditions.

10. The associated VDP shall default to a safe condition, such as a constant call on each active detection channel, in the event of unacceptable interference with the video signal.

11. The system shall be capable of automatically detecting a low-visibility condition such as fog and respond by placing all defined detection zones in a constant call mode. A user-selected output shall be active during the low-visibility condition that can be used to modify the controller operation if connected to the appropriate controller input modifier(s). The system shall automatically revert to normal detection mode when the low-visibility condition no longer exists.

Vehicle Detection

1. Up to 144 detection zones shall be supported and each detection zone can be sized to suit the site and the desired vehicle detection region.

2. Detection zones shall be capable of being OR'ed or AND'ed together to indicate vehicle presence on a single detector output channel.

3. Placement of detection zones shall be done by using only a pointing device, and a graphical interface built into the VDP and displayed on a video monitor, to draw the detection zones on the video image from each video camera. No separate computer shall be required to program the detection zones.

4. Up to three (3) detection zone patterns shall be saved for each camera within the VDP memory and this memory shall prevent loss during power outages.

5. The selection of the detection zone pattern for current use shall be done through a menu. It shall be possible to activate a detection zone pattern from VDP memory and have that detection zone pattern available within one (1) second of activation.

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

7. Detection shall be at least 98% accurate in good weather conditions, with slight degradation possible under adverse weather conditions (e.g. rain, snow, or fog) which reduce visibility. Detection accuracy is dependent upon camera placement, camera quality and detection zone location, and these accuracy levels do not include allowances for occlusion or poor video due to camera location or quality.

8. The VDP shall provide 32 channels of detection outputs through either a NEMA TS1 port or a NEMA TS2 port.

9. The VDP shall provide dynamic zone reconfiguration (DZR). DZR enables normal operation of existing detection zones when one zone is being added or modified during the setup process. The VDP shall output a constant call on any detector channel corresponding to a zone being modified.

10. Detection zones shall be directional to reduce false detections from objects traveling in directions other than the desired direction of travel in the detection area.

11. Detection zone setup shall not require site specific information such as latitude and

longitude to be entered into the system.

12. Detection zone setup shall not require temporal information such as date and time.

13. The VDP shall process the video input from each camera using a separate microprocessor at thirty (30) frames per second.

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

15. Detection zone outputs shall be configurable to allow the selection of presence, pulse, extend, and delay outputs. Timing parameters of pulse, extend, and delay outputs shall be user definable between 0.1 to 25.0 seconds.

16. Up to six detection zones per camera view shall have the capability to count the number of vehicles detected. The count value shall be internally stored for later retrieval through the RS-232 port. The data collection interval shall be user definable in periods of 5, 15, 30 or 60 minutes.

VDP Hardware

1. The VDP shall be housed in a durable metal enclosure suitable for shelf mounting or 19" rack mounting in a roadside traffic equipment cabinet. The VDP enclosure shall not exceed 7" height, 17.75" width, and 10.5" depth. The VDP shall be modular in construction with plug in field replaceable units (FRU's) to minimize trouble-shooting and repair time.

2. The VDP shall operate satisfactorily in a temperature range from -34 °C to +74 °C and a humidity range from 0%RH to 95%RH, non-condensing as set forth in NEMA specifications.

3. The VDP shall be powered by 120 VAC 60 Hz single-phase power. Surge ratings shall be as set forth in NEMA specifications. Power consumption shall not exceed 135 watts.

4. The VDP shall include an RS232 port for serial communications with a remote computer. The VDP RS232 port shall be multi-drop capable. This port shall be a 9-pin "D" subminiature connector on the front of the VDP.

5. The VDP shall include ports for transmitting TS1 and TS2 detections to a traffic controller. The TS1 port shall be a 37-pin "D" connector on the front of the VDP. The TS2 port shall be a 15-pin "D" connector on the front of the VDP.

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

7. The front of the VDP shall include one BNC video output. Any one of the six video inputs shall be switch selectable for output on this BNC connection via the pointing device at the VDP, momentary push-button switch, or through software and a personal computer connected through the RS-232 multi-drop port via a full duplex modem link.

8. The video inputs to the VDP shall include transient voltage suppression and isolation. Amplification that shall assure the 1-volt peak to peak video signal integrity is maintained despite video cabling losses and externally induced transients. The amplifier shall have a minimum common mode rejection at 60 Hz of 90 dB.

9. The VDP enclosure shall include provisions to be bonded to a good earth ground.

10. The front face of the VDP shall contain indications, such as LED displays, to enable the user to view real time detections for up to eight (8) detector output channels at a time.

11. The VDP shall consist of functional modular field replaceable units (FRU's) to facilitate maintenance and expandability. Each camera video input shall be processed of a separate higher performance RISC processor.

12. Software upgrades shall not require replacement of EPROMS or other integrated circuits. Setup and programming data shall be retained in FLASH memory. Upgrades may be accomplished locally or remotely over appropriate communications means from a standard computer.

13. A seven (7) inch or higher handheld monitor and cables for local communication shall be provided with the system. The monitor shall include all necessary capabilities to aim the cameras to establish detection zones and shall include a carrying case.

Video Detection Camera

(Not applicable for this order)

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

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

3. The camera shall use a CCD sensing element and shall output monochrome video with resolution of not less than 380 lines vertical and 380 lines horizontal.

4. The camera shall include an electronic shutter control based upon average scene luminance and shall be equipped with a factory adjusted manual iris.

5. The camera shall include a variable focal length lens with variable focus that can be

adjusted, without opening up the camera housing, to suit the site geometry by means of a portable interface device designed for that purpose and manufactured by the detection system supplier. The horizontal field of view shall be adjustable from 8.1 to 45.9 degrees. A single camera configuration shall be used for all approaches in order to minimize the setup time and spares required by the user.

6. The camera electronics shall include AGC to produce a satisfactory image at night.

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

8. The camera enclosure shall be equipped with a sun shield or lens hood. The sun shield shall include a provision for water diversion to prevent water from flowing in the camera's field of view. The camera enclosure with sun shield shall be less than six (6) inches diameter, less than fifteen (15) inches long, and shall weigh less than six (6) pounds when the camera and lens are mounted inside the enclosure.

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

10. When mounted outdoors in the enclosure, the camera shall operate satisfactorily in a temperature range from -34 °C to +60 °C and a humidity range from 0% RH to 100% RH.

11. The camera shall be powered by 120-240 VAC 50/60 Hz. Power consumption shall be 15 watts or less under all conditions.

12. Recommended camera placement height shall be thirty-three (33) feet (or ten [10] meters) above the roadway, and over the traveled way on which vehicles are to be detected. For optimum detection the camera should be centered above the traveled roadway. The camera shall view approaching vehicles at a distance not to exceed 350 feet for reliable detection (height to distance ratio of 10:100). Camera placement and field of view (FOV) shall be unobstructed and as noted in the installation documentation provided by the supplier.

13. It is the Contractor and manufacturer’s responsibility to mount the camera in a manner that ensures full functionality of the system. Verification on the traffic signal pole schedule is required. No not assume that the camera units will be mounted on traffic signal poles with luminare arms. In the absence of luminare arms, mast arm mounting will be necessary. The material shall be provided by the Contractor, at no additional expense to the City. The installation details are to be provided by the manufacturer.

14. The camera enclosure shall be equipped with separate, weather-tight connections for power and setup video cables at the rear of the enclosure. These connections may also allow diagnostic testing and viewing of video at the camera while the camera is installed on a mast arm or pole using a lens adjustment module (LAM) supplied by the

VDP supplier. Video and power shall not be connected within the same connector.

15. The video signal output by the camera shall be black and white in RS170 or CCIR format.

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

EdgeConnect Remote Communications Module

The EdgeConnect quad-view remote communications module shall provide both local and remote management of data and video over Ethernet, enabling system operators to manage their video detection systems by allowing the user to view real-time video.

The Contractor shall provide one (1) EdgeConnect quad-view remote communications module.

Standard features include:

1. MPEG4/H.264 video compression
2. Plugs into any standard detector rack that provides 12 or 24 volts of DC
3. Accommodates up to four video source inputs
4. Accommodates up to four expansion devices
5. 10/100 Base-T Ethernet Port
6. Web browser set up and support
7. USB and trackball mouse support
8. EIA-232 Serial communications port
9. High intensity LED status indicators

Rack Mount LCD Monitor Drawer

The rack mount LCD monitor shall install into traffic cabinet providing rapid or permanent access to a monitor for viewing and configuration purposes. It shall fold flat when not in use and be hinged to allow optimum viewing. The drawer shall be lockable to prevent unauthorized access. The monitor shall be capable of supporting computer resolutions up to 1280 x 1024 pixels as well as displaying video signals meeting NTSC or PAL composite video and S-video standards.

Installation

1. The coaxial cable to be used between the camera and the VDP in the traffic cabinet

shall be Belden 8281 or a 75 ohm, precision video cable with 20 gauge solid bare copper conductor (9.9 ohms/M), solid polyethylene insulating dielectric, 98% (min) tinned copper double-braided shield and black polyethylene outer covering. The signal attenuation shall not exceed 0.78 dB per 100 feet at 10 MHz. Nominal outside diameter is 0.304 inches. The coax cable shall be a continuous unbroken run from the camera to the VDP. This cable shall be suitable for installation in conduit or overhead with appropriate span wire. 75-ohm BNC plug connectors should be used at both the Camera and Cabinet ends. The coaxial cable, BNC connector, and crimping tool shall be approved by the supplier of the video detection system, and the manufacturer's instructions must be followed to ensure proper connection.

2. The power cabling shall be 16 AWG three conductor cable. The cabling shall comply with the National Electric Code, as well as local electrical codes. Cameras may acquire power from the luminaire if approved by the engineer.

3. The Contractor shall be responsible for contacting the video detection equipment supplier to arrange a mutually acceptable schedule for a certified technician to be on-site to set up the final camera field of view. The Contractor shall provide support for the video technician until the technician certifies that final camera placement is acceptable.

4. After component installation, the Contractor shall contact the video detection system supplier to arrange the setup of the video system for operation. The video detection system shall be set up for operation by supplier factory certified installers.

Limited Warranty

1. The supplier shall provide a limited two-year warranty on the video detection system. See suppliers standard warranty included in the Terms and Conditions of Sale documentation.

2. During the warranty period, technical support shall be available from the supplier via telephone within four (4) hours of the time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers.

3. During the warranty period, updates to VDP software shall be available from the supplier without charge.

Maintenance and Support

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

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

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

4. All product documentation shall be written in the English language.

BATTERY BACKUP SYSTEM

The battery backup system shall be manufactured by Sensata Technologies; the system shall be the Caltrans approved Dimensions Model #24M11-WBE (24VDC, 1100 Watts) or approved equal. The following specification and requirements is for a complete emergency battery backup system for use with Light Emitting Diode (LED) Traffic Signal Modules. The Battery Backup System (BBS) shall include, but not be limited to the following: Inverter/Charger, batteries, combination power transfer relay and manual bypass switch and all necessary hardware and interconnect wiring. The BBS shall provide reliable emergency power to a traffic signal system (Vehicle and Pedestrian Traffic) in the event of a power failure or interruption.

The BBS shall be capable of providing power for full run-time operation for an "LED-only" intersection (all colors: red, yellow, green and pedestrian heads), an intersection with only yellow and/or pedestrian incandescent bulbs or flashing mode operation for an intersection using Red LED's.

The battery backup system shall be designed for outdoor applications, in accordance with the Caltrans Transportation Electrical Equipment Specifications (TEES), dated August 16, 2002, Chapter 1, Section 8 requirements.

Furnish and install battery backup system equipped with Ethernet port, battery system and battery harness complete in place at the intersection of **Magnolia Street and Bolsa Avenue.**

Data transmission between the TMC and the battery backup system locations will be done via the existing Ethernet System.

The data shall be transmitted from the battery backup system to the Ethernet switch located in the traffic signal controller cabinet, to the Gigabit Ethernet switch at the communication hub for transmission to the Westminster TMC.

The battery backup systems equipped with Ethernet ports will be furnished by the Contractor, including the battery system, and battery harness. The Contractor shall install the battery backup systems and furnish and install all battery backup cabling, wiring and connections for operation of the battery backup systems, per the direction of the Engineer and as shown on the manufacturer's specifications, including all incidental accessories necessary to make the battery backup systems complete, fully functional, and ready for operation, even if not particularly specified. Such incidentals shall be furnished, delivered and installed by the Contractor without additional expense to the Engineer or the City. Minor details not usually shown or specified, but necessary for the proper installation and operation of the battery backup system shall be included. It is understood and agreed by the Contractor that the system description provided herein is

complete and includes all equipment necessary for the proper functioning of the battery backup systems, even though every item may not be specifically mentioned.

General Requirements

1. All components of the battery backup system, including the batteries, battery harness and external cabinets will be furnished by the manufacturer of the battery backup system.

2. Contractor shall furnish and install integrated battery backup and Ethernet cables at each installation.

3. Contractor shall furnish and install all other related items as specified in these special provisions, and as directed by Engineer or vendor representative.

4. Contactor shall furnish and install all necessary miscellaneous equipment and cabling to make the battery backup systems operational.

5. All equipment and materials used shall be standard components, regularly manufactured, and regularly utilized in the manufacturer's system.

6. All Systems and components shall have been thoroughly tested and proven in actual use.

7. Equipment used shall be identical at each field location and shall be completely interchangeable.

8. The data management system at TMC shall be furnished by the battery backup system vendor. Complete set up and integration of the data management system shall be by the vendor. Contractor shall coordinate with the manufacturer for support set-up and integration of battery backup systems as directed by Engineer.

Operation

1. **Compatibility**
BBS shall be compatible with NEMA, Caltrans Model 332A Cabinets, McCain 333JP Cabinets, Model 170E Controllers, Model 2070 Controllers and cabinet components for full time operation.

2. **Run-Time**
The BBS shall provide a minimum two (2) hours of full run-time operation for an "LED-only" intersection (minimum 700W/1000VA active output capacity, with 80% minimum inverter efficiency).

3. **Output Capacity**
The BBS shall be able to provide a minimum of 1100W @ +25ºC, continuous active output capacity, with 80% minimum inverter efficiency while running in Backup Mode (on batteries).

4. **Output Voltage**
When utilizing battery power, the BBS output voltage shall be between 110 VAC and 125 VAC, pure sine wave output, ≤ 3% THD, 60Hz ± 0.05Hz.

5. **DC System Voltage**
The BBS DC system voltage shall be 24 VDC.

6. **Transfer Time**
The maximum transfer time allowed, from disruption of normal utility line voltage to stabilized inverter line voltage from batteries shall be 40 milliseconds. The same maximum allowable transfer time shall also apply when switching from inverter line voltage to utility line voltage.

7. **Operating Temperature**
Operating temperature for the inverter/charger, and power transfer relay and manual bypass switch shall be –40 °C to +74 °C.

8. **AC Feedback**
BBS shall be equipped to prevent a malfunction feedback to the cabinet or from feeding back to the utility service.

9. **Surge Protection**
The BBS shall have lightning surge protection compliant with IEEE/ANSI C.62.41.

10. **Power & Control Connections**
The BBS shall be easily replaced by having easily removable AC input and output cables. The DC input connection shall be a one piece Anderson type connector. The external transfer relay control and battery temperature compensation cables shall be a quick release connector. The AC, DC, external transfer relay, and battery temperature compensation cables shall be removable without the use of a screwdriver.

11. **AC Connection**
The AC input and output shall be separate panel mounted plug receptacles that allow no possibility of accidental exposure to dangerous voltages (male receptacle for AC Input and female receptacle for AC Output). The receptacles shall utilize some form of locking mechanism or hold down clamps in order to prevent accidental disconnects.

12. **DC Connection**
The DC connection shall be a recessed one piece Red Anderson style receptacle.

13. **Relay / Temperature Probe Connection**
The external power transfer relay control and battery temperature sense inputs shall be heavy duty panel mounted connectors. The temperature probe must have a lug for attaching the sensor to the battery.

14. **General Connections**

All connections shall provide mechanically and electrically secure connections without the use of a screwdriver. The only exception will be the 18-position Relay Terminal Block which shall require a small screwdriver for holding down the relay wires.

15. **Unit Failure**
In the event of inverter/charger failure, battery failure or complete battery discharge, the power transfer relay shall revert to the NC (and de-energized) state, where utility line power is connected to the cabinet.

16. **Overload**
The Battery Backup System must be able to shutdown to protect against internal damage in the event of an overload at its output.

Functionality, Display and Controls

1. **Standby Type System**
There shall be two, user adjustable transfer point set types if the user wanted to use the BBS as a "Standby" type system instead of the default "Buck/Boost or Line Interactive" type system. The user will be able to select either "Normal" or "Generator" transfer points. The user will be able to set the low and the high cutoff transfer points which are adjustable between 89 and 135 AC volts. The BBS will automatically apply the 5 volt difference for the return transfer points.

a. If the BBS is configured to use these adjustable transfer points, the BBS shall bypass the utility line power whenever the utility line voltage is outside of the set transfer points (± 2VAC).

b. In cases of low (below the set low cutoff point) or absent utility line power, when the utility line power has been restored at or above 5 VAC ± 2 VAC of the set low cutoff point for more than 30 seconds (or the user configured line qualify time), the BBS shall transfer from battery backed inverter mode back to utility line mode.

c. In cases of high (above the set high cutoff point) utility line power, when the utility line power has been restored at or below 5 VAC ± 2 VAC of the set high cutoff point for more than 30 seconds (or the user configured line qualify time), the BBS shall transfer from battery backed inverter mode back to utility line mode.

2. **Buck/Boost or Line Interactive Type System**
The BBS shall be line interactive by default, and have a Buck/Boost function or mode of operation. The Buck/Boost shall have a range of 80-160Vac. There are not to be any user configurable transfer point settings for the Buck/Boost function. With Buck/Boost selected as the sense type, the output to the signal system will be regulated to voltages between 102-130 Vac.

3. **Buck/Boost Counter and Run Time**
There will be a Buck and Boost event counter and run time meter accessible through the LCD and Ethernet. Buck and Boost events will be recorded separately from each other. The counter and run time meter will show the cumulated information since the last reset.

4. **Line Qualify Time**
The BBS will have an adjustable line qualify time. The range will be from 1 to 60 seconds, in 1 second increments. The factory default setting will be 30 seconds.

5. **LCD Display**
The BBS shall have a 4 line by 20 character backlit Blue Negative LCD display. The main screen shall indicate information regarding; transfer points, transfer point type, time of day status, utility input voltage, charger on/off status, battery percent of charge, battery voltage, BBS Mode, a scrolling line of text (which automatically lists any faults, alarms and relay status information), inverter event counter and run time meter. The run time meter shall indicate run time in hours and minutes. The display shall be temperature compensated and have a user selectable contrast adjustment by pressing "Enter" at the main screen.

6. **Keypad**
The BBS shall have a 4-way navigational keypad so that the user can navigate the menu system by using "↑", "↓", "←", "→", "Enter", and "Esc" keys. There shall also be an "Inv" key to turn the inverter on or off.

7. **Status LED's**
The BBS shall have three status LED's.

a. Green LED "Output" – This is to be on any time the BBS is providing output for either backup, buck, or boost modes.

b. Red LED "Fault" – This is to be on any time there are any faults in the system.

c. Yellow LED "Alarm" – This is to be on anytime there are alarms on the system.

8. **Charger**
The BBS shall have an integral charger. The charger shall be a 4 step charger (zero-volt start, bulk, accept, and float).

a. The charger shall have the capability of providing the charge current required by the battery up to 20 amps DC.

b. The user shall be able to select either "gel" or "AGM" type batteries. The default setting is for AGM.

c. The BBS shall use a temperature-compensated battery charging system. The charging system shall compensate over a range of 2.5 – 4.0 mV/ °C per cell.

d. The temperature sensor shall be external to the inverter/charger unit. The temperature sensor shall come with 2 meters (6'6") of wire and have a lug at the end for termination to the negative post of a battery for the best temperature measurement.

e. Batteries shall not be recharged when battery temperature exceeds 50 °C ± 3 °C.

f. Recharge time for the battery, from “protective low-cutoff” to 80% or more of full battery charge capacity, shall not exceed ten (10) hours.

9. **Backup Counter and Run Time**
The BBS shall include a front-panel event counter display to indicate the number of times the BBS was in Backup, Buck, and Boost modes; and a front-panel hour meter to display the total number of hours and/or minutes the unit has operated in those modes since last reset. The run time shall be displayed in HHH:MM format. All meters shall be re-settable. The information displayed shall be cumulative since last reset.

10. **Event Log**
There shall be an event log that is 256 lines in length. Data shall be recorded in a FIFO format so that the oldest record is purged as the newest is entered. The event log shall date and time stamp all events. Each event that is recorded will also show the current operating mode of the BBS (Standby, Backup, Buck, and Boost).

11. **Dry Relay Contacts**
The BBS shall provide the user with 6 programmable dry relay contacts. These dry relay contacts shall be rated for 3 amps @ 125 VAC. Each relay can be programmed to trigger by more than one condition simultaneously. If any relay is energized, it will show up on the main screen of the LCD, Ethernet web browser, and the RS-232 menu. The programming options are as follows:

- On Battery
- Low Battery
- Timer
- Time of Day
- Alarm
- Fault
- BBS Failure
- Off

The relay contact terminal blocks shall conform to On-Shore Technology, type ED2200/22, or Phoenix Contact type FRONT 2,5-H/SA 5, or WECO type 180-A-111, or equivalent. The spacing between each terminal shall be 0.197” (5mm), with the hold-down screw and wire entrance both on the same face, facing forward and in the horizontal axis.

12. **Timer Relay Contacts**
The BBS shall have a timer that will energize the dry contact relays (that are configured for “Timer”) after the user configured time has elapsed. This timer is started when the

BBS is in Backup mode. The user can configure the timer from 0 to 480 minutes, in 1 minute increments. The factory default setting is at 120 minutes.

13. **Low Battery Relay Contacts**
The BBS shall have an adjustable low battery relay setting. This setting shall be adjustable so that the user can set the point at which the low battery relay energizes. This setting applies to any dry contact relay that is configured for “Low Battery”. This setting is adjustable from 0 to 100% of remaining usable battery capacity in 5% increments. This setting must be in percent. The factory default setting is 40%.

14. **Battery Voltage Test Points**
The BBS shall include a LCD display to indicate battery voltage and standard meter probe input jacks (+) and (-) to read the battery voltage externally.

15. **Circuit Breakers**
The BBS shall be equipped with Input and Output AC circuit breakers. The BBS shall also have a DC input circuit breaker.

16. **Time of Day Program**
The BBS shall be equipped with a Time Of Day (TOD) program. The user can set the beginning and the end time of the TOD program. The user can also “Enable” and “Disable” the program. Operation is such that if the program is enabled and the BBS goes to Backup mode, the TOD program will energize any dry contact relays that are programmed for TOD. If the BBS is still in Backup mode and the TOD program has expired, any relay that was energized by the TOD program will de-energize when the TOD program expires.

17. **Keypad Password Protection**
The BBS Configuration and System menus (on LCD) shall be password protected with a 6 digit alphanumeric password. The password feature can be disabled by the user in the System menu. This feature by default is disabled.

18. **Web Browser Password Protection**
The web browser shall be password protected and require a user ID and a password. This feature by default is disabled.

19. **Bypass Switch**
The manual bypass switch module and power transfer relay shall be rated at 240VAC/30 amps.

Communications

1. User Configuration, System, and Status Menus
All BBS Configuration, System, and Status menus shall be accessible and programmable from the RS-232 port and from the Ethernet port. Additionally, all log files shall be available through these ports.

2. **RS-232**
The BBS shall have RS-232 communications. The communications port shall be an EIA-232 (DB9-Female) connector.

a. The data transmission rate shall be user adjustable between 300 and 115200 baud.

3. **Ethernet**
The BBS shall have an Ethernet port as standard. The Ethernet port shall be an RJ45, EIA 568B pin out type connector. The data rate shall be 100mbps.

4. The BBS shall have an embedded web server.

5. The Ethernet port shall have user configurable IP, subnet mask, and gateway.

6. **Web Pages**

- On Battery

- Shall have a header area that shows location, date, time, firmware version, BBS Mode, quick status updates of alarms, faults and relay status. This header is to be on every web page.

- Shall have a Configuration page that allows for configuration of; sense type, transfer points (normal and generator), line qualify time, Time of Day program, self test, low battery relay in percent, timer relay, and dry relay contacts.

- Shall have a Status page that shows the current settings of; sense type, transfer points, line qualify time, Time of Day program, self test, and dry relay contacts.

- Shall have a System page to configure; location, date, time, password, user ID, IP address, sub-net mask, and gateway address.

- Shall have an email page to configure which events trigger an email. It also shall allow input of up to 6 email addresses.

- Shall have a 256 line event log (FIFO). The event log shall be able to be printed from the web browser. The event log shall be able to be saved as an HTML file. The event log shall also be able to be copied and pasted into an excel spreadsheet.

Battery System

1. Individual batteries shall be:

- On Battery

- Voltage rating: 12V type

- AGM/VRLA

- Batteries shall be easily replaced and commercially available off the shelf.

2. Batteries used for BBS shall consist of 2 to 8 batteries to run the loads for the specified time, and a maximum system voltage of 24 VDC to comply with NEC Class 2 Voltage.

3. Batteries shall be deep cycle, sealed prismatic lead-calcium based AGM/VRLA (Absorbed Glass Mat/ Valve Regulated Lead Acid).

4. Batteries shall be certified by the manufacturer to operate over a temperature range of – 40 °C to +60 °C.

5. The batteries shall be provided with appropriate interconnect wiring and corrosion-resistant mounting trays and/or brackets appropriate for the cabinet into which they will be installed.

Battery Harness

1. Interconnect wiring shall be via two-piece modular harness consisting of 8 gauge welding style cable, UL listed, super K90.

2. Cable assembly shall be equipped with insulated, mating, power pole style connectors. Where two-piece power pole style connectors are used Positive (+) shall be red, Negative (-) shall be black.

3. All power pole connectors shall be assembled to ensure proper polarity and circuit configuration throughout the entire harness.

4. Part one of the two-piece harness shall consist of seven inches of appropriate colored cable with ¼ inch ring terminals for connecting to the battery terminal and the appropriate colored modular power pole style connector.

5. Battery terminals shall be covered and insulated with appropriate colored molded boots.

6. Part two of the harness shall consist of mating two-piece power pole style connectors for connecting to the batteries and a single insulated power pole connector for connecting to the BBS unit.

7. Cable length shall be a minimum of 12 inches between batteries and 60 inches between BBS unit and first battery.

Mounting Inside Traffic Signal Cabinet

NOTE: All references made to EIA rail or EIA 19” (482.6mm) rack shall conform to Electronic Industries Standards EIA-310-B, Racks, Panels, and Associated Equipment, with 10-32 “Universal Spacing” threaded holes.

1. Mounting method shall be rack-mount. Front or rear mounted available rack space is 3U or approximately 6 inches.

2. The Power transfer relay and manual bypass switch shall be mounted on the EIA rail or the cabinet shelf.

3. All necessary hardware for mounting (shelf angles, rack, etc) shall be included in the bid price of the BBS. Bolts/fasteners and washers shall meet the following requirements:

- Screw Type: Pan Head Phillips Machine Screw
- Size and Thread Pitch: 10-32
- Material: 18-8 stainless steel (Type 316 stainless steel is acceptable as an alternate).
- Washer: Use one flat washer (18-8 stainless steel) under the head of each 10-32 screw (provided that the screws are properly tightened, lock washers are unnecessary).

4. All interconnect wiring shall be provided between power transfer relay and bypass switch and cabinet terminal service block and shall be no less than 2 meters of UL Style 1015 CSA TEW with the following characteristics:

- AWG Rating: 10 AWG
- Stranding: 105 strands of 30 AWG tinned copper
- Rating: 600 V, 105 °C, PVC Insulation

5. Relay contact wiring provided for each set of NO/NC relay contact closure terminals shall be 3 meters of UL Style 1015 CSA TEW 18 AWG wire, same ratings as above, except 16 strands of 30 AWG tinned copper.

Quality Assurance

1. Each BBS shall be manufactured by an ISO 9001:2000 certified company in accordance with a manufacturer Quality Assurance (QA) program.

2. QA process and test results documentation shall be kept on file for a minimum period of seven years.

3. Each system shall be visually inspected for any exterior physical damage or assembly anomalies. Any defects shall be cause for rejection.

Warranty

1. Manufacturers shall provide a five (5) year warranty for the complete battery backup system. The first three years will be with the Advanced Replacement Program. Under the Advanced Replacement Program, the manufacturer will send out a replacement unit within two business days of the call notifying them of an issue. The manufacturer will send out either a new unit or a re-manufactured unit that is fully tested and is up to the latest revision. The manufacturer is responsible for all shipping charges to the customer. The last two years of the warranty will be factory-repair warranty for parts and labor on the BBS.

2. Batteries shall be warranted for full replacement for two (2) years after the project notice of completion at no cost to the City.

3. The external cabinet shall be warranted by the manufacturer against mechanical defects for two (2) years after the project notice of completion at no cost to the City.

4. The warranty shall be included in the total bid price of the BBS.

Wiring Requirements

All wiring shall meet the requirements of the national electric code. All wires shall be cut to proper length before assembly. No wire shall be doubled-back to take up slack. Wires shall be neatly laced into cable with nylon lacing or plastic straps. Cables shall be secured with clamps. Service loops shall be provided at all connections.

Design Requirements

The battery backup system equipment shall be modular in design to allow major portions to be readily replaced. Modules and assemblies shall be clearly identified with name, model number, serial number and any other pertinent information required to facilitate equipment maintenance.

Fail Safe Provision

The equipment shall be designed such that the failures of the equipment shall not cause the failure of any other unit of equipment.

ETHERNET INTERSECTION SWITCH

General

The Contractor shall furnish and install Ethernet Intersection Switch as a requirement of the Contractor for the field installation said Ethernet Intersection Switch per the plans, and necessary connections for a fully operational system.

The Contractor shall be responsible for all incidental accessories necessary to make said Ethernet Intersection Switch complete and ready for operation, even if not particularly specified. Such incidentals shall be furnished, delivered and installed by the Contractor without additional expense to the City. Minor details not usually shown or specified, but necessary for the proper installation and operation of the System, shall be

included in the work and in the Contractor's price bid. It is understood and agreed by the Contractor that the description provided herein is complete and includes all equipment necessary for the proper functioning of the Ethernet Intersection Switch, even though every item may not be specifically mentioned.

Summary of Work

The following summary of work is an overall description of the work to be included for said Ethernet Intersection Switch and does not necessarily include every item of work. The Switch shall be furnished complete, installed, tested, and operational when connected with associated equipment. The Contractor shall supply and install items that meet or exceed the specified requirements.

1. Install **Contractor-Furnished** hardened Ethernet Intersection Switch, **Contractor-Furnished** power supply and its associated equipment and peripherals at locations as shown on the Plans, the approved list of equipment, Submittal, and these Special Provisions. Furnish and install 19-inch rack-mounted power strip at Type 333 cabinets, and wall mounted power strip at NEMA cabinets, for hardware installed by Contractor.

2. The Ethernet Intersection Switch will be configured by the manufacturer for installation by Contractor. The Contractor will be responsible for the integration of Gigabit and Ethernet Switch equipment, including the assignment of IP ports. Contractor shall install **Contractor-Furnished** Ethernet Intersection Switch hardware and support integration and set up as directed by Engineer.

3. The Contractor shall submit within twenty one (21) calendar days from Notice to Proceed, documents showing the Contractor's understanding of the design and list of equipment and materials proposed for the System to the Engineer for review and approval. Approval of the understanding document and equipment submittal is required prior to ordering and installation of any equipment or materials for the System.

4. The Contractor shall perform tests after completing the installation, as specified in these Special Provisions, to show the System is properly installed and operational, and that it meets the specification and applicable codes.

5. The Contractor shall provide warranty documentation and operations and maintenance manuals as specified in these Special Provisions.

6. All network cables shall be CAT-6 cables.

Features

- Environmentally hardened for direct deployment in difficult unconditioned out-of-plant and roadside installations
- Tested and certified by an independent laboratory for full compliance with the environmental requirements (ambient operating temperature, mechanical shock, vibration, humidity with condensation, high-line/low-line voltage conditions and transient voltage protection) of NEMA TS-1/TS-2 and CALTRANS Traffic Signal Control Equipment Specifications

- Compliant with EN60950-1 and UL Class 1, Division 2, Groups A, B, C and D for Hazardous Locations
- Extended ambient operating temperature range: -40˚ C to +75˚ C (Functional to 85ºC)
- 10/100 BASE-TX and 100/1000 BASE-FX compatible
- Flexible optics configuration via SFP plug-in modules
- DIN rail or wall mountable mounted
- Redundant power supply compatibility reduces possibility of single-point-of-failure for highest possible reliability
- Fully configurable through web-based or SNMP network management
- IGMP Snooping V1/V2 for multicast filtering and IGMP Query V1/V2
- Port based VLAN (IEEE 802.1Q)
- Rapid Spanning Tree protocol (IEEE 802.1W)
- Power Supply Included
- Lifetime Warranty

Applications

- ITS Traffic Signalization & Surveillance/Incident Detection Networks
- Industrial and Factory Automation
- Integrated IP-Video and Data Transmission Networks
- Industrial Security Access Control Systems

Benifits

- System Interface/Performance:
  - RJ45 port support Auto MDI/MDI-X function
  - SFP supports 100/1000 Dual Mode
  - Store-and-Forward Switching Architecture
  - Back-plane (Switching Fabric): 7.4Gbps
  - 1Mbits Packet Buffer
  - 8K MAC Address Table
  - Wide operating temperature (-40˚C - 75˚C)
- Power Supply
  - Wide-range Redundant Power Design
  - Power Polarity Reverse Protect
  - Overload Current Protection
- VLAN
  - Port Based VLAN
  - Support 802.1 Q Tag VLAN
  - GVRP
- Port Trunk with LACP
- QoS (Quality of Service)
  - Support IEEE 802.1p Class of Service
  - Per port provides 4 priority queues
  - Port Base, Tag Base and Type of Service Priority
- Port Mirror: Monitor traffic in switched networks

  - TX packet only
  - RX packet only
  - Both TX and RX packet
- Security
  - Port Security: MAC address entries/filter
  - IP Security: IP address security management to prevent unauthorized intruder
  - Login Security: IEEE802.1X/RADIUS
  - HTTPS SSH (V1, V2)/SSL 128 Bit Encryption
- IGMP
  - Query mode for Multi Media Application
  - Support multicast filter
- Case/Installation
  - IP-30 Protection
  - DIN Rail and Wall Mount Design
- Spanning Tree
  - Support IEEE802.1d Spanning Tree
  - Support IEEE802.1w Rapid Spanning Tree
- X-Ring
  - X-Ring, Dual Homing, Couple Ring and Dual Ring Topology
  - Provide redundant backup feature and the recovery time below 20ms
- Support IEEE802.1ab LLDP
- Bandwidth Control
  - Support Rate-based and Priority-based rate limiting
  - Broadcast/Multicast Packet Filter Control
- System Event Log
  - System Log Server/Client
  - SMTP e-mail Alert
  - Relay Alarm Output System Events
- SNMP Trap
  - Device cold start
  - Power status
  - Authentication failure
  - X-Ring topology changed
  - Port Link Up/ Link Down
- TFTP Firmware Update and System Configure Restore and Backup
- Supports 6000 VDC Ethernet ESD protection
- Supports DIDO function
- Provides EFT protection 3000 VDC for power line
- Standard Compliance
  - IEEE802.3 10Base-T Ethernet
  - IEEE802.3u 100Base-TX/100
  - IEEE802.3ab 1000Base-T
  - IEEE802.3z Gigabit fiber
  - IEEE802.3x Flow Control and Back Pressure
  - IEEE802.3ad Port trunk with LACP
  - IEEE802.1d Spanning Tree/ IEEE802.1w Rapid Spanning Tree
  - IEEE802.1p Class of Service
  - IEEE802.1q VLAN Tag

- IEEE802.1x User Authentication (Radius)
- IEEE802.1ab LLDP

Software Features

- Management SNMP v1, v2c, v3/ Web/Telnet/CLI/NS-View Management
- SNMP MIB RFC 1215 Trap, RFC 1213 MIBII, RFC 1157 SNMP MIB, RFC 1493 Bridge MIB, RFC 2674 VLAN MIB, RFC 1643, RFC 1757, RSTP MIB, Private MIB
- VLAN Port Based VLAN IEEE802.1Q Tag VLAN (256 entries)/ VLAN ID (UP to 4K, can be assigned from 1 to 4096) GVRP (256 Groups)
- Port Trunk w/ LACP LACP Port Trunk: 4 Trunk groups/ Maximum 4 Trunk members
- LLDP Support LLDP to allow switch to advise its identification and capability on the LAN
- Spanning Tree Support IEEE802.1w Rapid Spanning Tree
- X-Ring Support X-Ring, Dual Homing and Couple Ring Technology. Provide redundant backup feature and the recovery time below 20ms.
- Quality of Service The quality of service determined by port, Tag and IPv4 Type of Service, IPv4 Different Service
- Class of Service Support IEEE802.1p class of service, per port provides 4 priority queues
- Port Security Support 1000 entries of MAC address for static MAC and another 100 for MAC filter
- Port Mirror Support 3 mirroring types: RX, TX and Both packet
- IGMP Support IGMP snooping v1, v2; 256 multicast groups and IGMP query
- IP Security Supports 10 IP addresses that have permission to access the switch management and to prevent unauthorized intruder.
- Login Security Support IEEE802.1X Authentication/RADIUS
- Bandwidth Control Support ingress packet filter and egress packet limit. The egress rate control all of the packet types and the limit rates are 100K-250Mbps. Ingress filter packet type combination rules are Broadcast/Multicast/Unknown Unicast packet, Broadcast/ Multicast packet, Broadcast packet only and all of packet. The packet filter rate can be set from 100K-250Mbps.
- Flow Control Support Flow Control for Full-duplex and Back Pressure from Half-duplex
- System Log Support System log record and remote system log server
- SMTP Support SMTP Server and 6 e-mail accounts for receiving event alert
- Relay Alarm Provides one relay output for port breakdown, power fail. Alarm Relay current carry ability: 1A @ DC24V
- DIDO
  - DO: When disconnection of the specific port was detected, DO will activate the signal LED to alarm.
  - DI: Integrate critical sensors: 2 groups of digital inputs. DI can integrate the sensors into the auto alarm system and transfer the alarm information to IP network with email and SNMP.
- SNMP Trap Up to 3 Trap stations. Cold start, Port link up, Port link down, Authentication Failure, Private Trap for power status, Port Alarm configuration, Fault alarm, X-Ring topology change.

- DHCP Provide DHCP Client/ DHCP Server and IP Relay
- DNS Provide DNS client feature and support Primary and Secondary DNS server
- SNTP Support SNTP to synchronize system clock in Internet
- Firmware Update, configuration backup and restore Support TFTP firmware update, system configure backup and restore
- If Alias Each port allows importing 128 bit of alphabetic string of words on SNMP and CLI interface.

Hardware Specifications

- Switch Architecture Back-plane (Switching Fabric): 7.4Gbps Packet throughput ability (Full Duplex): 11 Mpps @64bytes
- Transfer Rate 14,880pps for Ethernet port 148,800pps for Fast Ethernet port 1,488,000pps for Gigabit Fiber Ethernet port
- Packet Buffer 1Mbits
- Mac Address 8K MAC address table
- Flash ROM 4Mbytes
- DRAM 32Mbytes
- Connector1 10/100TX: 7 × RJ45 10/100/1000T/Mini-GBIC Combo: 3 × RJ45 + 3 × 100/1000 SFP sockets RS232 connector: RJ45 type
- DI/DO 2 Digital Input (DI): Level 0: -30–2V Level 1: 10–30V Max. input current 8mA. 2 Digital Output (DO): Open collector to 40 VDC, 200mA
- Network Cable 10Base-T: 2-pair UTP/STP Cat. 3, 4, 5 cable. EIA/TIA-568 100-ohm (100m) 100Base-TX: 2-pair UTP/STP Cat. 5/5E cable. EIA/TIA-568 100-ohm (100m) 1000Base-TX: 2-pair UTP/STP Cat. 5e or 6 cable. EIA/TIA-568 100-ohm (100m)
- Optical Fiber[1] Multimode: 50/125µm - 62.5/125µm Single Mode: 9/125µm Requires selection of sold-separately SFP Modules. See ComNet data sheet “SFP Small Form-Factor Pluggable Modules” for number and description of SFP modules.
- Protocol CSMA/CD
- LED 10/100TX: Link/Activity (Green) Full Duplex/Collision (Yellow) Giga Copper: Link/Activity (Green) Speed: 1000Mbps (Green) SFP: Link/Activity (Green) Power (Green), Power 1 (Green), Power 2 (Green), Fault (Red), Master (Green)
- Reserve Polarity Protection Present
- Overload Current Protection Present
- IETF RFC Compliance RFC768-UDP, RFC783-TFTP, RFC791-IP RFC792-ICMP, RFC793-TCP, RFC827-ARP, RFC854-Telnet, RFC894-IP over Ethernet, RFC1112-IGMP v1, RFC1519-CIDR, RFC1541-DHCP (client), RFC2030-SNTP, RFC2068-HTTP, RFC2236-IGMP v2, RFC2475-Differentiated Services, RFC2865-Radius, RFC3414-SNMPv3-USM, RFC3415-SNMPv3-VACM
- IETF SNMP MIBS RFC1493-BRIDGE-MIB, RFC1907-SNMPv2- MIB, RFC2012-TCP-MIB, RFC2013-UDP-MIB, RFC2578-SNMPv2-SMI, RFC2579-SNMPv2-TC, RFC2819-RMON-MIB, RFC2863-IF-MIB, draft-ietf-bridge-rstppmib-03-BRIDGE-MIB, draft-ietf-bridge-bridgemib-smiv2-03-RSTP-MIB, IANAifType-MIB
- Safety UL, cUL, CE/EN60950-1, UL 508 Class 1, Division 2, Groups A, B, C and D for Hazardous Locations
- Stability Testing IEC60068-2-32 (Free fall), IEC60068-2-27 (Shock), IEC60068-2-6 (Vibration)

- Power Supply 12 - 48VDC, Redundant power with polarity reverse protect function and removable terminal block
- Power Consumption 10.2 Watts
- MTBF >100,000 hours
- Operating Humidity 5% to 95% (Non-condensing)
- Operating Temperature -40˚C to 75˚C (Functional to 85ºC)
- Storage Temperature -40˚C – 85˚C
- Case Dimensions Metal case. IP-30, 72mm (W) × 105mm (D) × 152mm (H) 2.84” (W) × 4.13” (D) × 5.98” (H)
- Installation DIN Rail (35 mm Track) or Wall Mount
- EMI FCC Class A, CE EN61000-4-2 (ESD), CE EN61000- 4-3 (RS), CE EN61000-4-4 (EFT), CE EN61000-4-5 (Surge), CE EN55022, CE EN61000-4-6 (CS), CE EN61000-4-8, CE EN61000-6-2, CE EN61000-6-4

Description

The Ethernet Intersection Switch shall consist of the following:

Furnish and Install Environmentally Hardened Managed Ethernet Switch with (7) 10/100TX + (3) 10/100/1000TX RJ45 or 100/1000 FX SFP Ports, and four (4) Small Form-Factor Pluggable Modules. **Hardened Ethernet Switch shall be ComNet CNGE3FE7MS2 or approved equal.**