CITY OF SACRAMENTO

STANDARD SPECIFICATIONS

FOR PUBLIC CONSTRUCTION

June 2007

Including Addendum No. 1

STANDARD SPECIFICATIONS

FOR PUBLIC CONSTRUCTION

City of Sacramento
California

Adopted by City Council

June, 2007

$20.00
Including Tax

TABLE OF CONTENTS

Section	Title	Pages
Section 1	Definitions and Terms	1-1 to 1-6
Section 2	Proposal Requirements and Conditions	2-1 to 2-6
Section 3	Award and Execution of Contract	3-1 to 3-3
Section 4	Scope of Work	4-1 to 4-8
Section 5	Control of Work and Materials	5-1 to 5-12
Section 6	Legal Relations and Responsibilities to the Public	6-1 to 6-17
Section 7	Prosecution and Progress	7-1 to 7-7
Section 8	Measurement and Payment	8-1 to 8-7
Section 9	Reserved	9-1
Section 10	Construction Materials	10-1 to 10-55
Section 11	Preconstruction Photographs	11-1 to 11-2
Section 12	Clearing and Grubbing, Tree Removal	12-1 to 12-2
Section 13	Existing Facilities	13-1 to 13-5
Section 14	Earthwork, Excavation, Embankment and Sub-grade	14-1 to 14-8
Section 15	Water Used in Construction	15-1 to 15-2
Section 16	Water Quality Control	16-1 to 16-6
Section 17	Laying Aggregate Base	17-1 to 17-3
Section 18	Headers	18-1 to 18-2
Section 19	Portland Cement Concrete Pavement, Joints and Curing	19-1 to 19-4
Section 20	Concrete in Structures	20-1 to 20-15

TABLE OF CONTENTS

Section	Title	Pages
Section 21	Placing Steel Reinforcement	21-1 to 21-4
Section 22	Asphaltic Concrete	22-1 to 22-11
Section 23	Bituminous Seal	23-1 to 23-13
Section 24	Curbs, Gutters, and Sidewalks	24-1 to 24-5
Section 25	Sanitary Sewer and Drainage Manholes	25-1 to 25-7
Section 26	Laying Sewer and Drain Pipe	26-1 to 26-24
Section 27	Water Distribution Systems	27-1 to 27-37
Section 28	Driveway Culvert and Sidewalk French Drains	28-1 to 28-3
Section 29	Moving or Changing Utilities and Water Services	29-1
Section 30	Drain Inlets, Gutter Drains and Ditch Boxes	30-1
Section 31	Construction of Chain Link Fence	31-1 to 31-2
Section 32	Traffic Signs, Markings and Barricades	32-1 to 32-10
Section 33	Pneumatically Applied Mortar	33-1 to 33-4
Section 34	Electrical	34-1 to 34-15
Section 35	Landscape Planting	35-1 to 35-24
Section 36	Irrigation System	36-1 to 36-8
Section 37	Boring and Jacking	37-1 to 37-6
Section 38	Standard Drawings	38-1 to 38-10
	Index	i-1 to i-14

Section 1

DEFINITIONS AND TERMS

Unless expressly indicated otherwise, the following terms or abbreviations used in these Specifications, or in any other Contract Documents, shall be defined as follows:

1-1 "A.A.S.H.T.O." The American Association of State Highway and Transportation Officials.

1-2 "Addendum" shall mean a document issued prior to the execution of the Agreement, that modifies or interprets any of the Contract Document, by additions, deletions, clarifications, or corrections.

1-3 "Agreement" shall mean the written agreement executed by Contractor and City, that constitutes one of the Contract Documents.

1-4 "A.S.T.M." The American Society for Testing Materials.

1-5 "A.W.W.A." The American Water Works Association.

1-6 "Bid" shall mean Proposal. A "formal" Bid shall mean a Bid submitted for a Contract required to be awarded by the Sacramento City Council pursuant to the Sacramento City Code, and "formal" bidding shall mean the bidding process used for such Contracts.

1-7 "Bidder" shall mean any individual, partnership, or corporation, or other entity or combination thereof, submitting a Proposal for the Work, whether acting directly or through a duly authorized representative.

1-8 "Change Order" shall mean a Contract amendment approved by the City in accordance with applicable provisions of these Specifications and the Sacramento City Code, authorizing an alteration, deviation, addition to, deletion from, or other change to the Contract issued after the effective date of the Agreement.

1-9 "City" shall mean the charter municipal corporation known as the City of Sacramento, in the State of California.

1-10 "City Council" shall mean the City Council of the City of Sacramento or any other board, body, official or officials, to which or to whom the power belonging to the City Council shall hereinafter pass.

1-11 “City Manager” shall mean the City Manager of the City of Sacramento acting either directly or through properly authorized representatives acting within the scope of their authorized duties.

1-12 “Completion Date” shall mean the date for completion of the entire Work as defined in Section 9 of the Agreement.

1-13 “Contract” shall mean the written contract covering the performance of the Work and the furnishing of labor, materials, tools and equipment in the construction of the Work, consisting of the Contract Documents.

1-14 “Contract Documents” shall mean the various documents constituting the Contract that are identified in Section 1 of the Agreement.

1-15 “Contract Price” shall mean the total dollar amount of the Contract.

1-16 "Contractor” shall mean the individual, partnership, corporation, or other entity or combination thereof, that has entered into a Contract with the City, or Contractor’s duly authorized representative.

1-17 “Controlling Operation” shall mean an item of Work on the project critical path whose duration time directly affects the date that the entire Work can be completed.

1-18 “Critical Path Method Schedule” or “CPM Schedule” shall mean a schedule with a consecutive sequence for completion of the Work with the least amount of float period(s).

1-19 “Day” shall mean a working day, unless otherwise expressly defined in the Special Provisions.

1-20 “Date of signing Contract” shall mean the date upon which the Contract, properly executed by Contractor and delivered to the City, is executed by the City.

1-21 “Director” shall mean the Director of the City Department administering the Contract.

1-22 “Division Manager” shall mean the appropriate Division Manager of the City department administering the Contract, or other City employee designated by such Division Manager to perform any duties assigned to the Division Manager in these Specifications.

1-23 “Engineer” shall mean the Director as well as the Director’s subordinates and other City representative(s) who have been duly authorized to

exercise control and supervision of the Work. The Engineer generally will be either a professional engineer or architect, depending on the nature of the Work, but the Engineer is not required to be a professional engineer or architect.

1-24 "ESBE participation" shall mean participation in performance of the Work by Small Business Enterprises and/or Emerging Business Enterprises in accordance with the provisions of Article VIII of Chapter 3.60 of the Sacramento City Code, commencing with City Code Section 3.60.260, and all policies and procedures adopted to implement these provisions.

1-25 "Federal Specifications" shall refer to the Standard Specifications of the United States Government designated in the Contract Documents.

1-26 "Field Order" shall mean a written instruction from the Engineer to Contractor made in the field.

1-27 "Finance Director" shall mean the Director of Finance of the City of Sacramento and shall include the term "City Controller" as used in the Sacramento City Charter.

1-28 "Fixed cost" shall mean a cost that remains constant regardless of the quantity of work done.

1-29 "Float period" shall mean such period(s) of time as may be shown on Contractor's schedule(s) that is/are not allocated to the performance and completion of the Controlling Operation(s) of the Work.

1-30 "Inspector" shall mean an engineering or construction inspector acting within the authorized scope of the particular duties and authority delegated to such inspector by the City.

1-31 "Laws or Regulations" shall mean any and all applicable laws, rules, regulations, ordinances, codes, resolutions, requirements and/or orders of any and all governmental bodies, agencies, authorities and courts, including but not limited to provisions of the Sacramento City Charter and City Code.

1-32 "Liquidated damages" shall mean the sum or sums prescribed in the Contract Documents, pursuant to the authority of Government Code Section 53069.85, to be paid to the City or to be deducted from any payment due or to become due to Contractor for delay beyond the time allowed in the Contract Documents for completing the whole, or any specified portion, of the Work.

1-33 “Landscape Architect” shall mean a Landscape Architect of the City of Sacramento Department of Parks and Recreation, and such assistants to the Landscape Architect who have been assigned to the Work by the Landscape Architect.

1-34 “Payment Bond” shall have the same meaning given to it by Section 3096 of the Civil Code of the State of California, and shall refer to the approved form of security furnished by Contractor and its Surety to guarantee the payment in full of all bills, accounts and related costs for labor and materials used in construction of the Work.

1-35 “Performance Bond” shall mean the approved form of security furnished by Contractor and its Surety to guarantee Contractor’s performance and completion of the Work in accordance with the terms of the Contract.

1-36 “Plans” shall mean the official Project Plans and Standard Drawings, profiles, typical cross sections, general cross sections, working drawings and supplemental drawings, or reproductions thereof, approved by the Director, that show the location, character, dimensions and details of the work to be performed. All such documents shall be construed to be part of the Plans whether or not reproduced in the Special Provisions. In the above definition, the terms “Standard Drawings” and “Project Plans” mean:

(1) “Standard Drawings”: The Standard Drawings or Standard Drawing as set forth in these Specifications. “Standard Drawing(s)” means “Standard Detail(s)”.

(2) “Project Plans”: The Project Plans or Plans include specific details and dimensions peculiar to the Work and that are supplemented by the Standard Drawings insofar as the same may apply.

1-37 “Project Estimate” shall mean the list of estimated quantities of Work to be performed that is included in the Notice to Contractors

1-38 “Proposal” shall mean the offer of the Bidder for performance and completion of the Work when properly completed, executed, guaranteed and submitted on the Proposal Form.

1-39 “Proposal Form” shall mean the approved form upon which the City requires formal Bids for the Work to be prepared and submitted.

1-40 “Proposal Guarantee” shall mean the security to be furnished by the Bidder as a guarantee of good faith that it will enter into a Contract and execute the required Bonds covering the Work if awarded the Contract.

1-41 “Special Provisions” shall mean the specific clauses setting forth conditions or requirements peculiar to the Work and supplementary to these Specifications.

1-42 “Specifications” shall mean the directions, provisions, and requirements contained herein. In the Special Provisions these Specifications may also be referred to as the “Standard Specifications”. The Council of the City of Sacramento has adopted these Specifications as Standard Specifications for the City of Sacramento. When the Standard Specifications of other organizations or agencies, or parts of such Specifications are referred to in these Specifications, such Standard Specifications of other organizations or agencies, or parts of such Specifications, are included in, and made a part of, these Specifications.

1-43 “State Specifications” shall mean the Standard Specifications of the State of California, Department of Transportation, as currently approved and in effect. In referring to the State Specifications, the section numbers referred to are those contained in the State Specifications when these Specifications are adopted. If, in subsequent editions of the State Specifications, these section numbers are changed, the reference in these Specifications shall be construed to refer to the renumbered sections.

1-44 “Subcontractor” shall mean any person or firm of any tier directly or indirectly utilized by Contractor to perform any portion of the Work.

1-45 “Substantially complete” as applied to the Work shall mean that the Engineer has determined that all of the Work has been performed, but there are minor deficiencies, as determined by the Engineer, that do not prevent the Work from being fully functional nor pose any risk to the public health, safety or welfare or public or private property, as determined by the Engineer. The Work shall be considered substantially complete on the date that the Engineer issues a punchlist to Contractor as specified in Section 8-4 of these Specifications.

1-46 “Supplier” shall mean any person or firm directly or indirectly supplying any materials or equipment for performance of, or incorporation in, the Work.

1-47 “Work” shall mean all actions and activities that Contractor is contractually required to undertake and perform as specified, indicated, shown, or implied in the Contract, including all duly authorized Change Orders.

1-48 “Working day” shall mean any day, except for the following:

(1) Saturdays, Sundays and legal holidays, unless otherwise indicated in the Special Provisions.

(2) Days on which Contractor is prevented from proceeding with the current Controlling Operation(s) of Work for at least (5) hours per day due to inclement weather, or conditions resulting immediately therefrom, as determined by the Engineer.

(3) Days on which Contractor is specifically required pursuant to the Contract Documents or by operation of law to suspend the Controlling Operation or Operations of Work, except in cases where such requirement applies due to the failure on the part of Contractor or any Subcontractor to carry out orders or to perform any provision of the Contract.

Section 2

PROPOSAL REQUIREMENTS AND CONDITIONS

2-1 NOTICE TO CONTRACTORS

"Notice to Contractors" is published by the City Clerk for formally bid contracts in accordance with Article III of Chapter 3.60 of the Sacramento City Code. Among other provisions, the Notice to Contractors makes reference to Section 1770 et seq. of the Labor Code relating to determinations regarding prevailing wages. Contractor shall pay prevailing wages according to the rates established by these determinations. Copies of these determinations are on file in the Office of the Director and shall be made available to any interested party on request, and also may be retrieved from the internet at www.dir.ca.gov/dlsr.

2-2 PROPOSAL FORM

A Proposal Form shall be made available to each prospective Bidder.

2-3 PROJECT ESTIMATE

The quantities given in the Project Estimate in the Notice to Contractors, Proposal and Contract are approximate only, and are given as a basis for comparison of Bids. The City does not, expressly or by implication, represent or agree that the actual amount of Work will equal the approximate estimate. The City 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 in the sole discretion of the Engineer, as provided in the Contract Documents.

2-4 EXAMINATION OF CONTRACT DOCUMENTS AND SITE OF WORK

All Bidders shall examine carefully the site of the contemplated Work, the Plans, Specifications, the Proposal and the other Contract Documents. The submission of a Bid shall be conclusive evidence that the Bidder has investigated and is satisfied as to the conditions to be encountered, the character, quality, quantity and scope of Work to be performed, the quantities of materials to be furnished, and the requirements of the Contract Documents, and that the Bidder is aware of no material discrepancy between such conditions, the character, quality, quantity and scope of Work to be performed, the quantities of materials to be furnished, and the requirements of the Contract Documents. If the Engineer has made investigations of conditions in areas where the Work is to be performed or in other areas, some of which may constitute possible local material sources, such investigations are

made only for the purpose of study and design. Subject to and upon the conditions hereinafter set forth, where such investigations have been made, prospective Bidders or Contractor may, upon written request, inspect the records as to such investigations. Any such inspection of records shall be made at such place or places that may be specified in the Special Provisions or by the Engineer.

The records of any such investigations shall not be construed to be or become a part of the Contract and are shown solely for the convenience of prospective Bidders or Contractor. It is expressly understood and agreed that the Engineer and the City assume no responsibility whatsoever in respect to the sufficiency or accuracy of such investigations, the records thereof, or any interpretation set forth therein or made by the Engineer and that there is no representation, warranty or guarantee, either express or implied, that the conditions indicated by such investigations or records thereof are representative of those existing throughout such areas, or any part thereof, or that unanticipated developments may not occur, or that materials other than or in proportion different from those indicated, may not be encountered.

The availability for use of information described in this Section is not to be construed in any way as a waiver of the provisions of the first paragraph of this Section and all prospective Bidders and Contractor are cautioned to make such independent investigations and examinations as each of them may consider necessary to sufficiently inform itself as to the conditions to be encountered in the performance of the Work, and, with respect to possible local material sources, the quality and quantity of material available from such sources and the type and extent of processing that may be required in order to produce material conforming to the requirements of the Contract. No information derived from such inspection of records of investigations or interpretations thereof made by the Engineer or from the Engineer shall in any way relieve any prospective Bidder or Contractor from any risk or from properly fulfilling the terms of the Contract.

2-5 PREPARATION OF PROPOSAL

The City Clerk or the City's designated reprographics firm shall make available to each prospective Bidder a Proposal Form, that, when properly completed and executed may be submitted as a Bid. Bids not presented on the Proposal Form shall be rejected.

The Proposal shall set forth for each item in clearly legible figures, an item price and a total for each item in the respective spaces provided, and shall be signed by the Bidder, who shall fill out all blanks in the Proposal Form.

2-6 DETERMINATION OF AMOUNT BID – MATHEMATICAL ERROR

In determining the amount bid by each Bidder, the City may disregard computations that contain obvious mathematical errors in addition, subtraction, multiplication, and division that appear on the face of the Proposal. When such a mathematical error appears on the face of the Proposal, the City may, but shall not be obligated to correct any such error and compute the total amount bid by said Bidder on the basis of the corrected figure or figures to determine which Bidder has submitted the lowest bid; provided that the City shall have no responsibility or liability to any bidder if the City determines which Bidder has submitted the lowest bid without doing so.

When an item price is required to be set forth in the Proposal, and the total price for the item does not agree with a figure that is derived by multiplying the item price by the Project Estimate of the quantity of work to be performed for said item, the item price shall prevail over the total price for the item. The total to be paid for each item shall be based upon the item price and not the total price for the item. If the Proposal contains only a total price for the item, and not the item price, the City shall determine the item price by dividing the total price for the item by the stated Project Estimate of the quantity of work to be performed for the item.

If the Proposal contains neither the item price nor the total price for the item, then it shall be deemed to be incomplete and the Proposal shall be rejected.

2-7 REJECTION OF PROPOSALS

Proposals may be rejected if they show any alteration of form, additions not called for, mathematical errors, conditional Bids, changes that make the Proposal illegible in any manner, or irregularities of any kind.

When Proposals are signed by an agent, other than an officer or officers of the corporation authorized to sign contracts on its behalf or a member of a partnership, a “power of attorney” must have been filed with the City of Sacramento prior to opening Bids or shall be submitted with the Proposal; otherwise, the Proposal shall be rejected as irregular and unauthorized. The City reserves the right to waive any informalities or minor irregularities in the Bids.

2-8 PROPOSAL GUARANTEE

All Bids shall be accompanied by one of the following forms of Bidder’s security, referred to herein as the “Bidder’s Proposal Guarantee”: Cashier’s

check, a certified check, or a Bidder's Bond executed by a surety insurer admitted and duly authorized to transact business in the State of California, made payable to the City.

No Bidder's Bond shall be accepted unless it substantially conforms to the Bond form included in the Special Provisions. Bidder's Bond forms may be obtained from the Engineer. The Engineer may waive the requirement to furnish a Bidder's Proposal Guarantee for Contracts that may be awarded without City Council approval pursuant to the Sacramento City Code.

2-9 SUBCONTRACTORS

Each Bidder and each Contractor shall, to the extent required by law, comply with and be subject to the Subletting and Subcontracting Fair Practices Act of the State of California. (Public Contract Code Sections 4100 et seq., hereafter referred to as the "Act".) Each Bidder bidding on a Contract subject to the Act, shall in the Bid, on a form provided by the City, set forth:

1. The name and location of the place of business of each proposed Subcontractor who shall perform work or labor or render service to the prime Contractor in or about the construction of the Work, or a Subcontractor licensed by the State of California who, under a subcontract to the prime Contractor, specially fabricates and installs a portion of the Work or improvement according to detailed drawings contained in the Plans and Specifications, in an amount in excess of one-half of one percent of the prime Contractor's total bid or, in the case of bids for the construction of streets or highways, including bridges, in excess of one-half of one percent of the prime Contractor's total bid or $10,000, whichever is greater.

2. The portion and dollar amount of the work that will be done by each such Subcontractor. The prime Contractor shall list only one Subcontractor for each such portion as is defined by the prime Contractor in the Bid.

In addition to the above requirements, Contractor shall perform with its own organization and with the assistance of workers under its immediate superintendence, work of a value not less than twenty percent (20%) of the value of all Work in the Contract. The dollar amount of subcontracted work that is specifically indicated by the Bidder on the form provided by the City shall be used to determine the value of work being subcontracted, as well as the value of ESBE Subcontractor participation for purposes of determining compliance with ESBE participation requirements, unless the Engineer determines such value to be significantly misstated. The Bidder shall provide

such bidding information as may be requested by the Engineer to make this determination.

2-10 SUBMISSION OF PROPOSAL

The Proposal shall be submitted as directed in the Notice to Contractors in a sealed envelope provided by the City. The Bidder shall plainly mark the exterior of the envelope in which the Proposal is submitted to indicate that it contains a proposal for the project for which the proposal is submitted, and the date of the Bid opening therefor. Proposals submitted in envelopes that are not properly marked may be rejected. The Proposal cannot be withdrawn or modified after the time specified for opening of the Bids, except as may be authorized under Section 2-12 below.

2-11 PUBLIC OPENING OF PROPOSALS

Proposals shall be opened and read publicly at the time and place indicated in the Notice to Contractors. Bidders or their authorized agents are invited to be present.

2-12 RELIEF OF BIDDERS

A Bidder may request relief from its Bid, pursuant to the provisions of Public Contract Code Section 5100 through 5103, inclusive.

2-13 DISQUALIFICATION OF BIDDERS

City shall not consider more than one Proposal from an individual, partnership, corporation, or other entity or combination thereof, under the same or different names. If City has reasonable grounds to believe that any individual, partnership, corporation or combination thereof is interested in more than one Proposal as a prime Bidder for the work contemplated, City may reject all Proposals in which such individual, partnership, corporation or combination thereof is interested. If City has reason to believe that collusion exists among any Bidders, City may reject the Proposals. City may reject a Proposal in which the bid(s) submitted for one or more items are obviously unbalanced, as reasonably determined by City.

2-14 LICENSING OF BIDDERS

Attention is directed to the provisions of Chapter 9 of Division 3 of the Business and Professions Code concerning the licensing of Contractors.

All Bidders and Contractors shall be licensed in accordance with the laws of California and any Bidder or Contractor not so licensed is subject to the

penalties imposed by such laws. The Bidder's or Contractor's license must be of a class that permits its holder to do the Work contemplated as of the date the Proposal is submitted and such license must be maintained for the duration of the work. The Bidder shall indicate its license number and class in the space provided for that purpose on the Proposal Form.

The City shall specify the classification of Contractor's license that a Contractor shall possess at the time a Contract is awarded. This shall be included in the Plans and Notice to Contractors (Public Contract Code Section 3300).

2-15 PREQUALIFICATION OF BIDDERS

The City may establish prequalification requirements for Bidders on one or more Contracts consistent with applicable provisions of the City Code, and any other Laws or Regulations if applicable.

2-16 JOINT VENTURE BIDS

If two or more prospective Bidders desire to bid jointly as a joint venture on a single project, they must first file an affidavit of joint venture with the City on the form approved by the Engineer. Such affidavit of joint venture will be valid only for the specific project for which it is filed. If such affidavit of joint venture is not filed and approved by the Engineer prior to the time for opening Bids on the specific project for which it is submitted, a joint bid submitted by said Bidders shall be rejected. On projects for which pre-qualification is required, each party to the joint venture must separately pre-qualify in order to file a joint venture affidavit.

2-17 AGREEMENT TO ASSIGN

The Bidder agrees that if its Bid is accepted, it will assign to City all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act, Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the Bidder pursuant to the Contract. Such assignment shall be effective at the time the City tenders final payment to the Bidder without further acknowledgement by the parties (Cal. Govt. Code §4552).

Section 3

AWARD AND EXECUTION OF CONTRACT

3-1 AWARD OF CONTRACT

Unless otherwise provided in the Special Provisions, or otherwise authorized by the City Council in accordance with applicable provisions of the Sacramento City Code, the award of a formally bid Contract, if it is awarded, will be to the lowest responsible Bidder (as said term is defined in Section 3.60.020 of Chapter 3.60 of the Sacramento City Code) whose Bid complies with the specific requirements of the Contract Documents. The City Council reserves the right to reject any and all Proposals.

3-2 TIME OF AWARD

The award of a formally bid Contract, if made, will be made within sixty (60) calendar days after the opening of the Proposals.

If the lowest responsible Bidder refuses or fails to execute the Contract, the City Council may award the Contract to the second lowest responsible Bidder. Such award, if made, will be made within ninety (90) calendar days after the opening of Proposals.

If the second lowest responsible Bidder refuses or fails to execute the Contract, the City Council may award the Contract to the third lowest responsible Bidder. Such award, if made, will be made within one hundred and twenty (120) calendar days after the opening of the Proposals.

The periods of time specified above within which the award of the Contract may be made, may be extended beyond the periods of time specified herein by written agreement between the Engineer and the Bidder(s) concerned.

3-3 COMPARISON OF BIDS

All Bids shall be compared on the basis of the Project Estimate of quantities of Work to be done, with such corrections in mathematical errors appearing on the face of the Proposal as the City may choose to make pursuant to Section 2-6 of these Specifications.

3-4 PERFORMANCE AND PAYMENT BONDS

The successful Bidder shall provide a Performance Bond and a Payment Bond to the City, each for a sum equal to one hundred percent (100%) of the

Contract Price. Each Bond shall be executed by a surety insurer admitted and duly authorized to transact business in the State of California. If the Contract Price is increased by Change Order, Contractor shall increase the Performance and/or Payment Bond amount(s) if and to the extent required by the Engineer.

Notwithstanding the foregoing, for any Contract awarded for a Contract Price of $25,000.00 or less, no Performance Bond or Payment Bond will be required unless it is specifically required in the Special Provisions, except as otherwise required by any Laws or Regulations.

3-5 RETURN OF PROPOSAL GUARANTEES

After bids have been received and reviewed, Proposal Guarantees will be returned to the respective Bidders except those submitted by the three lowest responsible Bidders. The Proposal Guarantees of the three lowest responsible Bidders will be returned after the Contract is executed, subject to the provisions of Section 3-7 below.

3-6 EXECUTION OF CONTRACT

The Contract shall be executed by the successful Bidder and returned to the City together with the Performance and Payment Bonds, not later than fifteen (15) calendar days after the date the Contract is awarded.

3-7 FAILURE TO EXECUTE CONTRACT

Failure of the lowest responsible Bidder, the second lowest responsible Bidder, or the third lowest responsible Bidder to execute a formally bid Contract and file acceptable Bonds and insurance as provided in the Contract Documents shall be just cause for the City Council to void the Contract award to that Bidder and utilize that Bidder's Proposal Guarantee to recover the City's cost as provided below.

If the lowest responsible bidder refuses or fails to execute the Contract as required herein, the City Council may award the Contract to the second lowest responsible Bidder. If this occurs, the amount of the lowest responsible Bidder's Proposal Guarantee shall be applied by the City to the difference between the lowest Bid and the Bid of the second lowest responsible Bidder and the surplus, if any, shall be returned to the lowest responsible Bidder if a check is used, or shall be credited to the surety on the Bidder's Bond if a Bond is used.

On refusal or failure of the second lowest responsible Bidder to execute the Contract, the City Council may award the Contract to the third lowest responsible Bidder. If this occurs, in addition to application of the lowest

Bidder's Proposal Guarantee as provided above, the amount of the second lowest responsible Bidder's Proposal Guarantee shall be applied by the City to the difference between the second lowest Bid and the Bid of the third lowest responsible Bidder, and the surplus, if any, shall be returned to the second lowest responsible Bidder if a check is used, or credited to the surety on the second lowest Bidder's Bond if a Bond is used.

The successful Bidder may file with the Engineer a written notice, signed by the Bidder or its authorized representative, specifying that the Bidder will refuse to execute the Contract if presented. The filing of such notice shall immediately have the same force and effect as the failure or refusal of the Bidder to execute the Contract and furnish acceptable Bonds within the time prescribed above.

3-8 FORM OF AGREEMENT AND SURETY BONDS

The form of the Agreement and the form of the Payment and Performance Bonds required to be executed by the successful Bidder shall be approved by the City Attorney.

Section 4

SCOPE OF WORK

4-1 INTENT OF PLANS AND SPECIFICATIONS

The intent of the Plans and Specifications is to prescribe the details for the completion of the Work that Contractor undertakes to perform in accordance with the terms of the Contract. Where the Plans and Specifications describe portions of the Work in general terms, but not in complete detail, it is understood that only the best general practice is to prevail and that only materials and workmanship of the best quality shall be used. Unless otherwise specified, Contractor shall furnish all labor, materials, tools, equipment, and incidentals, and do all the Work involved in executing the Contract in a satisfactory and workmanlike manner.

4-2 CLEANING UP

Contractor shall not allow the site of the Work to become littered with trash, debris, garbage or waste material, and shall maintain the site in a neat, orderly, safe and healthful condition until completion and acceptance of the Work. Before final inspection of the Work, Contractor shall clean the work site and all ground occupied by Contractor in connection with the Work of all rubbish, excess materials, falsework, temporary structures and equipment. All parts of the Work shall be left in a neat and presentable condition. Contractor shall implement a program of proper cleaning and "housekeeping" practices, employee training and other measures as needed to consistently maintain a clean Work site and shall at all times take all measures necessary to protect work in place and materials and equipment stored on site from contamination by dust, dirt, debris or mold. Full compensation for cleaning up and protection of work, materials and equipment is included in the prices paid for the various Contract items of work, and no separate or additional payment shall be made for cleaning up and protection of work, materials and equipment.

4-3 LINES AND GRADES

All Work done under this Contract shall be done to the lines and grades shown on the drawings. Contractor shall keep the Engineer informed, at least 2 working days in advance, of the times and places at which Contractor wishes to do work, in order that lines and grades may be furnished and necessary measurements for record and payment made with the minimum of inconvenience to the Engineer and delay to Contractor.

The datum to which all elevations mentioned herein or shown on the drawings refer is the official datum of the City of Sacramento, unless specifically shown or stated to be otherwise.

4-4 CHANGES IN THE WORK

The City reserves the right to make such alterations, deviations, additions to or deletions from the Work or any of the Contract Documents, including the right to increase or decrease the quantity of any item or portion of the Work or to eliminate any item or portion of the Work, as may be deemed by the Engineer to be necessary or advisable, and to require such extra work as may be determined by the Engineer to be necessary for the proper completion or construction of the whole Work.

Any such changes shall be set forth in a Change Order that shall specify, in addition to the work to be done or omitted in connection with the change made, the adjustment of Contract time, if any, and the increase or decrease in Contractor's compensation, if any, for that work. A Change Order issued by the Engineer shall not be deemed approved and effective until signed by Contractor (or otherwise deemed approved by Contractor as provided in this Section) and approved by the City in accordance with applicable approval requirements of the Sacramento City Code. The City's payment in accordance with the provisions for compensation set forth in an approved Change Order shall constitute full compensation for all work included in or required by the Change Order, including all direct, indirect and consequential costs incurred or claimed by the Contractor.

Contractor may contest the terms or conditions of a Change Order issued by the Engineer by submitting a written protest to the Engineer within 15 calendar days after Contractor's receipt of such Change Order. The protest shall state the points of disagreement, the applicable Contract Document references, and the quantities and costs involved. If a written protest is not submitted within such 15 calendar day period; (1) payment shall be made as set forth in the Change Order, and Contractor shall not be entitled to any additional compensation for all work included therein or required thereby; and (2) the Change Order shall be deemed to have been approved and executed by Contractor.

Upon receipt of an approved Change Order, Contractor shall proceed with the ordered work. In those instances where the Work would be delayed by waiting for City to issue and/or approve a Change Order, the Engineer may direct work to be done by issuing a written Field Order, and Contractor shall proceed with the work so ordered prior to actual receipt of an approved

Change Order therefor. In those cases, the Engineer shall, as soon as practicable, issue a Change Order for the ordered work.

Increases or decreases in the quantity of a unit price bid item of Work shall be determined by comparing the total quantity of that item of Work with the bid quantity. If the total quantity of a unit price bid item of Work is increased, the Engineer shall determine in the Engineer's sole discretion whether to pay for the additional quantity of the item (i) at the Contract unit price for the item, (ii) at a different unit price or in a lump sum, if such price or sum is agreed to by Contractor, or (iii) by cost and percentage, as provided in Section 8-10 below. If the total quantity of any item of Work required under the Contract is decreased, the Engineer shall determine the reduction in compensation for the item based on the Contract unit price for the item; provided that if the compensation for any "major item" (defined below) is reduced by more than 20% of the cost bid for that item, the Engineer also may agree to pay Contractor for lost overhead resulting from such reduction, if any, as determined by the Engineer in the Engineer's sole discretion; provided, further, that if the Engineer eliminates in its entirety an item of the Work, the reduction in compensation therefore shall be determined in accordance with Section 4-5 below.

As used in this Section and Section 4-5, a "major item" shall mean an item of the Work with a cost, computed on the basis of the bid quantity for the item, that exceeds the following percentages of the Contract price:

1. 10 % of the original Contract price, for Contracts originally awarded for a price of less than one million dollars;

2. 8 % of the original Contract price, for Contracts originally awarded for a price of at least one million dollars but less than five million dollars;

3. 6 % of the original Contract price, for Contracts originally awarded for a price of at least five million dollars but less than ten million dollars;

4. 5 % of the original Contract price, for Contracts originally awarded for a price of ten million dollars ($10,000,000.00) or more.

For extra work that does not constitute an increase of a unit price bid item of the Work, the Engineer shall determine in the Engineer's sole discretion whether to pay for the extra work (i) at a unit price or lump sum agreed to by Contractor, or (ii) by cost and percentage, as provided in Section 8-10.

4-5 ELIMINATED ITEMS

Notwithstanding any other provision of the Contract Documents, the Engineer may at any time, in writing, order eliminated in its entirety any item(s) of the Work if the Engineer determines, in the Engineer's sole discretion, that the item is unnecessary to the project or will be performed by the City's own personnel. Any elimination of Work shall not be a waiver of any of the conditions of the Contract nor invalidate any of the provisions thereof. Should any item of the Work be eliminated in its entirety, Contractor shall not receive any compensation for the eliminated item, except that payment shall be made to Contractor for actual costs incurred in connection with an eliminated Contract item if reasonably incurred prior to the date of notification in writing by the Engineer of the elimination. The payment by City for actual costs reasonably incurred by Contractor, if any, prior to elimination of an item as provided in this Section shall be computed in the same manner as if the work were to be paid by cost and percentage as provided in Section 8-10 of these Specifications. In addition, if any major item is eliminated in its entirety, the Engineer may agree to pay Contractor for lost overhead resulting from such elimination, if any, as determined by the Engineer in the Engineer's sole discretion.

If material acceptable to the City is ordered by Contractor for the eliminated item prior to the date of notification of the elimination by the Engineer, and if orders for that material cannot be canceled, the material shall be paid for at the actual cost to Contractor. In this case, the material paid for shall become the property of the City. If the material is returnable to the vendor and if the Engineer so directs, the material shall be returned and Contractor shall be paid for the actual cost of charges made by the vendor for returning the material.

4-6 EXTRA WORK

Work shall be considered extra work only when the Engineer determines that the work is not covered by any of the various items for which there is a bid price or by combinations of those items. Contractor shall perform extra work and furnish labor, material and equipment therefor upon receipt of a Change Order or other written order of the Engineer (including a Field Order) directing Contractor to perform such extra work, in accordance with the provisions of Section 4-4 above. Extra work must be authorized in writing by the Engineer before the work is started. No payment shall be made for extra work performed prior to Engineer's prior written authorization therefor.

4-7 NOTICE OF CLAIMS FOR ADDITIONAL COMPENSATION OR DAMAGES

Except as specifically otherwise provided herein, Contractor shall not be entitled to payment of any additional compensation or damages for any cause, including, but not limited to, any act or failure to act, by the Engineer or the City, or any officer, employee, agent or contractor of the City, the presence or discovery of any condition, or the happening of any event or occurrence, unless Contractor gives the Engineer timely written notice of and supporting data for any such potential claim and complies with the dispute procedure as hereinafter specified; provided however, that compliance with this provision shall not be necessary as to matters covered by the liquidated damages provisions of the Agreement, nor to any claim that is based directly and solely on differences in measurements or errors in computation of Contract pay quantities.

The written notice of potential claim required herein shall describe the cause, event, condition or occurrence, set forth the reasons why Contractor believes additional compensation or damages will or may be due, the nature of the costs involved, and insofar as possible, the amount of the potential claim. The notice shall be given to the Engineer as soon as the cause, event, condition or occurrence is first encountered and before Contractor incurs any costs giving rise to the potential claim for additional compensation or damages. Any additional data supporting the claim must be given to the Engineer not later than thirty (30) days after the date of such notice, unless the Engineer allows an additional period of time to ascertain more accurate data supporting the claim. This data shall be accompanied by Contractor's written statement that the amount claimed covers all known amounts (direct, indirect, and consequential) to which Contractor is entitled as a result of such condition, act, failure to act, event, thing or occurrence.

It is the intention of this provision that differences between the parties arising under the Contract be brought to the attention of the Engineer at the earliest possible time in order that such matters may be settled, if possible, or other appropriate action promptly taken to minimize damages and/or additional costs. For this reason, Contractor hereby agrees that Contractor shall have no right to additional compensation or damages for any claim for which a timely written notice of potential claim and supporting data is not filed as required by this Section 4-7, and Contractor waives and releases any and all such claims. The Engineer may summarily dismiss any claim for which a timely written notice of potential claim and/or supporting data is not filed as required by this Section 4-7.

4-8 DISPUTED CLAIMS

If the Engineer receives a timely notice of potential claim and supporting

data from Contractor as required by Section 4-7, the Engineer shall review such notice and supporting data to determine the merits of the claim. If the Engineer determines that the claim, in whole or in part, is not acceptable for any reason, as soon as practical thereafter, the Engineer shall give Contractor written notice that City rejects the claim, in whole or in part, and the reasons for the rejection. In the event the Engineer gives such notice of rejection, the Engineer shall, at Contractor's written request, specify a date for a hearing before the Division Manager for the purpose of resolving the dispute. Such written request by Contractor shall be made within fifteen (15) calendar days from the date of the written notice of rejection given by the Engineer. Unless otherwise directed by the Division Manager, pending resolution of any disputed claim, Contractor shall proceed diligently with the performance of the Contract.

Written notice of the date, time and location of the hearing shall be provided to Contractor not less than ten (10) calendar days prior to the date of the hearing. On such hearing date, or such other date to which the parties may agree, Contractor shall be afforded a reasonable opportunity to present Contractor's position on and substantiation for the claim. The hearing shall be conducted in an informal manner, and no record shall be made of the proceedings, except that any written materials submitted by the City or Contractor shall be preserved by the Division Manager until the Work is finally accepted by the City.

As soon as practicable after the hearing, the Division Manager shall prepare a written decision in regard to the dispute and forward it to Contractor. Any decision by the Division Manager to pay additional compensation to the Contractor shall be contingent upon approval of a change order authorizing such compensation by the Sacramento City Council, unless City Council approval of the change order is not required under the Sacramento City Code.

4-9 REVIEW BY CLAIM REVIEW COMMITTEE AND ISSUANCE OF DECISION BY DEPARTMENT DIRECTOR

This section sets forth procedures for the Contractor to request review of any claim decision issued by the Division Manager pursuant to Section 4-8. If the Contractor does not request such review in compliance with the requirements set forth in this Section 4-9, such failure shall constitute acceptance of the Division Manager's decision by the Contractor, and the Contractor thereafter shall have no right to additional compensation for any of the claim(s) to which the decision applies, beyond any amount(s) determined to be due the Contractor by the Division Manager's decision.

Review of the Division Manager's decision shall be conducted by the City's Claim Review Committee, consisting of the City's Chief Building Official, the Engineering Services Division Manager of the City's Department of Transportation, the Director of the City's Department of General Services, and the Engineering Services Manager for the City's Department of Utilities. In order for the Committee to conduct a review and issue a recommendation as provided in this section, at least two members of the Committee must be present, provided that the Committee member from the Department administering the Contract shall not participate as a Committee member in the Committee's review of or recommendation on the claim.

To obtain review of the Division Manager's decision, the Contractor shall file a written request for review with the Division Manager not later than fourteen (14) calendar days after the Contractor receives the Division Manager's decision. The request shall briefly describe the Division Manager's determination or determinations for which review is requested and the Contractor's reason(s) for requesting review of the determination(s), and shall provide the Contractor's mailing address.

Not later than ten (10) calendar days after receiving a timely and complete request for review, the Division Manager shall forward the request, with copies of the Contractor's original claim, the Division Manager's decision on the claim and any additional related materials to the Claim Review Committee, which shall set the matter for a review hearing at the earliest practical date. Notice of the date, time and location of the review hearing shall be mailed to the Contractor at the address specified in the request for review not less than ten (10) calendar days prior to the date of the review hearing.

The review hearing shall be conducted in an informal manner, and no record shall be made of the proceedings. The scope of the review shall be limited to issues raised in the Contractor's original claim and/or addressed in the Division Manager's decision on the claim. At the review hearing, representatives of the Department administering the Contract and the Contractor shall be provided a reasonable opportunity to present their positions and any additional evidence within the scope of the review.

As soon as practical after the review hearing, the Claim Review Committee shall issue a written recommendation to the Director of the Department administering the Contract providing the Committee's recommendation(s) for action on the claim, and the Director shall issue a final written decision on the claim not later than ten (10) calendar days thereafter. The Director shall mail a copy of the decision to the Contractor at the address specified in the request for review. In rendering the decision, the Director, in his or her sole discretion, may accept, modify or reject, in whole or in part,

the Division Manager decision and/or the Committee recommendation. Any decision by the Director to pay additional compensation to the Contractor shall be contingent upon approval of a change order authorizing such compensation by the Sacramento City Council, unless City Council approval of the change order is not required under the Sacramento City Code.

If claim review is conducted pursuant to this Section 4-9, all communications, statements, correspondence, information and other evidence, whether documentary or oral, made or presented at, or in anticipation of, the Claim Review Committee review hearing, as well as the Committee's recommendation to the Director and the fact that it was given, shall be deemed an attempt to compromise and settle the Contractor's claim under California Evidence Code section 1152, and as such will be inadmissible for any reason in any litigation that may arise pertaining to the claim or the Contract.

Section 5

CONTROL OF WORK AND MATERIALS

5-1 AUTHORITY OF ENGINEER

As defined in Section 1 of these Specifications, the "Engineer" may mean either the Director or the representatives authorized by the Director to exercise control and supervision of the Work. Much of the actual supervision and control of the project may be by such subordinate representatives who are designated as "Engineer." However, whenever in these Specifications, Plans or Special Provisions, the Director is designated as the authority in any matter, it will mean only the Director and not subordinates working under the Director's supervision. Whenever the word "Engineer" is used in these Specifications, Plans or Special Provisions, then either the Director's subordinates assigned to the supervision and control of the Work or the Director will exercise such authority.

The Engineer will decide any and all questions that may arise as to the quality and acceptability of materials furnished, work performed, and rate of progress of the Work. The Engineer will decide all questions that may arise as to the interpretation of the Specifications, Plans or Special Provisions, the fulfillment of the Contract on the part of Contractor, and all questions as to the rights of different contractors on the project. The Engineer will determine the amount and quality of the Work performed and materials furnished, for which payment is to be made under the Contract.

Whenever, in these Specifications, or upon the Plans, the words "directed," "required," "permitted," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood the direction, requirement, permission, order, designation, or prescription of the Engineer is intended; and similarly, the words "approved," "acceptable," "satisfactory," or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer, subject in each case to the final determination of the Director and/or the City Council.

5-2 CONFORMITY WITH PLANS AND ALLOWABLE DEVIATIONS

Finished surfaces shall conform to the lines, grades, cross-sections, and dimensions shown on the approved Plans and working drawings, unless a deviation from the Plans is authorized in writing by the Engineer.

5-3 COORDINATION OF CONTRACT DOCUMENTS

These Specifications, the Plans, Special Provisions, and all supplementary Plans, drawings, and other Contract Documents are essential parts of the Contract, and a requirement occurring in one is just as binding as though occurring in all. These documents are intended to be integrated to describe and provide for a complete Work. Whenever a reference is made in these Specifications to a Section or subsection of another agency's Specifications, such reference shall be deemed to include the General Provisions of such other Specifications of which the Section or subsection is a part, to the extent pertinent to the reference and not inconsistent with the other Contract Documents. In the event of a conflict in the Contract Documents, unless expressly indicated otherwise, the governing priorities shall be as follows:

1. A Change Order shall govern over all other Contract Documents.
2. The Agreement shall govern over all other Contract Documents except for any Change Order.
3. Addenda shall govern over all other Contract Documents except for the Agreement and any Change Order. Subsequent addenda shall govern over prior addenda only to the extent specified.
4. In case of conflict between the Specifications and the Special Provisions, the Special Provisions shall govern.
5. In case of conflict between Plans and Specifications, the Plans shall govern in matters of quantity and the Specifications shall govern in matters of quality.
6. In case of conflict within the Plans involving quantities and quality, Contractor shall furnish the greater quantity and quality material and procedure.
7. In case of conflict within a plan sheet involving figured or numerical dimensions the profile shall govern over the layout.
8. In case of conflict within the Specifications involving quality of material or procedure, Contractor shall furnish the higher quality material and procedure.
9. Specific notes shall govern over other notes and other portions of the Plans except Schedules.
10. Larger scale drawings shall govern over smaller scale drawings.
11. Detail plans shall govern over standard plates bound within the Specifications.
12. Figured or numerical dimensions shall govern over dimensions obtained by scaling.
13. Where provisions of codes, safety orders, Contract Documents, referenced manufacturers' specifications or industry standards are in conflict, the more restrictive and higher quality shall govern.

Contractor shall not take advantage of any error, discrepancy or omission in any of the Contract Documents if such error, discrepancy or omission was or should have been apparent to Contractor. As soon as Contractor discovers any apparent error, discrepancy or omission, Contractor shall immediately notify the Engineer, so that the Engineer may make a determination on the matter, which determination shall be final, subject to Contractor's right to submit a claim in accordance with applicable provisions of the Contract Documents.

The Work shall be performed and completed according to the meaning and intent of the Contract Documents.

In addition to the drawings made a part of this Contract at time of signing, by incorporation or reference, the Engineer may furnish such additional drawings from time to time during the progress of the Work, as are necessary to make clear and to define in greater detail, as may be necessary, the intent of the Specifications, Plans, Special Provisions and other Contract Documents and Contractor shall make its Work conform to all such drawings.

Should it appear that the work to be done or any of the matters related thereto are not sufficiently detailed or explained in the Contract Documents, Contractor shall provide the Engineer with a request for information (RFI) requesting such information or explanations as may be necessary to complete the Work. The City shall respond to RFIs within 20 calendar days of receipt, unless the Engineer reasonably determines that a longer time period is necessary to provide the information requested by Contractor. The City response (but not Contractor's RFI) shall become part of the Contract, and Contractor shall be responsible for conforming its activities and operations, including the activities and operations of all subcontractors and suppliers, to all applicable requirements, terms and conditions of the City's response.

5-4 COOPERATION OF CONTRACTOR

After all necessary signatures by City, City will supply Contractor a copy of the Plans, Special Provisions, and the fully executed Agreement. City will also make available to Contractor at least five (5) copies of the Plans and Special Provisions for Contractor's use in prosecuting the Work. If Contractor requests additional copies of the Plans and/or Special Provisions, the City or its designated reprographics firm will supply such additional copies at Contractor's expense.

Contractor shall give the Work the constant attention necessary to facilitate the satisfactory progress thereof. Contractor shall cooperate with the Engineer, inspectors and with other contractors in every way possible. Contractor shall at all times have a competent Superintendent at the site of

the Work and Contractor's Superintendent shall be fully authorized as Contractor's agent on the Work. Such Superintendent shall be capable of reading and understanding all of the Contract Documents. Unless otherwise approved by the Engineer, the Superintendent shall be an employee of Contractor who is responsible for providing continuous on-site supervision of the Work and shall be fully authorized to receive and follow any instruction given by the Engineer and to sign Change Orders on behalf of Contractor. Unless specifically called for by the Special Provisions, Contractor is not required to provide an office for use by the Engineer.

If requested by the Engineer, Contractor shall provide daily reports signed by Contractor's Superintendent indicating the location and description of operations and details of the equipment and labor used to perform the items of Work. Such details shall include the description of the items of Work, names and classifications of laborers, hours worked, description of equipment used, equipment numbers, hours equipment is in use, and hours equipment may be idle.

5-5 CONSTRUCTION STAKES

The Engineer will furnish Contractor with all lines, grades and measurements necessary for the proper prosecution and control of the Work unless stated otherwise in the Special Provisions. Contractor shall provide the Engineer with the City's standard Survey Request Form at least three (3) working days before construction stakes are required. The Engineer may reject any unreasonable or incomplete Survey Request Form and require Contractor to resubmit. Contractor shall have no claim for any costs, damages or extensions of time arising from any delay cased by Contractor's submittal of an unreasonable or incomplete Survey Request Form.

Such stakes and markings as the Engineer may set for either the City's or Contractor's guidance shall be preserved by Contractor. In the event that the stakes or marks placed by the Engineer are destroyed through carelessness or negligence on the part of Contractor or any Subcontractor and the destruction of these stakes or marks causes a delay in the Work, Contractor shall have no claim for damages or extensions of time. Additionally, the City reserves the right to charge Contractor or deduct from the progress payments the costs to the City for any re-staking and/or remarking required as a result of carelessness or negligence on the part of Contractor or any Subcontractor.

5-6 PERMANENT SURVEY MONUMENTS

Contractor is responsible for verifying that the arrangements have been made for preserving and/or perpetuating all permanent survey monuments that will be affected by the Work. Contractor is responsible for preserving all

permanent survey monuments that are not proposed to be disturbed. Contractor shall provide a minimum of ten (10) working days notice to Engineer prior to disturbance or removal of any permanent survey monument, and shall coordinate with the Engineer to reset monuments or provide permanent witness monuments and file the required documentation with the County Surveyor pursuant to Business and Professions Code Section 8771.

5-7 SUBMITTALS

Contractor shall supply all submittals that are required by the Special Provisions or are required by the Engineer. Unless otherwise specified herein, Contractor shall deliver five (5) copies of the submittals to the Engineer when required by the Contract Documents or the Engineer. Within twenty (20) calendar days after receipt of a submittal as specified above, the Engineer will return two (2) marked copies of the submittal to Contractor indicating one of the following four (4) actions taken by the Engineer, in the Engineer's sole discretion:

1. If the Engineer's review indicates no exceptions, copies will be returned marked "NO EXCEPTIONS TAKEN". Contractor may begin immediately on incorporating the material and equipment covered by the submittal into the Work.

2. If the Engineer's review indicates limited corrections are required, copies will be returned marked "MAKE CORRECTIONS NOTED". Contractor may begin immediately on incorporating into the Work the material and equipment covered by the corrected submittal, with the corrections noted by the Engineer.

3. If the Engineer's review indicates insufficient or incorrect data has been submitted, copies will be returned marked "REVISE AND RESUBMIT". No work may begin on incorporating the material and equipment covered by this submittal into the Work until the submittal is revised, resubmitted, and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".

4. If the Engineer's review indicates the material and equipment submittal is unacceptable, copies will be returned marked "RESUBMIT". No work may begin on incorporating the material and equipment covered by this submittal into the Work until a new submittal is submitted and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".

After approval by the Engineer, submittals (including any corrections noted by the Engineer) shall become a part of the Contract, and the work shall be done in conformity with such approved submittals. No such work shall be

started or material or equipment purchased until the submittals therefor have been approved. Submittals furnished to the Engineer shall include finished drawings, if required, that are neat, legible, to scale, and drawn to as large scale as reasonably possible.

5-8 RECORD DRAWINGS

Contractor shall maintain a neatly and accurately marked set of record drawings showing the final locations and layout of all facilities as-built. Drawings shall be kept current weekly, with all work instructions and Change Orders, accommodations, and construction adjustments. Drawings shall be subject to the inspection by the Engineer at all times, and progress payments, or portions thereof, may be withheld if drawings are not accurate and current. Prior to City's acceptance of the Work, Contractor shall deliver to the Engineer one (1) set of neatly marked record drawings, accurately showing all the information required above. If the Engineer does not approve the record drawings, Contractor shall revise and resubmit the record drawings as necessary to obtain the Engineer's approval. If Contractor fails to comply with the requirements of this section, the City may deduct and retain the cost of preparing the record drawings from the Contract.

5-9 SUGGESTIONS TO CONTRACTOR ADOPTED AT CONTRACTOR'S OWN RISK

Contractor shall be solely responsible for determining whether to follow or utilize any plan or method of work suggested by the Engineer to Contractor in whole or in part, and Contractor shall assume all risks therefor. The Engineer and City will assume no responsibility or risk therefore.

5-10 REQUEST FOR MODIFICATION OF WORK

Should conditions occur during the progress of the Work of such nature as to make it impossible for Contractor to comply strictly with the terms of the Contract with respect to a portion of the Work, Contractor shall make written request to the Engineer for a modification of such portion of the Work, provided that such modification would not be detrimental to the Work or create any additional cost to the City. If the modification is acceptable to the Engineer, Contractor will be notified in writing that the modification may be made, consistent with any conditions specified by the Engineer. If such modification is not acceptable to the Engineer, Contractor shall determine some other method of performing such portion of the Work that is acceptable to Engineer.

Such approved modifications shall in no way affect or alter the application of any provision of the Contract to any portion of the Work for which no modification is approved by the Engineer.

5-11 RIGHT TO PERFORM EXTRA WORK

In case of neglect or refusal by Contractor to perform any extra work as directed by the Engineer pursuant to Section 4-6 of these Specifications or to make satisfactory progress in the execution of the same, the City may employ any person or persons to perform such work, and Contractor shall not in any way interfere with the person or persons so employed.

5-12 PROVISIONS FOR EMERGENCIES

Whenever, in the opinion of the Engineer, Contractor has not taken sufficient precautions for the safety of the public or the protection of the Work or adjacent structures or property and immediate action is necessary in order to protect the public, any person or any property or property interest (hereafter referred to as "emergency work"), the Engineer, with or without notice to Contractor, may, but will not be obligated to, take such action and/or obtain or provide for such work and material as the Engineer may consider necessary and adequate to furnish such protection.

The City's cost to perform, obtain or provide for such action, work and material shall be paid by Contractor, and may be deducted by City from any payment due or to become due to Contractor.

The performance of emergency work under the direction of the Engineer shall in no way relieve Contractor from its responsibility or liability for any damages that may occur while or after any actions are or have been taken by the Engineer.

5-13 SUSPENSION OF WORK TO PROTECT HEALTH, SAFETY OR WELFARE OF PERSONS OR PROPERTY

In the event the Engineer determines in the Engineer's sole discretion that a situation exists where continuation of the Work would be illegal or endanger the health, safety or welfare of persons or property on or affected by the Work, the Engineer will have the right to order Contractor in writing to delay or suspend the Work in whole or in part for a period of time equal to the period of time while such situation exists. Any order given to Contractor to suspend or delay the Work shall identify the situation that makes such suspension or delay necessary.

Such order of the Engineer shall not otherwise modify or invalidate in any way any of the provisions of this Contract, and Contractor shall not be entitled to any damages or compensation from City on account of such delay or suspension.

5-14 RIGHT TO RETAIN IMPERFECT WORK

If any portion of the work done or material furnished under this Contract proves defective and not in accordance with the Contract Documents, and if the imperfection is not of sufficient magnitude or importance to make the Work or any portion of the Work dangerous or undesirable, the Engineer will have the right and authority, but shall not be obligated, to retain such imperfect work instead of requiring the imperfect work to be removed and reconstructed. The Engineer may make such deduction from the payments due or to become due to Contractor as determined appropriate by the Engineer to account for the imperfections and/or pay the City's costs of removal and reconstruction.

5-15 STORAGE OF MATERIALS AND EQUIPMENT

Contractor shall be solely responsible for protecting work in place and materials and equipment stored on-site or off-site from contamination by dust, dirt, debris or mold. Materials and equipment shall be stored so as to ensure the preservation of their quality and fitness for the Work. Stores of equipment and materials shall be located so as to facilitate inspection by the City. Contractor shall be responsible for all damages that occur in connection with the care and protection of all materials and equipment to be incorporated in the Work until the completion and final acceptance of the Work by the City.

Prior to storing any materials or equipment on private property not owned by Contractor, Contractor shall obtain written permission from the property owner and, if different than the property owner, the occupant of the property. Contractor shall be solely responsible for obtaining such permission and complying with any and all conditions and requirements of the property owner and/or occupant, and the City shall have no responsibility of any kind therefor.

Contractor shall be solely responsible for maintaining adequate security and warning signs and controlling dirt, debris and dust within the limits of Contractor's storage areas at all times. Contractor shall take whatever steps are necessary or are required by the Engineer to prevent and eliminate blowing dust.

Prior to commencing the Work, Contractor shall submit a written "Storage of Materials and Equipment Plan" for approval by the Engineer. This Plan shall specify the location, entry date and exit date for all locations where Contractor will store materials or equipment, and a site maintenance plan for all such locations. Additionally, this Plan shall describe the measures that Contractor will undertake to minimize impacts to driveways, residents and the general public in the vicinity of such storage locations during work and non-work hours. If this Plan is not approved by the Engineer, Contractor shall revise and resubmit the Plan as necessary to obtain the Engineer's approval.

5-16 MANUFACTURER'S DIRECTION

Manufactured articles, material, and equipment shall be applied, installed, connected, erected, adjusted, tested, used, cleaned, maintained, and conditioned as recommended by the manufacturer. Copies of the manufacturer's installation instructions and procedures shall be submitted, in accordance with Section 5-7 of these Specifications.

5-17 QUALITY OF MATERIALS AND WORKMANSHIP

Whenever it is provided in the Contract that Contractor shall furnish materials or manufactured articles or shall do work for which no detailed specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable in the market from firms of established good reputation, or, if not ordinarily carried in stock, shall conform to the usual standards for first-class materials or articles of the kind required, with due consideration of their intended use. The work performed shall be in full conformity with the intent to secure the best standard of construction and equipment for the Work as a whole or in part.

5-18 TRADE NAMES AND ALTERNATIVES

For convenience in designation, certain articles or materials to be incorporated in the Work may be designated under a trade name or the name of a manufacturer and its catalogue information. Unless such trade or manufacturer name is expressly designated as the only brand that will be accepted, for one or more of the purposes specified in Public Contract Code Section 3400(b), such designation shall be deemed to include the words "or equal," so that the use of an alternative article or material that is of equal quality and possesses the required features and characteristics for the purpose intended will be permitted, subject to the following requirements:

The burden of proof as to the quality and suitability of alternatives shall be upon Contractor, who shall furnish all relevant information as required by the Engineer. The Engineer will be the sole judge as to the quality and

suitability of alternative articles or materials and the Engineer's decision will be final.

Whenever the Contract Documents permit the substitution of a similar or equivalent material or article, no tests or action relating to the approval of such substitute material will be made until the request for substitution is made in writing by Contractor accompanied by complete data as to the equality of the material or article proposed. Such requests shall be made in ample time to permit approval without delaying the Work, but need not be made within thirty (30) days after award of the Contract.

5-19 DUTIES AND POWERS OF INSPECTORS

Properly authorized inspectors shall be considered to be the representatives of the City with respect only to the duties and powers entrusted to them, subject to any limitations on their authority specified by contract or under any Laws or Regulations. Their duty will be to inspect materials and workmanship of those portions of the Work to which they are assigned, either individually or collectively, under instructions of the Engineer, and to report any and all deviations from the Contract Documents that they may notice. Until such time as the Engineer is notified and determines and orders that the Work may proceed, if in the inspector's opinion such action is necessary, any inspector assigned to the Work will have the authority to order Contractor to stop the Work to which such inspector is assigned.

5-20 INSPECTION

All work and materials furnished pursuant to this Contract shall be subject to inspection and approval or rejection by the Engineer. In order to assure strict compliance with the requirements of the Contract, the Engineer may assign such assistants as the Engineer may deem necessary to inspect work and material furnished under this Contract. Contractor shall notify the Engineer of the time and place of any factory tests that are required by the Contract, and the time and place of preparation, manufacture or construction of any material for the Work, or any part of the Work, that the Engineer notifies Contractor the Engineer wishes to inspect.

Contractor shall give such notice not less than three (3) working days in advance of the beginning of the work on any such material or of the beginning of any such test to allow the Engineer to make arrangements for inspecting and testing or witnessing as the case may be, if such inspection and testing or witnessing are deemed beneficial by the Engineer or are required by the Contract.

When the Engineer considers such action to be proper and practicable the Engineer will at the written request of Contractor, cause materials intended for use in the Work to be inspected at the point of production or manufacture. The Engineer may at any time cause such an inspection, however, it will not be undertaken until the Engineer is assured of the cooperation and assistance of both Contractor and the material producer. The Engineer or the Engineer's authorized representative(s) will have free entry at all times to such parts of the plant as concerns the manufacture or production of the materials. Adequate facilities shall be furnished free of charge to make the necessary inspection. Notwithstanding the foregoing, the City shall have no obligation of any kind to inspect materials at the source of supply.

Unless authorized by the Engineer, any work done in the absence of an inspector that may be completed or in progress shall be subject to inspection. If required by the Engineer, Contractor shall furnish all tools, labor, materials, and other facilities necessary to make such inspection, even to the extent of uncovering or taking down portions of the finished work. Contractor shall pay the cost of such inspection and removing any defective work and performing any necessary reconstruction.

5-21 REMOVAL OF REJECTED MATERIALS AND STRUCTURES

Contractor shall remove from the site of the Work, without delay, all rejected materials or structures of any kind brought to or incorporated in the Work, and upon Contractor's failure to do so, or to make satisfactory progress in doing so within forty-eight (48) hours after the service of a written notice from the Engineer, the rejected material or work may be removed by City and the City may deduct the cost of such removal from any payments that are due or may become due Contractor. No such rejected material shall again be offered for use by Contractor under this Contract or any other contract with City. Contractor shall not use any such rejected material in the performance of the Contract.

5-22 APPROVAL OF SOURCES OF SUPPLY OF MATERIALS

The Engineer may require Contractor to provide information on the source of supply of any and all materials for the Work and may require that the Engineer's approval be obtained prior to Contractor securing any or all materials. The Engineer may require Contractor to submit representative samples of any and all materials for inspection and testing by City.

Even though a source of supply has been approved, such approval shall not prevent subsequent disapproval or rejection of materials, if the quality of the product or material is later determined to be below the standard or requirements set by any of the Contract Documents.

5-23 PREPARATION FOR TESTING

Contractor shall at all times maintain proper facilities and provide safe access for inspection by City of all parts of the Work and of the shops or other locations where any portion of the Work is in preparation. Where the Specifications or Special Provisions require work to be specially tested or approved, it shall not be tested or covered up without at least a 24 hour written notice to the Engineer of its readiness for inspection unless the written approval of the Engineer for such testing or covering is first obtained.

5-24 METHODS OF SAMPLING AND TESTING

Contractor shall furnish samples of materials for testing as may be required by the Engineer. Contractor shall furnish such samples without cost to City. Testing shall be done to such standards as may be set forth in the Contract Documents. References made in these documents to standard methods of testing materials shall by such reference make such standards a part of the Contract.

Whenever a reference is made in the Contract Documents to a specification or test designation either of the A.S.T.M., the A.A.S.H.T.O., the A.W.W.A., the Federal Specifications, or any other recognized national organization or State of California agency, and the number or other identification representing the year of adoption or latest revision is omitted, it shall mean the specification or test designation in effect on the day the Notice to Contractors for the Work was dated.

Section 6

LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

6-1 LAWS TO BE OBSERVED

Contractor shall be familiar with all Federal, State, and local Laws or Regulations that in any manner affect those engaged or employed in the Work, or the material or equipment used in or upon the site of the Work, or the conduct of the Work. Any misunderstanding or ignorance on the part of Contractor of such Laws or Regulations shall not in any way relieve Contractor of any responsibility under such Laws or Regulations or the Contract or otherwise modify the Contract.

Contractor shall at all times observe and comply with all Laws or Regulations affecting the conduct of the Work, and Contractor and its Sureties shall defend, indemnify and hold harmless City and all of its officers, agents, and employees against any claim for liability arising from, based upon, or resulting from a condition created as a result of, the violation of any such Law or Regulation, whether by Contractor or any Subcontractor or Supplier or any of their respective officers, employees or agents.

6-2 CERTAIN LAWS AFFECTING THE WORK

In this Section, Contractor's attention is directed to certain laws that affect the Contract. The listing of such laws in this Section is not to be construed as a complete inventory of all applicable Laws or Regulations, but is rather a summary of a few selected State laws and City ordinances applicable to the Work.

1. State Laws

a. Labor Discrimination

Contractor shall not discriminate in the employment of persons on any ground listed in Labor Code Section 1735. The penalty for any such discrimination will be as set forth in the Labor Code, Section 1735, and Chapter 1 of Part 7 of Division 2 of the Labor Code.

b. Fair Labor Standards Act

Contractors shall comply with the Fair Labor Standards Act of 1938 (52 Stat. 1060) as amended as it may be applicable.

c. Contractors License

Bidders and Contractors shall maintain license as required by Chapter 9 of Division III of the Business and Professions Code.

d. Subcontractors

The rules concerning the use of Subcontractors have been discussed in Section 2-9 of these Specifications. Particular reference was made therein to Section 4101 to Section 4113, inclusive, of the Public Contract Code.

e. Underground Service Alert

Prior to conducting any excavation, Contractor shall contact the Underground Service Alert – Northern California as required by Government Code Section 4216.2, and shall take any and all other actions necessary to comply with and shall be subject to the provisions of Government Code Sections 4216.2 through 4216.9, inclusive.

2. Local Ordinances

a. Prevailing Wages

Pursuant to Section 3.60.180 of the Sacramento City Code, Contractor shall pay not less than the prevailing rate of wages as determined by the Director of the California Department of Industrial Relations pursuant to Labor Code Section 1773. The wage rate determinations may be viewed on the Internet at http://www.dir.ca.gov/dlsr/. Witholdings and penalties shall be as set forth in Section 3.60.180 of the Sacramento City Code and applicable Labor Code provisions.

For Federally funded projects, Contractor shall pay the higher of the Federal Davis Bacon Wage Rate, that is published with the Contract, or the rate specified herein for each trade or work classification employed. Contractor is responsible for submitting all required original signed payroll documents to the City for itself and all Subcontractors. The City shall not recognize any claim for additional compensation because of the payment by Contractor of any wage rate in excess of the prevailing wage rate required under the Contract.

The wage rates determined by the Director of the California Department of Industrial Relations refer to expiration dates. Prevailing wage determinations with a single asterisk (*) after the expiration date apply to any contract advertised for bids prior to the expiration date and

are good for the life of the contract. Prevailing wage determinations with double asterisks (**) after the expiration date indicate that the wage rate to be paid for work performed after this date has been predetermined. If Work under the Contract will extend past this date, Contractor and its Subcontractors will be required to pay the new rate after such expiration date.

Contractor should contact the Prevailing Wage Unit, Division of Labor Statistics and Research (DLSR), (415-703-4780), to obtain predetermined wage changes for rates designated by a double asterisk (**) after the expiration date. The possibility of wage increases is one of the elements to be considered by Contractor in determining its bid, and shall not under any circumstances, be considered as the basis of a claim for additional compensation or damages against the City under the Contract.

b. Hours of Labor

Contractor shall comply with the provisions of Section 3.60.180 of the Sacramento City Code regarding the maximum hours of labor. Witholdings and penalties shall be a set forth in Section 3.60.180 of the Sacramento City Code and applicable Labor Code provisions.

c. Apprentices

Contractor shall comply with the provisions of Section 3.60.190 of the Sacramento City Code, as well as any other applicable Laws or Regulations.

d. Grading, Erosion, and Sediment Control

Contractor shall be responsible for controlling erosion and sedimentation within the limits of the Work site at all times during the course of construction, including evenings, nights, weekends and holidays in addition to the normal working days, in accordance with the provisions of Chapter 15.88 of the Sacramento City Code.

e. Storm Water Management and Discharge Control

Contractor shall prevent sediment and construction debris from entering the storm water conveyance system in accordance with Chapter 13.16 of the Sacramento City Code.

f. Work Affecting the Public Right-of-way

Contractor shall be responsible for obtaining City approval of and complying with a traffic control plan, providing for the maintenance of construction areas affected by the Work, protecting existing facilities in the Work area, repairing any existing facilities damaged by Contractor's operations, and notifying the public prior to performing the Work in accordance with the provisions of Chapter 12.20 of the Sacramento City Code.

g. Noise Regulations

Contractor shall comply with the provisions of Chapter 8.68 of the Sacramento City Code.

h. Dust Regulations

Contractor shall take reasonable cautions to prevent and control the movement of dust created by Contractor's Work activities in accordance with Section 15.40.050 of the Sacramento City Code. The Engineer may stop Work activities during conditions of high winds that may carry dust from the Work-site.

3. The statute and ordinance citations set forth above shall be deemed to refer to future amended or renumbered versions of the statute or ordinance cited.

6-3 PERMITS, LICENSES AND FEES

Unless otherwise indicated in the Special Provisions, Contractor shall at Contractor's sole expense obtain all necessary permits and licenses for the construction of the Work, give all necessary notices, pay all fees required by law, and comply with all Laws and Regulations relating to the Work and to the preservation of the public health and safety.

6-4 PROTECTION OF CITY AGAINST PATENT CLAIMS

Contractor shall assume all cost arising from the use of patented, copyrighted, trademarked or other similar materials, equipment, devices, or processes used on or incorporated in the Work and shall defend, indemnify and hold harmless the City of Sacramento together with all of its officers and employees, and their duly authorized representatives, from any and all claims and actions, including claims and actions for violation of intellectual property rights, arising on account of the use of any such materials, equipment, devices, or processes by Contractor or any Subcontractor or Supplier. Before final

payment is made on the Contract, if requested by Engineer, Contractor shall furnish acceptable proof of a proper release from all costs arising from the use of such materials, equipment, devices, or processes used on or incorporated in the Work.

6-5 SANITARY REGULATIONS

Contractor shall fully comply with all Laws or Regulations governing sanitation and/or public health, and shall defend, indemnify and hold harmless the City of Sacramento together with all of its officers and employees, and their duly authorized representatives, from any and all claims, actions or other liabilities arising on account of any failure to do so by Contractor or any Subcontractor or Supplier.

Contractor shall construct and maintain the necessary sanitary conveniences for the use of the workers in such a manner and at such points as shall be approved by the Engineer, and the use of these facilities shall be strictly enforced.

Contractor shall obey and enforce such sanitary regulations and orders and shall take such precautions against contagious or infectious diseases as required by any Laws or Regulations or as the Engineer may deem necessary.

6-6 PUBLIC CONVENIENCE AND SAFETY

Contractor acknowledges and agrees that public safety is of utmost importance, and Contractor agrees that during the progress of the Work Contractor shall constantly protect and preserve the safety of the public. Contractor shall not unnecessarily cause inconvenience to the public during the progress of the Work and shall minimize the inconvenience caused by Contractor's operations. Such operations include, but are not limited to, work performed on or adjacent to the Work site, traffic lane and pedestrian closures and deliveries of material and equipment.

Materials stored on the work site shall be so placed that no hazard to the public and no damage to public property will result. Any property or other damage caused by Contractor shall be repaired by Contractor to the satisfaction of the Engineer at Contractor's own expense. Spillage resulting from hauling operations along or across any public traveled way shall be removed immediately by Contractor at Contractor's expense. Water or dust palliative shall be applied as necessary or if ordered by the Engineer for the alleviation or prevention of dust. Contractor shall insure that all utility services to customers in the project area are maintained.

The applicable State of California, Public Utilities Commission regulations shall be in effect at railroad grade crossings, and Contractor shall not interfere with or impair any railroad operations. If the Work could affect railroad operations in any way, Contractor shall be responsible for contacting the railroad prior to construction and complying with any and all requirements pertaining to railroad operations or facilities.

6-7 HOUSEKEEPING PRACTICES

Contractor shall implement good housekeeping practices during all construction activities until completion and final acceptance of the Work. In addition to practices specified elsewhere in the Contract Documents, Contractor is required to implement, at a minimum, the following housekeeping practices: solid waste management, material storage and delivery area, concrete waste management, and spill prevention and control.

Solid Waste Management: Contractor shall maintain a clean construction site. Contractor shall provide designated areas for waste collection. The waste collection areas shall be leak-proof containers with lids or covers. Site trash shall be collected daily and placed in the disposal containers. Contractor shall make arrangements for regular waste collection. Contractor also shall regularly inspect the waste disposal areas to determine if potential pollutant discharges exist.

Material Storage and Delivery Area: Contractor shall provide one central material storage and delivery area (MSDA) for the duration of the Work. This area shall be fenced or otherwise protected such that runoff will not be allowed to leave the MSDA site. Contractor shall regularly inspect the MSDA site to ensure that any hazardous or non-hazardous materials have not spilled.

Concrete Waste Management: Contractor shall arrange for concrete wastes to be disposed of off-site or in one designated area. Concrete wastes, including left-over concrete and material from washing out the concrete truck, shall not be disposed to the storm drain system via curb and gutter or otherwise. If a designated area is provided, the site shall be bermed to allow the concrete to dry. The dried concrete waste shall be removed and disposed of properly by Contractor at Contractor's expense.

Spill Prevention and Control: Contractor shall be responsible for instructing employees and Subcontractors about preventing spills of hazardous materials and controlling spills if they occur. Proper spill control and cleanup materials shall be kept on-site near the MSDA and updated as materials change on site.

More information about required Housekeeping Practices can be obtained by referring to the City of Sacramento's Administrative and Technical Procedures Manual for Grading, Erosion and Sediment Control available at 1395 35th Avenue, Sacramento, CA 95822.

6-8 TRENCH SAFETY PLANS

Before beginning excavation for a trench five (5) feet or more in depth, Contractor shall secure a permit from the Division of Industrial Safety. A copy of this permit must be available at the construction site.

When required on the Plans or by the Engineer, Contractor shall submit to the Engineer a detailed Plan showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground. Such Plan shall be approved by the Engineer at least five (5) days before Contractor intends to begin work on the trench. If such Plan varies from the shoring system standards established by the Construction Safety Orders of the Division of Industrial Safety, the Plan shall be prepared by a registered civil or structural engineer. Nothing herein shall be deemed to allow the use of shoring, sloping or protective systems less effective than that required by the Construction Safety Orders of the Division of Industrial Safety.

Contractor’s bid for any item requiring excavation shall include all costs to furnish, install, maintain and remove adequate sheeting, shoring and bracing, and any other measures necessary to maintain adequate worker protection and conform to all applicable safety orders.

6-9 COMPLIANCE WITH OSHA

Contractor shall be responsible for strict compliance with all requirements of the California Occupational Safety and Health Act (Labor Code Sections 6500 et seq.) that are applicable to the Work. The foregoing shall include, but not be limited to, all applicable Construction Safety Orders issued by the State of California, Division of Industrial Safety, under Title 8 of the California Code of Regulations.

6-10 TRAFFIC CONTROL REQUIREMENTS

Contractor shall be solely responsible for furnishing, installing and maintaining all warning signs and devices necessary to safeguard the general public and the Work, and to provide for the proper and safe routing of vehicular and pedestrian traffic during the performance of the Work. This requirement shall be continuous for the duration of the project, and shall not be limited to working hours. The use of flagmen, barricades, and construction

signing shall comply with the current edition of the California "Manual on Uniform Traffic Control Devices."

Contractor shall submit a traffic control plan showing proposed traffic control measures and detours for vehicles and pedestrians a minimum of ten (10) working days prior to the start of any Work within or affecting the street right of way. The traffic control plan shall include the following information pursuant to City Code Chapter 12.20:

1. The name and business address of the applicant.
2. A diagram showing:

- **a.** The location of the proposed work area;
- **b.** The location of areas where the public right-of-way will be closed or obstructed; and
- **b.** The placement of traffic control devices necessary to perform the work.

3. The proposed phases of traffic control in a narrative format including a description and dates for the beginning and ending of each phase.
4. The time periods when the traffic control will be in effect.

Contractor shall not be allowed to work until a City-approved traffic control plan is on file with the Engineer. If the Engineer determines at any time that actual traffic conditions under the approved plan are not adequate to ensure public safety, the Engineer may require the plan to be immediately modified. If a hazardous condition cannot be eliminated by plan modification the Engineer may require work under the plan to be stopped, and the plan suspended, until the safety hazard is remedied. Contractor shall not be entitled to any costs, damages or extension of Contract time arising from any stop work order issued by the Engineer under this Section.

Contractor shall provide safe pedestrian and disabled access through or around the construction area at all times. Sidewalk closure shall comply with the "Policy for Sidewalk Closures" established by the City of Sacramento's Department of Transportation pursuant to federal and state disability access laws and regulations. Contractor shall provide access to all existing driveways, adjacent parking areas, and buildings at all times unless other arrangements are made with the property owner and approved by the Engineer. Access for emergency vehicles shall be clear at all times.

Contractor shall use skid resistant steel plates to cover all excavations permitted to remain open in the roadway during non-working hours. Steel plates shall be placed in a safe and proper manner that does not impede the passage of pedestrians, bicycles, and the disabled community.

All Work within public streets and/or right-of-way shall be done in an expeditious manner so as to cause as little inconvenience to the public as possible. Unless otherwise approved, Contractor shall maintain at least one travel lane in each direction at all times on two-way Primary Streets (defined below), and at least two travel lanes at all times on one-way Primary Streets.

On working days, between 7:00 a.m. to 8:30 a.m. and 4:00 p.m. to 6:00 p.m., Contractor shall maintain the number of lanes normally available on all Primary Streets unless otherwise approved in writing by the City Traffic Engineer. In addition to the foregoing, on working days, Contractor shall maintain the number of lanes normally available on J Street between Interstate 5 and 16th Street between the hours of 7:00 a.m. and 6:00 p.m. unless otherwise approved in writing by the City Traffic Engineer.

"Primary Streets" are defined as any one of the following streets and its adjacent public sidewalk:

3rd St. between I St. & Broadway
5th St. between H St. & Broadway
6th St. between H St. & Q St.
7th St. between G St. & T St.
8th St. between G St. & Broadway
9th St. between G St. & Broadway
10th St. between G St. & Broadway
11 th St. between G St. & Q St.
12th Ave. btwn Martin Luther King, Jr. Blvd. & Sutterville Rd
12th St. between N 12th St. & W St.
13th St. between H St. & L St.
14th St. between G St. & L St.
15th St. between F St. & Broadway
16th St. between N 16th St. & Broadway
19th St. between G St. & Broadway
21st St. between 4th Ave. & G St
24th St btwn (Knight Way & Meadowview Rd, W St. & 2nd Ave)
29th St. between D St. & W St.
30th St. between E St. & T St.
34th St. between Folsom Blvd. & Broadway
43rd Ave. west of South Land Park Dr.
47th Ave., city portions between 24th St. & Stockton Blvd.
55th St.
65th St. between Folsom Blvd. & Broadway
65th St. Expressway between Elvas Ave. & south city boundary
Alhambra Blvd. between E. St. & Broadway
Alta Arden Expressway
Alta Valley Way
American River Dr. between Howe Ave. & Munroe St.
Arcade Blvd. between Marysville Blvd. & Marconi Ave.
Arden Way
Azevedo Dr.
G St. between 3rd St. & Alhambra Blvd.
Garden Highway
Greenhaven Dr.
H St.
Heritage Lane
Hornet Dr.
Howe Ave.
I St. between 3rd St. & 29th St.
J St.
Jackson Road
Jibboom St.
K St. between 15th St. & Alhambra Blvd.
L St. between 3rd St. & Alhambra Blvd.
La Mancha Way
La Riviera Dr.
Land Park Dr.
Mack Road
Main Ave. west of Kelton Way
Marconi Ave.
Martin Luther King, Jr. Blvd.
Marysville Blvd. btwn Del Paso Blvd. & Bell Ave.
Meadowview Road
Munroe St.
N St. between 2nd St. & Alhambra Blvd.
North 12th St.
North 16th St.
North B St. between N Th St. & 16th St.
Northgate Blvd.
Norwood Ave.
P St. between 2nd St. & Stockton Blvd.
Pocket Road
Point West Way

Broadway
Bruceville Road
Capitol Ave. between 15th St. & Folsom Blvd.
Carlson Dr.
Center Parkway
Challenge Way
College Town Dr.
Connie Dr. between Roseville Road & Marconi Ave.
Cosumnes River Blvd.
Del Paso Blvd. south of Marysville Blvd.
E St. between 7th St. & Alhambra Blvd.
El Camino Ave.
Elder Creek Road
Elsie Ave.
Elvas Ave. between 56th St. & 65th St.
Ethan Way
Evergreen St.
Exposition Blvd.
Fair Oaks Blvd.
Florin Perkins Road
Florin Road
Folsom Blvd.
Franklin Blvd.
Freeport Blvd.
Fruitridge Road
Power Inn Road
Q St. between 2nd St. & Alhambra Blvd.
Raley Blvd. .
Response Road
Richards Blvd.
Rio Linda Blvd.
Riverside Blvd.
Roseville Road
Royal Oaks Dr.
San Juan Road
Seamas Ave. east of Riverside Blvd.
South Land Park Dr.
South Watt Ave.
Sproule Ave.
Stockton Blvd.
Sunbeam Ave.
Sutterville Road
T St. between 34th St. & 39th St.
Truxel Road
University btwn Campus Commons & Fair Oaks.
Valley Hi Dr. between Franklin Blvd. & Mack Road
W St. between 3rd St. & 29th St.
West El Camino Ave.
Windbridge Dr.
Winding Way
X St. between 3rd St. & Alhambra Blvd.

The above definition of "Primary Streets" may be modified at any time upon written notice to Contractor by City, as the City Traffic Engineer deems necessary.

6-11 HOLIDAY SEASON CONSTRUCTION MORATORIUM

During the holiday season, construction will be suspended on Holiday Season Moratorium Streets (defined below) unless otherwise approved in writing by the City Traffic Engineer. As used herein, the term "holiday season" means the period of time beginning on Thanksgiving Day and ending on the first regular working day following New Years Day.

No new work that would interfere with traffic during the holiday season shall begin on any Holiday Season Moratorium Streets after November 1. All existing conditions within any Holiday Season Moratorium Streets shall be restored to their original or better condition prior to the start of the holiday season, and all unauthorized steel plates, barricades, and barriers shall be removed from all traffic lanes.

Contractor may submit a written request for exemption from the foregoing prohibition to the Engineer, explaining why Contractor should be allowed to work within any Holiday Season Moratorium Streets during the

holiday season. The request shall specify the time, date, and description of the work to be performed in the Holiday Season Moratorium Streets and the full extent of Contractor's proposed lane and/or sidewalk closure. The Engineer will decide whether to approve, conditionally approve or deny such request, in whole or in part, in the Engineer's sole discretion.

Emergency repairs to any Holiday Season Moratorium Streets will be permitted during the holiday season, provided that Contractor notifies the Engineer at least one (1) hour in advance during working hours. If the emergency arises during non-working hours, Contractor shall notify the Engineer before 9:00 a.m. the following workday. Any emergency repairs performed by Contractor shall otherwise comply with the Contract Documents and all applicable Laws or Regulations.

"Holiday Season Moratorium Streets" are defined as follows:

12th Avenue between Martin Luther King, Jr. Boulevard and Sutterville Road
21st Street between 4th Avenue and G Street
24th Street, between (Knight Way and Meadowview Rd) and (W Street and 2nd Avenue)
55th Street south of Fruitridge Road
Alta Arden Expressway
Arden Way
Broadway
Challenge Way
Del Paso Boulevard south of Marysville Blvd
El Camino Avenue
Ethan Way
Evergreen Street
Exposition Boulevard
Fair Oaks Boulevard
Florin Boulevard
Folsom Boulevard
Franklin Boulevard
Freeport Blvd, within one block of all its side streets between Broadway and Blair Ave
Fruitridge Road between Rickey Dr and 59th Street
Greenhaven Drive between Havenhurst Dr and Windbridge Drive
H Street
Heritage Lane
Howe Avenue
J Street
La Mancha Way
Mack Road
Marconi Avenue
Marysville Boulevard between Del Paso Boulevard and Bell Avenue
Meadowgate Way between Munson Way and Franklin Boulevard
Meadowview Road
Munson Way
Natomas Boulevard
Northgate Boulevard
Point West Way
Power Inn Road

Response Road
Royal Oaks Drive
San Juan Road
Stockton Blvd, and w/in one block of all it's side streets from Perry Ave to the south City imits
Truxel Road
Valley Hi Drive north of Wyndham Way
West El Camino Avenue

The above definition of "Holiday Season Moratorium Streets" may be modified at any time upon written notice to Contractor, as the City Traffic Engineer deems necessary.

In addition to the above listed streets, no work shall be performed during the holiday season on any street in the area bounded by the American River on the north, the Sacramento River on the west, one block south of Broadway on the south, and 34th Street on the east, without obtaining permission in writing from the City Traffic Engineer.

6-12 CONTRACTOR NOT AN AGENT OF CITY

At all times during the term of the Contract, Contractor shall be an independent contractor and shall not under any circumstances be considered an employee, agent, or other representative of the City. Contractor shall not be authorized to bind City to any obligation whatsoever. Nothing in this Contract shall be construed to create any relationship of joint venture, partnership or any other association of any nature whatsoever between City and Contractor other than that of owner and independent contractor. City shall have the right to control Contractor only insofar as provided in this Contract and only insofar as the results of Contractor's work pursuant to the Contract. The City's right of supervision shall in no manner reduce or abrogate Contractor's liability for any and all damage or injury to persons, public property or private property that may arise directly or indirectly from Contractor's performance of the Work.

6-13 APPROVAL OF CONTRACTOR'S PLANS NO RELEASE FROM LIABILITY

The approval by the Engineer of any drawing or any method of work proposed by Contractor shall not relieve Contractor of Contractor's responsibility for any errors therein and shall not be regarded as any assumption of risk or liability by City or any officer or employee thereof. Contractor shall have no claim under the Contract on account of the failure or partial failure or inefficiency of any plan or method so approved. Such approval by the Engineer shall be considered to mean merely that the Engineer has no objection to Contractor's using, at Contractor's sole responsibility and risk, the plan or method Contractor proposes.

6-14 CONTRACTOR SHALL NOT MORTGAGE EQUIPMENT

Contractor shall not mortgage or otherwise convey the title of the plant, machinery, tools, appliances, supplies, or materials that may at any time be in use, or further required or useful, in the performance of the Contract, without prior written consent of the Engineer.

6-15 PROPERTY RIGHTS IN MATERIALS

Nothing in this Contract shall be construed as vesting in Contractor any right of property in the materials used after they have been attached, or affixed to the Work, and on which partial payments have been made by City, but all such materials shall be the property of Contractor and City jointly as their interests may appear, and may not be removed from the Work by Contractor without the consent of City.

6-16 USE OF EXPLOSIVES

Explosives shall not be used on the Work unless permission to use them is granted by the Engineer in writing, and only then under such conditions as may be prescribed by the Engineer and in compliance with all applicable Laws or Regulations.

6-17 CONTRACTOR'S LEGAL ADDRESS

At Contractor's office at the site of the Work, Contractor shall provide a representative authorized to receive drawings, samples, notices, letters, instructions, explanation or other communications or articles from City. Drawings, samples, notices, letters, instructions, explanations, or other articles or communications may be mailed or personally delivered either to Contractor's address given in the Proposal, or to Contractor's representative at the site of the Work, or to Contractor's office at the site of the Work. The delivery at any of these places of any such item from City to Contractor shall be deemed sufficient service thereof upon Contractor, and the date of such service shall be the date of mailing or personal delivery. The address given in the Proposal may be changed by notice in writing from Contractor to City. Nothing herein contained shall be deemed to preclude or render inoperative the service of any drawing, sample, notice, letter, instruction, explanation, article or communication to or upon any authorized representative of Contractor personally.

6-18 ON STREET PARKING REMOVAL

In performing the Work, Contractor shall minimize the inconvenience to the public and shall only place "No Parking" signs in areas where parking clearly needs to be removed to safely perform the Work. "No Parking" signs shall be 11" by 17" inches, with red letters on white construction paper or other material approved by the Engineer, and shall comply with all applicable Laws or Regulations. "No Parking" signs shall be neat and clean, and clearly indicate the specific times and dates when parking is to be prohibited. "No Parking" signs shall be securely fastened to barricades, and shall not be placed on trees, utility poles, or other facilities not approved by the Engineer.

Contractor shall maintain the "No Parking" signs and barricades prior to and during the course of the Work. Contractor shall verify three days prior to commencing the Work, and continuously during the course of the Work, that the signs and barricades are adequately visible and properly placed.

The Engineer may make arrangements for vehicles that interfere with the Work to be towed. No vehicles parked in a "No Parking" area will be towed without acceptable documentation that the signs and barricades are properly placed, and no towing will be allowed unless the Engineer determines that a reasonable person would have been able to determine that parking is not allowed. If Contractor requests towing of a vehicle, Contractor shall include in such request written documentation indicating that the "No Parking" barricades were placed at least seventy-two (72) hours in advance of the start of Work, and Contractor shall provide a photograph of the vehicle to be towed, showing the nearest "No Parking" sign. Contractor shall reimburse City for any payment of a claim filed against the City for the towing of any vehicle without the Engineer's approval or acceptable documentation as provided herein.

<u>In Non Metered Areas</u>

Seventy-two (72) hours prior to the start of Work, Contractor shall place "No Parking" signs on approved barricades at fifty (50) to sixty (60) foot intervals.

<u>In Metered Parking Areas</u>

Contractor shall obtain permission to remove parking stalls from the City Parking Division not less than three (3) working days before the start of construction and shall be responsible for the payment of parking removal fees pursuant to applicable provisions of the Sacramento City Code. It is recommended that Contractor consult with the City's Parking Division to obtain an estimate of the fees.

If Contractor pays the applicable fees and the removal of parking stalls is approved by City, seventy-two (72) hours prior to the start of Work, Contractor

shall place "No Parking" signs adjacent to every third parking stall to be removed, when an entire block of parking is to be removed. Contractor shall move these signs into every third parking stall at the beginning of the workday, in conjunction with the covering of parking meters for all stalls to be removed. If Contractor only needs to remove a portion of parking stalls on a block, every stall removed shall be barricaded with a "No Parking" sign in conjunction with the covering of parking meters for all stalls to be removed. Contractor shall comply with any other conditions specified by the City for such parking stall removals.

In addition to the foregoing, Contractor shall comply with all applicable requirements of the Sacramento City Code pertaining to on-street parking removal.

6-19 MAIN AND TRUNKLINE UTILITIES

The City of Sacramento is a member of the Underground Service Alert (U.S.A.) one-call program. Contractor or any Subcontractor is required to notify the U.S.A. at least two (2) working days, but not more than fourteen (14) calendar days, in advance of performing excavation work as provided in Government Code Section 4216.2, and Contractor shall comply with all other applicable requirements specified in Article 2 of Division 5 of the Government Code, commencing with Section 4216.

Contractor shall bear the responsibility, as between Contractor and the City, for the timely removal, relocation or protection of any existing main or trunkline utility facilities located on the site of the Work and identified on any of the Contract Documents in their approximate location (defined below). Subject to the provisions of this Section, City shall bear the responsibility, as between Contractor and City, for the timely removal, relocation or protection of any existing main or trunkline utility facilities located on the site of the Work that are not identified in any Contract Documents in their approximate location; provided that nothing herein shall be deemed to require City to indicate the presence of existing service laterals or appurtenances whenever the presence of existing service laterals on the site can be inferred from the presence of other visible facilities, such as buildings, meter and junction boxes, valves, service facilities, identification markings and other indicators of whatsoever and every nature, on, or adjacent to, the site of the Work, and Contractor shall bear the responsibility, as between Contractor and the City, for the timely removal, relocation or protection of such service laterals.

In the event that existing main or trunk line utility facilities on the site of the Work are required to be located or repaired, or removed and relocated, or protected, and such subsurface main or trunk line utility facilities were not identified in any of the Contract Documents at their approximate location, and any damage occurring to such main or trunk line facilities was not due to the

failure of Contractor or any Subcontractor to use reasonable care, then City shall pay for the cost of locating and repairing, or removing and relocating, or protecting such main or trunk line utility facilities. A subsurface main or facility shall be deemed to be in the "approximate location" shown on the Contract Documents if the main or facility or any portion thereof is located within a strip of land extending twenty-four inches (24") on either side of the location for the exterior surface of the main or facility shown on any of the Contract Documents. "Approximate location" does not refer to the depth of the subsurface main or facility.

The obligation of City to pay in instances of a discovery of main or trunk line facilities on site in the circumstances described above shall be limited strictly to the costs described above and for any equipment on the site of the Work necessarily idled as a result of such circumstances.

In the event the completion of the project is delayed by (1) a failure of City to provide for the repair, removal, relocation or protection of an existing main or trunk line utility facility not identified in its approximate location on any of the Contract Documents, or (2) a failure by another owner of an existing main or trunk line utility facility to provide for the repair, removal, relocation or protection of such main or facility, except in cases where Contractor is responsible under the Contract for causing such repair, removal, relocation or protection to occur, then such delay shall be an Excusable Delay as that term is defined in the Contract Documents.

Nothing herein shall be construed to relieve any utility from any obligation as required either by law or by contract to pay the cost of removal or relocation of existing utility facilities. For facilities owned by a public utility, the public utility shall have the sole discretion to perform repairs or relocation work or permit Contractor to do such repairs or relocation work at a reasonable price. Nothing herein shall preclude City from pursuing any appropriate remedy against the utility for delays that are the responsibility of the utility.

If, after commencing the Work, Contractor discovers existing main or trunk line utility facilities located on the site of the Work that were not identified on any of the Contract Documents in their approximate location, Contractor shall immediately notify the Engineer and the owner of the utility facility in writing by the most expeditious means available.

6-20 ITEMS CONTAINING TRADE SECRETS OR PROPRIETARY RIGHTS PROHIBITED

Neither Contractor nor any Subcontractor shall furnish any item or combination of items to which, or in which, Contractor or any Subcontractor or Supplier claims any trade secret or proprietary right, and City shall own

without restriction all items furnished under this Contract. Such items shall include, without limiting the generality of the foregoing, any item assembly, combination of items, process, electrical or mechanical or electro-mechanical or microprocessor process or program, or any combination or sequence thereof. Neither Contractor nor any Subcontractor shall furnish any item or combination of items pursuant to this Contract containing any program or programmable item without first obtaining the written consent of the Engineer, that may be withheld or conditioned in any manner determined to be in the best interest of the City by the Engineer in the Engineer's sole discretion. In the event of any conflict between the provisions of this Section and Section 5-18 ("Trade Names and Alternatives"), the provisions of this Section shall prevail.

Section 7

PROSECUTION AND PROGRESS

7-1 ASSIGNMENT

The Contract may be assigned only upon written consent of the City Council of the City of Sacramento, and also with the consent of Contractor's Sureties, unless the Sureties have waived their rights of notice of assignment.

7-2 WORK SCHEDULE AND ADEQUATE RESOURCES

Contractor shall perform the Work under this Contract with all materials, tools, machinery, apparatus, and labor necessary to the complete and timely execution of everything described, shown or reasonably implied under this Contract on or before the Contract Completion Date.

Contractor shall give to the Engineer full information in advance as to Contractor's plans for carrying on any part of the Work. Contractor shall submit to the Engineer prior to the pre-construction meeting or as otherwise required in the Special Provisions a detailed achievable schedule for the various items of Work and for completion of the Work as a whole, using the critical path method (CPM) or other format acceptable to the Engineer. If such schedule is not accepted in writing by the Engineer, Contractor shall revise and resubmit the schedule as necessary to obtain the Engineer's written acceptance. If at any time during performance of the Work the Engineer notifies Contractor that its latest accepted schedule is not reasonable or does not accurately reflect the current progress or sequence of Work, Contractor shall revise and resubmit an updated schedule within five (5) working days of the Engineer's notification. If such updated schedule is not accepted in writing by the Engineer, Contractor shall revise and resubmit the schedule as necessary to obtain the Engineer's written acceptance. Notwithstanding any contrary provision of the Contract Documents, Contractor shall not be entitled to claim any damages or compensation for any delay caused by the City unless Contractor's claim of City-caused delay is substantiated by an accurate CPM schedule accepted by the Engineer indicating the Controlling Operation(s) and sequence of Work, that Contractor submitted to the City prior to the occurrence of the delay.

The schedule(s) required herein shall show the order in which Contractor proposes to carry out the Work, the total float period, the logical relationships between Work activities, the critical path, the dates on which Contractor will commence the different tasks comprising the Work (including procurement of materials, plant, and equipment), and the contemplated dates for completing such tasks.

The schedule(s) submitted shall be consistent in all respects with the completion time requirements and any order of work requirements indicated in the Contract.

Subsequent to the time that submittal of a schedule is required in accordance with these Specifications, no progress payments will be made for any Work until such schedule has been submitted to the Engineer.

If at any time before the beginning or during the progress of the Work, any part of Contractor's plant, or equipment, or any of Contractor's methods of execution of the Work, appear to the Engineer to be unsafe, inefficient, or inadequate to insure the required quality or rate of progress of the Work, the Engineer may order Contractor to increase or improve its facilities or methods, and Contractor shall promptly comply with such orders at no cost to the City; but neither compliance with such orders nor failure of the Engineer to issue such orders shall relieve Contractor from its obligation to secure the degree of safety, the quality of the Work, and the rate of progress required of Contractor under the Contract Documents. Contractor alone shall be responsible for the safety, adequacy, and efficiency of its plant, equipment, and methods.

7-3 WORK UNDER UNFAVORABLE WEATHER AND OTHER ADVERSE CONDITIONS

During unfavorable weather and other adverse conditions, Contractor shall pursue only such portions of the Work as will not be damaged thereby. If the quality or efficiency of any portions of the Work will be affected by any unfavorable conditions, such portions shall not be performed while those conditions exist, unless Contractor can overcome these conditions by special means or precautions approved by the Engineer.

7-4 SATURDAY, SUNDAY, HOLIDAY, AND NIGHT WORK

No work shall be done between the hours of 6 p.m. and 7 a.m., nor on Saturdays, Sundays or legal holidays, except such work as is necessary for the proper care and protection of work already performed or except in case of emergency or special situation, and in any case only with the permission of the Engineer or as specified in the Special Provisions.

Notwithstanding the foregoing, if Contractor first requests and obtains the written permission of the Engineer, Contractor may establish different hours of work as a regular procedure, as specifically approved by the Engineer; provided, however, that the Engineer may revoke such permission at any time for any reason. If such off-period work is approved, Contractor shall comply with any and all conditions established for such work by the Engineer at Contractor's own cost and expense, and Contractor shall pay any and all costs

incurred by the City in connection with such off-period work, including but not limited to the City's costs to inspect such work.

7-5 SEPARATE CONTRACTS

City reserves the right to let other contracts in connection with the project. Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate Contractor's work with theirs.

If any part of Contractor's Work depends for proper execution or results upon the work of any other contractor, Contractor shall inspect and promptly report to the Engineer any defects in such work that render it unsuitable for such proper execution or results. Contractor's failure to inspect and report any defects in such work shall constitute an acceptance of the other contractor's work as fit and proper for the reception of Contractor's Work, except as to defects not arising from the Contractor's Work that may develop in the other contractor's work after the execution of Contractor's Work.

7-6 REMOVAL OF UNSATISFACTORY EMPLOYEES

Contractor and Contractor's Subcontractors shall employ on the site of the Work only persons who are competent and skilled in their respective lines of work. Whenever the Engineer notifies Contractor that any person employed by or representing Contractor or any Subcontractor on the Work is, in the Engineer's opinion, incompetent, unfaithful or disorderly, or refuses to carry out the provisions of this Contract, or uses threatening or abusive language to or otherwise threatens or abuses any City employee or representative or any member of the public, or is otherwise unsatisfactory, Contractor shall remove or require its Subcontractor to remove the person from the Work and shall not return that person to the Work unless approved by the Engineer.

7-7 PROTECTION OF WORK, PERSONS AND PROPERTY AGAINST DAMAGE

Contractor shall protect the Work, all materials incorporated or to be incorporated in the Work and all equipment used in connection with the Work, whether located on or off the Work-site, and all public and private improvements and facilities within the site of the Work, from damage due to the nature of the Work, the action of the elements, trespassers, vandalism, fire or any other cause whatsoever, until the completion and City acceptance of the Work. The City shall not have or assume any responsibility for collecting indemnity from any person or persons causing damage to the work or property of Contractor. Any and all costs incurred by Contractor to protect the Work, materials, equipment, improvements and facilities as provided above shall be

included in Contractor's Proposal and Contractor shall not be entitled to any additional compensation or damages from City therefor.

Contractor shall furnish such guards, fences, warning signs, walks, and lights as shall be necessary, or as may be ordered by the Engineer, and shall take all other necessary precautions to prevent damage or injury to persons or property. Existing public and private improvements including utilities and adjacent properties shall be protected from potential damage resulting from the operations of Contractor or any Subcontractor. Typical improvements to be protected shall include, but shall not necessarily be limited to, trees, shrubbery, fences, walls, existing pavement, sidewalks, street improvements and underground utilities that are either to be, or not to be, removed under the Contract.

All existing street signage, markings and striping damaged as a result of construction shall be replaced in kind by Contractor, to the satisfaction of the Engineer. In the case of partial damage the whole stripe or marking in its entirety shall be replaced. Temporary marking and striping shall be installed within 3 working days of any damage.

All painted or other markings, such as Underground Service Alert (USA) markings, on the pavement, sidewalk or gutters used for constructing the project shall be removed by Contractor before final acceptance of the Work.

If public or private improvements are damaged by the operations of Contractor or any Subcontractor, the damaged improvements shall be replaced or restored at Contractor's expense to a condition as good as before the damage occurred.

The fact that any underground facility is not shown on the Plans shall not relieve Contractor of the responsibility to appropriately notify USA in order to determine the location of underground facilities, or to exercise sound judgment when working in the vicinity of known, visible or reasonably ascertainable underground facilities. It shall be Contractor's responsibility to ascertain the location of those underground facilities that may be subject to damage by reason of Contractor's operations.

7-8 TIME OF COMPLETION

Contractor shall complete all Work within the time set forth in the Agreement.

Contractor shall not be charged for a working day on which the Engineer determines that as a result of inclement weather, or conditions resulting from the weather, Contractor is or was prevented from engaging in the current

Controlling Operation or Operations of the Work with its normal labor and effort for at least five (5) hours of the day.

The current Controlling Operation or Operations shall be construed to mean any feature of the Work (e.g., an operation or activity, or a settlement or curing period) that, if delayed or prolonged, will necessarily delay the time of completion of the entire Work, as determined by the Engineer based on Contractor's most recent schedule that has been accepted by the Engineer.

The Engineer will furnish Contractor a weekly statement showing the number of working days charged to the Contract for the preceding week, the number of working days of time extensions being considered or approved, the number of working days originally specified for the completion of the Contract and the extended date for completion thereof, if any, except when working days are not being charged in accordance with the provisions in Section 7-9 "Temporary Suspension of Work." Contractor will be allowed 15 calendar days from the date of the Engineer's issuance of the weekly statement of working days in which to file a written protest of the Engineer's determination of working days; otherwise the weekly statement shall be deemed to have been accepted by Contractor as correct.

7-9 TEMPORARY SUSPENSION OF WORK

The Engineer shall have the authority to suspend the performance of the Work wholly or in part, for such period as the Engineer may deem necessary, due to unsuitable weather, or for such other conditions as are considered unfavorable for the suitable prosecution of the Work, or for such time as the Engineer may deem necessary due to the failure on the part of Contractor or any Subcontractor to carry out orders given, or to satisfactorily perform any provision of the Contract. Contractor shall immediately comply with the written order of the Engineer to suspend the Work wholly or in part. The suspended Work shall be resumed when conditions are favorable and/or methods are corrected, as ordered or approved in writing by the Engineer.

If a suspension of Work or any portion of the Work is ordered by reason of the failure of Contractor or any Subcontractor to carry out orders or to satisfactorily perform any portion of the Contract, or by reason of weather conditions being unsuitable for performing any item or items of Work, which items, in the opinion of the Engineer, could have been performed prior to the occurrence of such unsuitable weather conditions had Contractor diligently prosecuted the Work in accordance with the Contract when weather conditions were suitable, Contractor shall perform at its own expense all the work necessary to (i) preserve and protect the Work and related facilities and improvements from weather and other environmental conditions during the period of suspension, (ii) repair any damage to the Work and/or related

facilities and improvements occurring before, during or after the period of suspension, and (iii) provide a safe, smooth, and unobstructed passageway through construction for use by public traffic and any other public use during the period of suspension. In the event Contractor fails to timely perform such work, the City may perform such work and the cost thereof will be paid by Contractor or will be deducted from moneys due or to become due Contractor under the Contract.

Except as may be provided otherwise in the Contract Documents, if the Engineer orders a suspension of all of the Work, or a portion of the Work that is the current Controlling Operation or Operations, by reason of unsuitable weather conditions, and in the opinion of the Engineer such suspension is not due to the failure of the Contractor or any Subcontractor to carry out orders or to satisfactorily perform any portion of the Contract nor due to the Contractor's failure to diligently prosecute the Work in accordance with the Contract prior to such suspension, Contractor shall perform all work necessary to (i) preserve and protect the Work and related facilities and improvements from weather and other environmental conditions during the period of suspension, and (ii) provide a safe, smooth, and unobstructed passageway through construction for use by public traffic and any other public use during the period of suspension, provided that the cost of such work shall, upon approval by the Engineer, be paid for as extra work as provided in Section 4-4 above, or, at the option of the Engineer, all or a portion of such work shall be performed by the City at no cost to Contractor.

If the Engineer orders a suspension of all of the Work, or a portion of the Work that is the current Controlling Operation or Operations, due to unsuitable weather or due to such other conditions that the Engineer considers unfavorable to the suitable prosecution of the Work, and in the opinion of the Engineer such suspension is not due to the failure of the Contractor or any Subcontractor to carry out orders or to satisfactorily perform any portion of the Contract nor due to the Contractor's failure to diligently prosecute the Work in accordance with the Contract prior to such suspension, the days on which the suspension is in effect shall not be considered working days. If a portion of Work at the time of such suspension is not a current Controlling Operation or Operations, but subsequently becomes the current Controlling Operation or Operations, the determination of working days will be made on the basis of the current Controlling Operation or Operations.

If a suspension of Work or any portion of the Work is ordered by the Engineer, due to the failure on the part of Contractor or any Subcontractor to carry out orders given or to satisfactorily perform any provision of the Contract, or by reason of weather conditions being unsuitable for performing any item or items of Work, which items, in the opinion of the Engineer, could have been performed prior to the occurrence of such unsuitable weather

conditions had Contractor diligently prosecuted the Work in accordance with the Contract when weather conditions were suitable, the days on which the suspension order is in effect shall be considered working days unless such days are not working days pursuant to Section 1-48(1) of these Specifications.

In the event of a suspension of Work under any of the conditions set forth in this Section, such suspension of work shall not relieve Contractor of its responsibilities as set forth elsewhere in the Contract Documents. This Section 7-9 shall not apply to any suspension of work to protect the health, safety, welfare or condition of persons or property pursuant to Section 5-13 of these Specifications.

7-10 DETOURS

Contractor shall construct and remove detours and detour bridges for the use of public traffic as provided in the Special Provisions, or as shown on the Plans, or as directed by the Engineer. Payment for such work shall be made as set forth in the Special Provisions, or, if not addressed there, at the Contract prices for the items of work involved if such prices are specified in the Contract. If not addressed in the Special Provisions and no such prices are specified in the Contract, all detours shall be constructed and removed at no additional charge by Contractor.

Contractor shall pay all costs of repairing damage to detours caused by public traffic.

When public traffic is routed through the Work, Contractor's obligation to provide for a safe passageway through construction operations shall not be considered to constitute construction or maintenance of a detour and Contractor shall not be entitled to any additional payment therefor, unless otherwise specified in the Special Provisions.

Detours constructed by Contractor exclusively for Contractor's or any Subcontractor's own use and convenience for hauling materials and equipment shall be constructed and maintained by Contractor at its own expense.

The failure or refusal of Contractor to construct and/or maintain adequate detours at the proper time and in satisfactory condition for use by public traffic shall be sufficient cause for closing down the Work until the Engineer determines that such detours have been constructed and/or are in satisfactory condition for use by public traffic. Contractor shall be solely responsible for all costs incurred to repair any damage to any detour caused by Contractor's or any Subcontractor's hauling or other activity.

Section 8

MEASUREMENT AND PAYMENT

8-1 MEASUREMENT OF QUANTITIES

The Engineer shall determine quantities of Work acceptably completed under the terms of the Contract, or as directed by the Engineer in writing, based on measurements taken by the Engineer or the Engineer's assistants. In computing quantities, the length, area, solid content, number, weight or time in standard units, as the case may be, shall be computed as specified in the Contract. All earth excavation shall be computed to the neat lines and grades as set and directed by the Engineer and shall be computed in relation to the original undisturbed condition.

8-2 SCOPE OF PAYMENT

The compensation provided by the Contract shall constitute full payment for furnishing all materials, supplies, equipment, tools, labor, and all incidentals necessary to complete the Work and for performing all work and services contemplated and implied by the Contract, and for loss or damage arising from the nature of the Work, or from action of the elements, or from unforeseen difficulties that may be encountered during the performance of the Work and until its final acceptance, and for all risks of every description connected with the performance of the Work, and for any infringement of patent, trademark, or copyright and for completing the Work according to the Contract Documents.

For unit price items, payment for those items at the unit price bid by Contractor shall constitute full payment for all work and services related to such items, except as otherwise specified in the Contract Documents. For any work or services required to perform the Work that are not specifically described in the Contract Documents, Contractor will include payment for such work and services under the bid of any item(s) that Contractor deems appropriate and City shall not pay additional compensation for any such work or services. No payment shall be made for materials stored on- or off-site until such materials are properly installed and incorporated in the Work.

8-3 PAYMENT ON ENGINEER'S CERTIFICATE

City shall make no payment pursuant to the Contract until the Engineer certifies that such payment is due on account of work done and material furnished in accordance with the Contract.

8-4 COMPLETION OF WORK AND FINAL PAYMENT

1. Issuance of Punchlist

A punchlist may be issued when the Engineer determines, as provided herein, that the Work is "substantially complete" as such term is defined in Section 1 of these Specifications. The Engineer may issue a punchlist on the Engineer's own initiative or in response to Contractor's request. If Contractor believes the Work to be substantially complete and requests issuance of a punchlist, the following provisions shall apply:

a. Contractor shall submit to the Engineer a written request for issuance of a punchlist. Contractor also shall provide any information relating to the Work that may be requested by the Engineer after receiving Contractor's request. The Engineer shall request such information, if any, not later than five (5) working days after receiving Contractor's request for issuance of a punchlist.

b. After reviewing such request and information and performing such other investigations, inspections or reviews as may be necessary to ascertain the condition or status of the Work, the Engineer, in the Engineer's sole discretion, shall either (1) issue a punchlist, or (2) notify Contractor in writing that the Work is not yet substantially complete, including a listing of items of the Work that are not yet complete and/or have more than minor deficiencies. Unless otherwise agreed by the parties, the Engineer shall take one of the above actions within ten (10) working days after receiving Contractor's request for issuance of a punchlist, or, if the Engineer requests information, within ten (10) working days after the Engineer receives such information. Any subsequent requests by Contractor for issuance of a punchlist shall be made in accordance with the provisions of this Section.

The City may issue one or more punchlists, as determined necessary or appropriate by the Engineer. The issuance of a punchlist shall be made solely for purposes of identifying items of the Work that have minor deficiencies, and shall not modify or otherwise affect the meaning, application or operation of any provision of the Contract Documents, including but not limited to any warranty, liquidated damages or termination provisions.

2. Final Acceptance of the Work

Final acceptance occurs when the Engineer determines, as provided herein, that the entire Work is complete. The Engineer may make this determination on the Engineer's own initiative or in response to Contractor's request. If Contractor believes the entire Work, including all punchlist work, to be complete and requests final acceptance, the following provisions shall apply:

a. Contractor shall submit to the Engineer a written request for final acceptance. Contractor shall provide any information relating to the condition or status of the Work as may be requested by the Engineer. The Engineer shall request such information, if any, not later than five (5) working days after receiving Contractor's request for final acceptance.

b. After reviewing such request and information and performing such other investigations, inspections or reviews as may be necessary to ascertain the condition or status of the Work, the Engineer, in the Engineer's sole discretion, shall either (1) issue final acceptance establishing the date of completion of the entire Work, or (2) notify Contractor in writing that the entire Work is not yet complete, including a list of items of the Work that are deficient. Unless otherwise agreed by the parties, the Engineer shall take one of the above actions within ten (10) working days after receiving Contractor's request for final acceptance, or, if the Engineer requests information, within ten (10) working days after the Engineer receives such information. Any subsequent requests by Contractor for final acceptance shall be made in accordance with the provisions of this Section. The date of completion of the entire Work determined by the Engineer shall be specified in any Notice of Completion filed pursuant to Civil Code Section 3093.

Completion of the Work shall not be deemed to occur under the Contract for any purpose until the Engineer determines the date of completion as provided above.

3. Final Payment

Upon determining the date of completion, the Engineer shall make a final estimate of the amount of Work done under the Contract, and the value of such Work and, if necessary, shall prepare a balancing Change Order. The Engineer shall send the final estimate to Contractor with a balancing Change Order, if required, for Contractor's review and signature.

Not later than fifteen (15) calendar days after receiving such final estimate and balancing Change Order, if any, Contractor shall either (1) sign the final estimate and balancing Change Order, if any, and return them to the Engineer, or (2) notify the Engineer in writing of any disagreement with the final estimate. If Contractor fails within this time period to either return the signed final estimate and balancing Change Order, if any, or notify the Engineer in writing of any disagreement with the final estimate, this shall be deemed to constitute acceptance by Contractor of the Engineer's final estimate and balancing Change Order (if any).

Upon Contractor's signature or acceptance of the final estimate and balancing Change Order, if any, as provided above, the City may approve such final payment amount and execute the balancing Change Order, if any, in accordance with applicable approval requirements of the Sacramento City Code. In the event that Contractor timely notifies the Engineer in writing of a disagreement with the final estimate, if such disagreement is not resolved fifteen (15) calendar days after the Engineer receives such notification, the City may unilaterally approve a final payment amount and execute a balancing Change Order therefor, if required, in accordance with applicable approval requirements of the Sacramento City Code; provided that such unilateral approval by the City shall not affect Contractor's right to seek additional compensation, if any, but only to the extent authorized under other provision(s) of the Contract Documents.

The City's final payment hereunder shall consist of the entire sum found to be due by the Engineer after deducting therefrom all previous payments and all amounts charged against or withheld from Contractor under any provision of the Contract Documents or any Laws or Regulations, and all amounts retained under the provisions of the Contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment. The City's subsequent release of any amounts charged, withheld or retained at the time of final payment shall not be considered to be a "final payment" as the term is used herein.

No payment made under the Contract at any time shall be construed to be an acceptance by City of any defective work or improper materials.

8-5 ASSIGNMENT OF CLAIMS

Contractor shall not assign, by power of attorney or otherwise, any right to any portion of the moneys that may become due or may be claimed to become due to Contractor under the Contract without the written approval of the City Council. No person other than the party signing the Contract shall have any claim thereunder, except as provided herein.

8-6 PAYMENTS BY CONTRACTOR

1. Contractor shall provide all labor, services, materials, and equipment necessary to perform and complete the Work under the Contract. Except as otherwise approved by City, Contractor shall: (1) pay in full for transportation and utility services on or before the 20th day of the month following the calendar month in which such services are rendered; and, (2) pay for all materials, tools, and other expendable equipment, to the extent of at least ninety percent (90%) of the cost thereof, on or before the 10th day after payment by City of any progress payment relating thereto.

2. In the absence of other provisions in the Contract applicable to any Subcontractor, Contractor shall pay each Subcontractor, within ten (10) days after each payment City makes Contractor, the sum allowed in such payment for and on account of the Work performed by the Subcontractor, to the extent of the Subcontractor's interest therein, as required by Section 7108.5 of the California Business and Professions Code.

3. In addition to other responsibilities specified in the Contract Documents, Contractor shall be responsible for payment of:

a. Restaking costs resulting from loss of stakes and survey markers due to Contractor's or any Subcontractor's negligence;

b. Repeat testing of soils and materials when the previous testing results failed to meet the requirement(s) specified in the Contract Documents; and

c. Overtime inspection costs when the Engineer determines the overtime inspection was performed primarily to benefit Contractor.

8-7 RELEASE AT TIME OF FINAL PAYMENT

If requested to do so by City, at the time of final payment, as a condition precedent to final payment, Contractor and each assignee under any assignment approved in accordance with the Contract Documents and in effect at the time of final payment shall execute and deliver a release in form and substance satisfactory to City that shall discharge City, its officers, agents and employees of and from all liability, obligations and claims arising under the Contract, provided that disputed Contract claims in stated amounts may be specifically excluded by Contractor from the operation of the release pursuant

to Public Contract Code Section 7100, but only to the extent that Contractor has complied with all procedures and requirements applicable to the presentation and processing of such claim(s) under the Contract Documents.

8-8 EXTRA WORK A PART OF THE CONTRACT

If extra work is ordered or authorized by the City in accordance with the provisions of the Contract, such work shall be considered a part thereof and subject to each and all of its terms and conditions.

8-9 INSPECTION AND PAYMENTS NO WAIVER OF CONTRACT PROVISIONS

No inspection, order, measurement, approval, modification, certificate, payment, acceptance of work or material (including, but not limited to, acceptance of the entire Work), extension of time or possession of any part of or the entire Work shall operate as a waiver of any of the terms and conditions of the Contract, the powers reserved therein to the City, or any right of City to damages or to reject work in whole or part. No waiver of any breach of the Contract shall be construed to constitute a waiver of any other or subsequent breach. All remedies provided in the Contract shall be construed to be cumulative and shall be in addition to all other rights and remedies that may exist at law or in equity.

8-10 PAYMENT BY COST AND PERCENTAGE

Payment by cost and percentage shall be made as follows:

1. For all materials purchased by Contractor and used in the specific portion of the Work, Contractor shall receive the actual cost of such materials including freight charges, as shown by original receipted bills for material and freight, to which shall be added an amount equal to fifteen percent (15%) of the sum thereof.

2. For all labor of any class including foremen engaged in the specific portion of the Work, Contractor shall receive the prevailing wage and fringe benefits (not including payroll taxes) paid for each hour such labor is engaged in the specific work, in accordance with the following method of calculation:

1.33 [(hourly wage + fringes) + 0.24 (hourly wage + fringes)]

3. For any Contractor-owned machine, power machinery and equipment that is deemed necessary and desirable to use on the specific portion of the Work, Contractor shall be allowed a rental price equivalent to the current Caltrans rental rate (less any state mark-ups) +15%. For

machines and equipment rented by Contractor, a rental price, fully maintained, must be agreed upon by City and Contractor in writing before the specific work is begun, for each hour such machines and equipment are used, to which shall be added no percentage. If a rental price is not agreed to in writing as specified herein the current Caltrans rental rate shall be used.

4. Where extra work under cost and percentage is being performed by a Subcontractor, Contractor shall be allowed a five percent (5%) surcharge on the combined total of (1), (2), and (3) above for work performed by the Subcontractor. This surcharge shall be allowed only to Contractor and not to any Subcontractors.

Contractor shall keep and present to the City in such form as the Engineer may direct, complete and correct documentation of the net cost of all labor and materials subject to the provisions of this Section.

No claim for payment for extra work, whether done by cost and percentage or otherwise, can be honored unless the Engineer has given prior written authority and permission for such work.

Section 9

(RESERVED)

Section 10

CONSTRUCTION MATERIALS

This Section describes various classes and types of materials used in public construction within the City of Sacramento. Materials to be used for the work and not included in this section shall be described and specified in the Special Provisions.

10-1 PORTLAND CEMENT

Unless otherwise specified in the Special Provisions, all cement used in concrete shall conform to ASTM C 150 and these Specifications, and shall be Type II, unless otherwise specified herein.

ASTM C 150, Type III, portland cement shall be used for concrete requiring high early strength where specifically required by the Special Provisions.

Type II and Type III portland cements shall be "low alkali" containing not more than 0.60 percent by weight of alkalies, calculated as the percentage of Na_2O plus 0.658 times the percentage of K_20.

When directed by the Engineer, Contractor shall furnish certificates of compliance stating that the cement delivered to the work complies with these Specifications.

10-2 CONCRETE AGGREGATES

Unless otherwise specified in the Special Provisions all concrete aggregates shall conform to ASTM C 33, except that grading requirements shall be as specified in Section 10-5 of these Specifications.

10-3 WATER FOR CONCRETE

Water used for mixing concrete and water used for curing concrete shall be clean, free from oil, acid, alkalies, vegetable matter, or other deleterious matter. No water containing excessive amounts of salts, sulphates, or chlorides shall be used.

10-4 PREFORMED EXPANSION JOINT FILLER

Unless otherwise specified in the Special Provisions, preformed expansion joint filler material shall conform to ASTM D 1751.

10-5 PORTLAND CEMENT CONCRETE

1. Composition:

Portland cement concrete (referred to herein as concrete) shall be composed of Portland Cement, fine aggregate, coarse aggregate, admixtures if used, and water.

Concrete shall be designated as one of the following classes:

Class “A” Concrete shall contain six (6) sacks (564 pounds) of portland cement per cubic yard and shall have a maximum size of coarse aggregate of one and one-half inches (1½").

Class “B” Concrete shall contain six (6) sacks (564 pounds) of portland cement per cubic yard and shall have a maximum size of coarse aggregate of three-quarter inch (¾")

Class “C” Concrete shall contain five (5) sacks (470 pounds) of portland cement per cubic yard and shall have a maximum size of coarse aggregate of one inch (1”).

Class “D” Concrete shall contain five (5) sacks (470 pounds) of portland cement per cubic yard and shall have a maximum size of coarse aggregate of three-quarters inch (¾").

When approved by the Engineer, fly ash conforming to ASTM C 618 may be used to replace up to 20 percent of the portland cement requirement for Class A and B concrete except that fly ash shall not replace portland cement for concrete used to pave alleys.

Should the quantity of ingredients designed to produce a cubic yard of finished concrete result in a yield greater than one cubic yard, the relative proportions of fine and coarse aggregates shall be adjusted as necessary to maintain a constant quantity of portland cement in each cubic yard of concrete.

Contractor shall determine the mix proportions for all concrete to be used in the work. A mix design for each class of concrete used in the work shall be submitted to the Engineer for approval at least five (5) working days prior to the proposed concrete being incorporated into the work.

2. Proportioning:

The coarse and fine aggregates shall be combined in such proportions

that the percentage composition by weight of the individual and primary sizes of aggregates and of the combined aggregates, as determined by laboratory screens and sieves, will be as follows:

GRADING AND COMPOSITION REQUIREMENTS

Sieve Size	Designation and Nominal Size Percentage Passing Sieves					
	Primary Aggregate Sizes			Combined Aggregate Sizes		
	1½x ¾"	1" x No. 4	Fine	1½" Max.	1" Max.	¾" Max.
2"	100	--	--	100	--	--
1½"	88-100	100	--	90-100	100	--
1"	1-59	88-100	--	50-86	90-100	100
¾"	0-17	37-100	--	45-75	55-100	90-100
⅜"	0-7	0-53	100	38-55	45-75	60-80
No. 4	--	0-16	95-100	30-45	35-60	40-60
No. 8	--	0-6	65-95	23-38	27-45	30-45
No. 16	--	--	45-85	17-33	20-35	20-35
No. 30	--	--	25-55	10-22	12-25	13-23
No. 50	--	--	10-35	4-9	5-15	5-15
No. 100	--	--	2-10	1-3	1-5	1-5
No. 200	0-2	0-2	0-5	0-2	0-2	0-2

In addition to the above required grading analysis in the primary aggregate size, the distribution of the fine aggregate sizes shall be such that the difference between the total percentage passing the No. 16 sieve and the total percentage passing the No. 30 sieve shall be between 10 and 40; and the difference between the percentage passing the No. 30 and No. 50 sieves shall be between 10 and 40.

Exact proportions of primary aggregate sizes used in the concrete mix shall be as designated and/or approved by the Engineer. The Engineer may adjust the mix to accommodate changes in aggregates and moisture contents, to improve mixing and placing characteristics and to secure maximum quality of the finished concrete.

3. Mixing:

All concrete mixing shall be done in machine batch mixers of an approved type, having a capacity of not less than a full one-sack batch, unless the quantity to be mixed is, in the opinion of the Engineer, too small to justify the use of a batch mixer. Sacks of cement shall be completely emptied by dumping directly upon other materials previously measured into the mixer, and no splitting of sacks of cement will be allowed, except where Contractor provides suitable equipment approved by the Engineer, the cement may be weighed into the batch from bulk storage.

Mixing shall continue for not less than one (1) minute and in mixers larger than one cubic yard capacity this minimum shall be increased so that minimum mixing time shall not be less than one (1) minute for each cubic yard or part thereof of mixer capacity.

Where transit mixers are used, the mixing period shall conform to the requirements of ASTM C 94.

The total volume of material mixed per batch shall not exceed the rated capacity of the mixer as determined by the standard requirements of the Associated General Contractors of America. All mixing equipment shall be operated at the speeds recommended by the manufacturer, provided, however, that the revolving drum type, except on transit mixers, shall not make less than fourteen (14) or more than eighteen (18) revolutions per minute, and that the rotation rate of transit mixing drums be such as to produce a peripheral speed of approximately two hundred feet (200') per minute. Each paving mixer or stationary mixer shall be equipped with an acceptable timing device.

Should Contractor elect to utilize transit mixing equipment, he shall make adequate advance arrangements for preventing delays in delivery and placing of the concrete. An interval of more than forty-five (45) minutes between any two consecutive batches or loads, or a delivery and placing rate of less than eight (8) cubic yards of concrete per hour, shall constitute cause for shutting down the work for the remainder of the day, and if so ordered by the Engineer, Contractor shall make at his own expense, a construction joint at the location and of the type directed by the Engineer, in the concrete already placed.

Transit-mixed concrete shall be delivered to the site of the work and discharge shall be completed within ninety (90) minutes after the addition of the cement to the aggregates or before the drum has been revolved 250

revolutions, whichever comes first. In hot weather or under conditions contributing to quick stiffening of the concrete or when the temperature of the concrete is 85 F. or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed forty-five (45) minutes.

A ticket showing volume of concrete and the mix number shall accompany each batch of transit-mixed concrete delivered to the job site. The ticket shall also show the time of day at which the materials were batched.

4. Placing:

The placing of the concrete from a stationary or transit mixer must be done in such a manner as to avoid separation of constituent materials of the concrete. The Engineer shall have the right to stop concrete pouring if the placing of the concrete is improper in this respect.

5. Water Control:

Within the limits hereinafter specified, the amount of water required for the proper consistency of concrete shall be determined by the slump test in accordance with ASTM C 143, except that the ratio of weight of water (water cement ratio) shall not exceed 0.55 unless otherwise approved by the Engineer.

The allowance for slump, unless otherwise directed by the Engineer, shall be as follows:

a. concrete paving and reinforced structures (heavy sections), not more than three inches (3");

b. reinforced structures (thin sections) and columns, not more than four inches (4");

c. concrete placed under water, not less than six inches (6") nor more than eight inches (8").

d.

No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Engineer. If the Engineer authorizes additional water to be incorporated into the concrete, the drum shall be revolved not less than 30 revolutions at mixing speed after the water is added and before discharge is commenced.

10-5 PORTLAND CEMENT CONCRETE (cont.)

If mixing in transit is allowed, the control equipment as above specified shall be at the proportioning plant and there shall be no water added after the mixture leaves the plant, unless directed by the Engineer.

Contractor shall furnish, without charge, such materials as may be required for making tests of concrete during the progress of the work. Such tests will be made at the expense of the City of Sacramento, except that, if tested concrete does not meet required standards, the cost of additional testing shall be borne by Contractor.

No concrete shall be used which has partially set, and no concrete shall be re-tempered or remixed.

10-6 CURING COMPOUNDS FOR CONCRETE

Concrete curing compounds shall be used where specified in these Specifications and the Special Provisions. The compounds shall meet the requirements of ASTM C 309 as modified below and shall be one of the following two types:

1. Type 1-D, clear or translucent with red fugitive dye, Class A vehicle.
2. Type 2, white pigmented, Class A vehicle.

The water retention test shall be modified in that the loss of water shall not exceed 0.040 grams per square centimeter of surface in seventy-two (72) hours.

10-7 AGGREGATE BASES

Aggregate bases shall conform to the requirements of Section 26 of the State Specifications, except as modified herein.

The combined aggregate shall conform to the grading specified for the three-quarter inch (¾") maximum aggregate for Class 2 aggregate base, unless otherwise specified in the Special Provisions. Aggregate may include material processed from reclaimed asphalt concrete, Portland cement concrete, lean concrete base, cement treated base or a combination of any of these materials. The amount of reclaimed material may constitute up to 100% of the total volume of the aggregate used.

Aggregate base will be paid for at the contract price bid per ton or per cubic yard delivered to the job and placed according to the Plans and Specifications. The method used on any work will be shown by the list of

quantities on the Proposal and by the type of unit price requested in the Proposal.

The weight of material to be paid for will be determined by deducting from the weight of material delivered to the work, the weight of water in the material, at the time of weighing, as determined by California Test 226, in excess of one (1) percentage point more than the optimum moisture content as determined by ASTM D 1557. The weight of water deducted as provided in this Section will not be paid for.

Quantities of aggregate base to be paid for by the ton or cubic yard will be calculated on the basis of the dimensions shown on the plans adjusted by the amount of any change ordered by the Engineer. No allowance will be made for aggregate base placed outside said dimensions unless otherwise ordered by the Engineer.

The above prices and payment shall be full compensation for furnishing all labor, material, tools, equipment, water, and incidentals, and for all work involved in constructing aggregate base complete in place as shown on the Plans, and as specified in these Specifications and the Special Provisions or as directed by the Engineer.

10-8 AGGREGATE SUBBASE (GRADED)

Aggregate subbase shall conform to the requirements of Section 25 of the State specifications. Aggregate subbase shall be Class 1, unless otherwise approved by the Engineer.

Payment for aggregate subbase shall be per ton of material delivered to the job and placed in accordance with the Plans and Special Provisions. The weight of material to be paid for will be determined by deducting from the weight of material delivered to the work, the weight of water in the material, at the time of weighing, as determined by California Test 226, in excess of one (1) percentage point more than the optimum moisture content as determined by ASTM D 1557. The weight of water deducted as provided in this Section will not be paid for.

The compacting of the material shall be done in accordance with the requirements for placing aggregate bases, as provided in these Specifications.

Payment for the material at a price per ton or cubic yard shall constitute full compensation for furnishing, hauling, placing, compacting, and finishing the material including the furnishing of all labor, material, tools, equipment, water and incidentals.

10-9 CEMENT TREATED BASES

Road-mixed and plant-mixed cement treated bases shall conform to the requirements of Section 27 of the State Specifications.

Measurement and payment for cement treated bases shall be in accordance with the State Specifications or may be paid for at a price per ton or cubic yard of cement treated base complete in place as so indicated in the Special Provisions.

10-10 LIME STABILIZATION

Lime stabilization shall conform to the requirements of Section 24 of the State Specifications, except as modified herein.

Unless otherwise specified in the Special Provisions or approved by the Engineer the amount of lime to be added shall constitute a minimum of four and one-half percent (4.5%) by unit weight of the material to be stabilized.

10-11 TREATED PERMEABLE BASES

Treated permeable bases shall conform to the requirements of Section 29 of the State Specifications.

10-12 GEOGRID

Geogrid may be used in areas requiring soil stabilization, such as unsuitable subgrade, or as specified in the Special Provisions, or as approved by the Engineer. Geogrid material shall conform to the following requirements unless otherwise specified in the Special Provisions.

The reinforcement material shall be biaxially oriented geogrid with high tensile modulus in relation to the material being reinforced, with large apertures, thick ribs and junctions to permit significant mechanical interlock with the material being reinforced, and with high continuity of tensile strength through all ribs of the structure.

The geogrid shall maintain its reinforcement and interlock under normal construction practices, and be resistant to both ultraviolet degradation and all forms of biological degradation normally encountered in the material being reinforced. Geotextiles shall not be accepted as reinforcing material. The geogrid shall be installed per the manufacturers recommendations and as specified in the Special Provisions. Grid ties shall be installed a maximum of twenty feet apart and overlaps shall be a minimum of two feet, unless otherwise approved by the Engineer.

The geogrid shall be a single-layer grid that meets the dimensions and properties outlined below. Multi-layered grids fastened together shall not be acceptable. The biaxial geogrids shall conform to the property requirements listed below:

Property	Test Method	Units	Value
Mass	ASTM D 5261-92	oz/sy	8.75 (nom)
Tensile			
Peak Tensile MD (a)	GRI GG1	lb/ft	1,200 (min)
Tensile at 5% MD	GRI GG1	lb/ft	810 (min)
Peak Tensile CMD (b)	GRI GG1	lb/ft	1,970 (min)
Tensile at 5% CMD	GRI GG1	lb/ft	1,340 (min)
Stiffness			
Torsional Stiffness	Corps of Engineers	cm-kg/deg	6.5 (min)
Flexural Stiffness True Initial	ASTM D 1388	mg-cm	750,000 (min)
Modulus in Use MD (c)	GRI GG1 (b)	lb/ft	20,500 (min)
True Initial Modulus in Use CMD (c)	GRI GG1	lb/ft	30,000 (min)
Interlock			
MD dimension	I. D. Calipered	in	0.75-1.50
CMD dimension	I. D. Calipered	in	0.75-1.50
Open area (d)	COE Method Modified	%	70 (min)
Junctions			
Efficiency	GRI GG2	%	90 (min)
Strength MD	GRI GG2	lb/ft	1,080 (min)
Strength CMD	GRI GG2	lb/ft	1,778 (min)

(a) MD - Machine Direction which is along roll length
CMD - Cross Machine Direction which is across the roll width.
(b) Resistance to in-plane rotational movement measured by applying a 20 cm-kg moment to the central junction of a 9" x 9" specimen restrained at its perimeter. (U.S. Army Corps of Engineers Methodology).
(c) True resistance to elongation when initially subjected to a load measured via GRI-GG1 without deforming test materials under load before measuring such resistance or employing

"secant"or "offset" tangent methods of measurement so as to overstate tensile properties
(d) Percent open area measured without magnification by Corps of Engineers method as specified in CW 02215 Civil Works Construction Guide, November 1977.

Stress transfer capability through junctions (i.e. material overlaps) The value of the Peak Tensile Strength CMD multiplied by Junction Efficiency shall be greater than 1,080 lb/ft.

10-13 BEDDING SAND

Bedding Sand shall have a minimum sand equivalent of 50. Ninety to one hundred percent (90-100%) shall pass the #4 sieve and a maximum of fifteen percent (15%) shall pass the #200 sieve. Sand material shall be of a good quality with a minimum resistivity of 5,000 ohm-cm., a minimum pH of 6.0, a maximum chloride concentration of 300 ppm and a maximum sulfate concentration of 1,000 ppm.

Chemical Analysis	ASTM Method
Conductivity	D 1125
Sulfate	D 516A (SM 4500)
PH	D 2976/D 4972/G 51
Chlorides	D 512C

10-14 CRUSHED SCREENINGS

In these Specifications, in the Special Provisions, or on the Plans, the use of crushed screenings may be specified for certain purposes. When so specified this shall mean a uniformly graded material that is the product of crushing rock or gravel; free of organic matter, oil, alkali, or other deleterious substances and is hard, sound and durable.

Unless otherwise indicated in the Special Provisions, the crushed screenings shall conform to the requirements for coarse (½" x No. 4) crushed screenings as set forth in Section 37-1.02 of the State Specifications. In addition, crushed screenings shall have a minimum Cleanliness Value of fifty (50) as determined by California Test 227.

10-15 SLURRY CEMENT BACKFILL

Slurry Cement Backfill specified herein for use as trench backfill shall conform to the requirements of Section 19-3.062 of the State Specifications except that no less than 282 pounds of cement shall be used for each cubic yard of material produced.

10-16 CONTROL DENSITY FILL (CDF)

Control Density Fill (CDF), also known as Controlled Low Strength Material (CLSM) or ready Mixed Flowable Fill (RFF) as processed and distributed by the National Ready Mixed Concrete Association, may be used as an alternate initial backfill and/or trench backfill material, if approved by the Engineer, or if specified in the Special Provisions. After all necessary provisions are made, the bedding is installed and the pipe placed, CDF may be placed from the pipe bedding to the top of the trench or subgrade in conformance with Sections 10 and 14 and these specifications.

Hand Excavatable: Material shall be a hand excavatable mixture of cement, pozzolan, course and fine aggregate and water which has been mixed in accordance with ASTM C 94.

Flowable: Material shall be flowable with a high slump, non-segregating consistency that readily flows and fills voids, congested areas, difficult to reach places, and that may additionally be used for pipe abandonment, structure backfill, and structure cavity fill as directed.

Rapid Set: Material shall obtain early strength gain, to allow traffic load or other live loads on the fill in less than one (1) day after placing the material.

Cement: Shall be type II in accordance with requirements of ASTM C 150.

Pozzolan: Shall be added to improve flowability and shall be type F in accordance with the requirements of ASTM C 618.

Aggregate: Course aggregate shall consist of well graded mixture of crushed rock with a maximum size aggregate of ⅜ inch. 100% shall pass the 2 inch sieve. Not more than 30% shall be retained by the ⅜ inch sieve and not more than 12% shall pass the number 200 sieve. All material shall be free from organic matter and not contain more alkali, sulfates, or salts than the native materials at the site of work.

Admixtures: Air entrainment shall be added (minimum of 8%, maximum of 20%) to improve workability in accordance with ASTM C 260. Water reducing agent shall be added to improve workability in accordance with ASTM C 494.

Water: Shall be potable, clean, and free from silty organic matter, alkali, salts, or other impurities.

Compressive Strength: The minimum 28 day compressive strength shall be 50 psi and the maximum shall be 150 psi.

Floating Pipe: Care shall be taken to avoid floating the pipe, especially with pipe types other than concrete. Means shall be employed to assure a consistent flowline in accordance with plans and special provisions.

Density: Minimum density shall be 120 PCF, maximum density 135 PCF.

10-17 CLEAN CRUSHED ROCK

In these Specifications, on the Plans, or in the Special Provisions, the use of clean crushed rock may be specified for certain purposes. When so indicated on the Plans or in the Special Provisions, a clean crushed rock of the type indicated shall be provided which is the product of crushing rock or gravel.

Clean crushed rock shall have a minimum Cleanliness Value of sixty (60) as determined by California Test 227, and the portion of the material which is retained on the ⅜-inch sieve shall contain at least fifty percent (50%) of particles having three (3) or more fractured faces. The percentage composition by weight of clean crushed rock shall conform to the following gradations for the Type specified.

% Passing Sieves				
Sieve Size	**Type A**	**Type B**	**Type C**	**Type D**
2"	--	--	--	100
1½"	--	--	100	--
1"	--	100	90-100	--
¾"	100	90-100	30-80	0-17
½"	90-100	30-60	0-20	--
⅜"	20-60	0-20	0-6	0-7
No. 4	0-15	0-5	0-5	--
No. 200	0-2	0-2	--	0-2

10-18 ASPHALTS, LIQUID ASPHALTS AND ASPHALTIC EMULSIONS

Asphalts, liquid asphalts and asphaltic emulsions as required by these Specifications or by the Special Provisions shall mean respectively the asphalts as specified in Section 92 of the State Specifications, liquid asphalts as specified in Section 93 of the State Specifications and asphaltic emulsions as specified in Section 94 of the State Specifications.

10-19 SEWER AND DRAINAGE PIPE

1. Joints

Unless otherwise specified herein, sewer and drain pipes shall have elastomeric gasket joints providing a water tight seal. An exception to this requirement is fusion welded solid wall HDPE. Any leakage in solid wall, fusion jointed HDPE means that a joint is faulty and must be repaired at the contractor's expense.

2. Manhole Connections

Unless otherwise specified, connecting a 24 inch or smaller inside diameter pipe, not cast into the base of a manhole, shall be accomplished by using a coring machine. The annular space between the outside of the pipe and the manhole wall shall be sealed by using a flexible annular space filler such as "Kor n' Seal Cavity O-Ring" by NPC Inc. or approved equal. Such connection shall be made in conformance with manufacturer's recommendations.

Unless otherwise specified, connecting a pipe with an inside diameter greater than 24 inch to a manhole shall be accomplished by cutting a hole into the manhole and grouting in the pipe. The hole shall be no more than the pipe outside diameter plus the thickness of the manhole wall. The annular space between the outside surface of the pipe and the hole in the wall shall be filled with non-shrink grout and the pipe shall be properly installed with an approved water stop.

In the connection of the pipe to a drop inlet, the use of a coring machine and flexible annular space filler are not required.

3. Deflection

For all flexible pipe and fittings, the minimum pipe stiffness at 5% deflection shall be 46 PSI according to ASTM D 2412. All flexible conduits shall be tested with a mandrel 5% smaller than the average inside diameter of the pipe no sooner than 96 hours after placement of the backfill. Mandrel tests may be performed by the City after a 6 month period of time at which time a

maximum deflection of 7-1/2% from the base I.D. will be allowed. The mandrel used shall be the PHOS PVC Sewer Pipe Deflection Gauge or other deflection gauge approved by the Engineer.

4. Drainage and Sewer Pipe Requirements

The requirements for the various types of pipe are summarized in the following paragraphs:

a. Acrylonitrile-Butadiene-Styrene (ABS)

ABS gravity sewer pipe and fittings in sizes 4" & 6" shall conform to ASTM D 2661. Eight inch (8") and larger in diameter shall conform to either ASTM D 2751, SDR 23.5 or ASTM D 2680 (ABS composite pipe).

Joints shall be solvent cemented (SC). All Service connections shall be installed with "Tee" fittings. Saddles are not approved. When the sewer main is of a material other than ABS, the connection joint to the sewer main shall be made with a flexible adapter manufactured by FERNCO, or approved equal.

b. Closed Profile Poly Vinyl Chloride (CPPVC)

CPPVC pipe with integral bell and spigot joints shall conform to ASTM F 1803. Joints shall be of the bell and spigot type with elastomeric seals conforming to the requirements of ASTM D 3212. Gaskets shall be factory installed and chemically bonded to the bell end of the pipe. Gasket material shall conform to ASTM F 477 and shall be capable of the same water tightness requirements as smooth or solid wall PVC pipe.

c. High Density Polyethylene (HDPE) Solid Wall Fusion Jointed

HDPE pipe shall be as manufactured by Phillips Drisco pipe, a division of Phillips Petroleum company, or equal. The material shall be listed by PPI (Plastic Pipe Institute, a division of the Society of the Plastics Industry) in PPI TR-4 with a 73.4°F hydrostatic design basis of 800 psi. The PPI listing shall be in the name of the pipe manufacturer and shall be based on ASTM D 2837 and PPI TR-3 testing and validation of samples of the pipe manufacturer's production pipe.

Material Requirements - Pipe shall be high molecular weight, high density polyethylene pipe and shall have a standard dimension ratio of 32.5 (SDR 32.5). The material shall have a standard PE code designation of PE 3408 and have a cell classification of 345434C as described in ASTM D 3350. The pipe shall contain no recycled compound except that

generated in the manufacturer's own plant from resin of the same specification from the same raw material pipe

The pipe shall be homogeneous throughout and free of visible cracks, bubbles, holes, foreign inclusions or other injurious defects. It shall be uniform in color, opacity, density, and other physical properties and produced to the dimensions and tolerances specified in ASTM F 714. The inside and outside surfaces shall be semi-matte or glossy in appearance. Any pipe not meeting these criteria shall be rejected.

The polyethylene pipe manufacturer shall provide certification that stress regression testing has been performed on the specific product. The said certification shall include a stress life curve per ASTM D 2837. The stress regression testing shall hav e been done in accordance with ASTM D 2837, and the manufacturer shall provide a product supplying a minimum Hydrostatic Design basis (HDR) of 1,600 psi, as determined in accordance with ASTM D 2837.

The manufacturer's certification shall state that the pipe was manufactured from one specific resin in compliance with these specifications. The certification shall state the specific resin used, its source, and list its compliance to these specifications.

Joints - All joints for the buried polyethylene pipe shall be of the thermal butt fusion type or bolted flanges reinforced with stainless steel.

Fittings - Polyethylene fittings shall be of the same material as the pipe and manufactured by the pipe manufacturer.

d. Polyvinyl Chloride (PVC)

PVC drain pipe and fittings, with at least eighteen inches (18") of cover to sub-grade, shall conform to ASTM D 3034 and ASTM F 679 and shall be SDR 35 pipe with elastomeric gasket joints providing a watertight seal.

PVC drain pipe and fittings, with less than eighteen inches (18") of cover to sub-grade, shall be class 100 SDR 25 or 26 pipe conforming to AWWA C 900.

All joints shall be intregral wall bell and spigot configuration, factory formed. Pipes at joints are not to be inserted beyond "stop-mark" on spigot end. All service connections shall be installed with "Tee" fittings, gasketed "Tee" saddles with stainless steel bands, or

other approved tapping devices. Solvent welded "Wye" saddles are not approved. All rubber rings shall conform to ASTM F 477.

e. Reinforced Concrete Pipe (RCP)

Reinforced concrete pipe shall conform to ASTM C 76 Class III, IV, or V. The class of pipe will be shown on the Plans or indicated in the Special Provisions. Sections of circular pipe with elliptical reinforcing shall have the location of the minor axis of the reinforcing indicated by three inch (3") wide, waterproof, painted stripes on the inside and outside of the pipe at the top and bottom, at least twelve inches (12") long at each end of the pipe section.

Joint materials for concrete pipe shall be rubber gasket joints conforming to the requirements of ASTM C 443 and shall be flexible and able to withstand expansion, contraction, and settlement. All rubber gaskets shall be stored in as cool a place as practicable, preferably at 70° F. or less, and in no case shall the rubber gaskets be exposed to the direct rays of the sun.

Rubber gaskets, of the type requiring lubrication, shall be lubricated with the lubricant recommended and supplied by the manufacturer of the pipe.

f. Vitrified Clay Pipe (VCP)

Vitrified clay pipe shall conform to the specifications for extra strength clay pipe as set forth in ASTM C 700.

Stoppers shall be used with branch pipes that are to be left unconnected. Stoppers for branch pipes having flexible compression joints may be either clay discs with flexible compression joints, factory applied, that will mate with the branch joint; or a resilient material of controlled design and dimensions for mating with the branch pipe to which it is to be applied; or, of other material approved by the Engineer. Wooden stoppers will not be accepted.

Joint materials for vitrified clay pipe shall be an approved type of factory-made mechanical compression joint conforming to the requirements of ASTM C 425. Banded rubber couplings and sleeves conforming to ASTM C 425 are acceptable.

g. Corrugated Metal Pipe

Corrugated metal pipe may only be used for driveway culverts and

shall conform to ASTM A 760, Type 1 or !R. Minimum depth of cover shall be 6 inches.

h. Corrugated HDPE Pipe

Corrugated High Density Polyethylene (HDPE) pipe may only be used for driveway culverts. HDPE pipe shall have smooth interior and shall be Type S conforming to AASHTO M 252 for four inch (4") through ten inch (10") diameter pipe and to AASHTO M 294 for twelve inch (12") and larger pipe. Provide Grade 2A2 gasketed joints in conformance with ASTM D 1056. Installation shall be in accordance with manufacturer's standards and ASTM D 2321. Minimum depth of cover shall be 12 inches.

i. Glass-Fiber-Reinforced Termosetting-Resin Pipe

Glass-Fiber-Reinforced Termosetting-Resin Pipe shall meet the requirements of ASTM D 3262, Class 36. Pipe shall be field connected with fiberglass sleeve couplings that utilize flexible elastomeric seals conforming to ASTM D 4161.

10-20 SUBSURFACE DRAINS

Subsurface drains shall comply with Section 68 of the State Specifications.

10-21 RESERVED

10-22 FIELD ASSEMBLED PLATE CULVERT

Field assembled plate culverts shall conform to Section 67 of the State Specifications.

10-23 REINFORCING STEEL

Reinforcing steel shall conform to Section 52, "Reinforcement", in the State Specifications. Unless otherwise provided by the Special Provisions, bar reinforcement shall be deformed Grade 60 conforming to ASTM A 615, "Deformed Billet-Steel Bars for Concrete Reinforcement".

Welded steel wire fabric for concrete reinforcement shall conform to ASTM A 185. The gauge of the wire and the dimensions of the mesh will be as shown on the Plans or indicated in the Special Provisions.

10-24 CURB DOWEL AND TIE BARS

Dowel and tie bars for curbs shall conform to ASTM A 615. Grade 60 or Grade 40 may be used at Contractor's option.

10-25 CASTINGS FOR MANHOLES, COVERS, ETC.

Casting for manhole heads, covers, and other purposes shall be tough gray iron, free from cracks, holes, swells and cold sheets, be of workmanlike finish, and conform to ASTM A 48/A 48M, Class 30. The quality shall be such that a blow from a hammer will produce an indentation on a rectangular edge of the casting, without flaking or cracking the metal.

All castings are to be manufactured true to pattern and with satisfactory fit of component parts. Round frames and covers shall have machined bearing surfaces. All manhole covers which do not fit neatly and bear firmly in the ring shall be rejected.

Alternate Castings for manhole covers

Where specified, casting shall be constructed of ductile iron in conformance with ASTM A536A, Class 60-45-12. Castings shall match the dimensions shown in Section 38. Cover shall be hinged and may or may not be gasketed. Gasket shall be mechanically fitted to frame such that removal and attachment can be accomplished without the use of tools and glue, per manufacturer's instructions. Lid shall have a rated capacity in excess of H20 loading per AASHTO.

10-26 WATER PIPE – Distribution (12 inch diameter & smaller)

Water Distribution System pipe shall be of the material type as indicated on the Plans or specified in the Special Provisions and comply with AWWA standards and AWSI 61. All pipe shall be the regular product of a firm which has successfully manufactured comparable pipe for at least three (3) years. Pipe shall conform to the following requirements:

1. Ductile Iron Pipe

All ductile iron pipe shall conform to the following AWWA Standards as listed below:

a. AWWA C 104 (ANSI A21.4), "Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water," if cement-mortar lined.

b. AWWA C 111 (ANSI A21.11), "Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings."

c. AWWA C 150 (ANSI A21.50), "Thickness Design of Ductile-Iron Pipe."

d. AWWA C 151 (ANSI A21.51), "Ductile-Iron Pipe, Centrifugally Cast, for Water."

Pipe shall comply with the following requirements:

a. Size – 4, 6, 8, 12 inch diameter only

b. Laying Condition – Type 5

c. Minimum Depth of Cover – Three (3) feet for improved; four and one-half (4 -1/2) feet for unimproved

d. Working Pressure-150psi

e. Laying Length – Minimum eighteen (18) foot nominal lengths with allowable trim pipe lengths in accordance with AWWA C 151 and special shorter lengths provided as required by the drawings.

f. Joints – Push on or mechanical

g. Restrained Joints – Bolted flanged connections, push-on locking gasket such as "Field-Lok" gaskets as manufactured by U.S. Pipe, push-on joint restraint such as "TR-Flex" as manufactured by U.S. Pipe, wedge action joint mechanism such as "Megalug" as manufactured by EBAA Iron, Inc. or approved equal.

h. Gasket Lubricant – Minimum required plus 10% additional

i. Pressure Class-350

j. Linings–Standard thickness of cement w/ asphalt seal coat.
Coatings–Minimum one (1) mil thick petroleum asphaltic material.

k. Certification by Manufacturer Required

2. Polyvinyl Chloride Pipe

10-26 WATER PIPE – Distribution (12 inch diameter & smaller)(cont.)

All polyvinyl chloride pipe in sizes ranging from four through twelve inch (4”-12”) shall conform to AWWA C 900 “Polyvinyl Chloride (PVC) Pressure Pipe,” or AWWA C 909 “Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe”. Pipe shall be manufactured with cast iron outside diameters (CIOD) for all sizes.

Pipe shall comply with the following requirements:

a. Size – 4, 6, 8, 12 inch diameter only

b. Class 150

c. Dimension Ratio – 18

d. Laying Length – 20 feet

e. Joints – Integral bell and spigot joints conforming to the requirements ASTM D 3139 with factory supplied elastomeric gaskets meeting the requirements of ASTM F 477.

f. Restrained Joints – Bolted flanged connections, Wedge action joint mechanism such as “Megalug” as manufactured by EBAA Iron, Inc. or approved equal.

g. Gasket Lubricant–Minimum required plus 10% additional

h. Each pipe length shall be marked showing the nominal pipe size and O.D. base, the AWWA pressure class, the AWWA specification designation, and the seal of the testing agency that verified the suitability of the material.

10-27 WATER PIPE FITTINGS – Distribution (12 inch diameter & smaller)

Water pipe fittings shall be of the material type as indicated on the Plans or specified in the Special Provisions and comply with AWWA standards and AWSI 61. All fittings shall be the regular product of a firm which has successfully manufactured comparable fittings for at least three (3) years.

All water pipe fittings shall be Ductile Iron and shall conform to the following AWWA Standards:

1. AWWA C 104 (ANSI A21.4), “Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water,” if cement-mortar lined.

10-27 WATER PIPE FITTINGS – Distribution (12 inch diameter & smaller)

2. AWWA C 110 (ANSI A21.10), "Ductile-Iron and Gray-Iron Fittings for Water."

3. AWWA C 111 (ANSI A21.11), "Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings."

4. AWWA C 153 (ANSI A21.53) "Ductile-Iron Compact Fittings for Water Service."

5. AWWA C 116 (ANSI A21.16) "Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior surfaces of the Ductile-Iron and Gray-Iron Fittings for Water Supply Service," if fusion-bonded epoxy lined or coated.

Fittings shall comply with the following requirements:

1. Pressure Rating – 250 psi

2. Coatings – Exterior: Minimum one (1) mil thick petroleum asphaltic material coated. Interior: Lined with standard thickness cement and asphaltic seal coated. Or, exterior and interior: Minimum eight (8) mil thick fusion bonded epoxy coated.

3. Joints – Push-On, mechanical, or flange

4. Certification by manufacturer

5. Dimensions – AWWA C 153 Compact Fittings are approved.

6. Bolts shall be carbon steel ASTM A 307, Grade B. Nuts shall be heavy hex nuts conforming to ASTM A 563, Grade C3.

7. Ring gaskets for flanged joints shall be full faced with a thickness of eight of an inch (⅛"). The material used for the ring gaskets shall be red rubber or neoprene suitable for a minimum of one hundred and fifty pounds per square inch (150 psi), cold water service.

10-28 WATER PIPE – Transmission (greater than 12 inch diameter)

Water Transmission System pipe shall be of the material type as indicated on the Plans or specified in the Special Provisions and comply with AWWA standards and AWSI 61. All pipe shall be the regular product of a firm which has successfully

manufactured comparable pipe for at least three (3) years. Pipe shall conform to the following requirements:

1. Welded Steel Pipe (WSP)

All welded steel pipe shall conform to the following AWWA Standards:

a. AWWA C 200, "Steel Water Pipe – 6 in. and larger."

b. AWWA M 11, "Steel Pipe – A Guide for Design and Installation" except as modified herein.

c. AWWA C 205, "Cement-Mortar Protective Lining and Coating for Steel Water Pipe – 4 in. and Larger – Shop Applied ."

Pipe shall comply with the following requirements:

a. Pipe shall be designed for one hundred and fifty pounds per square inch (150 psi) working pressure with an additional seventy-five pounds per square inch (75 psi) allowance for surge. Pipe design shall be in accordance with AWWA M 11 to withstand the

simultaneous application of external earth loads, HS-20 live load and internal pressures. The minimum steel cylinder thickness shall be ten (10) gauge. Drawings shall be submitted to the Engineer for approval and shall include the following:

i. Pipeline layout showing stations and elevations;

ii. Details of standard pipe, joints, specials and fittings;

iii. Calculations for pipe design field welded joint restraint and fittings reinforcement;

iv. Details of joint bonding and field welded joint restraint calculations.

b. The nominal diameter or inside diameter of the pipe and other fabricated steel sections as shown on the plans is the clear diameter of the lined pipe after the application of the interior mortar lining.

c. Each piece of pipe shall be hydrostatically tested and the stress in

the pipe during testing shall not be less than seventy-five percent (75%) of the steel minimum yield strength.

d. Minimum Depth of Cover shall be three feet (3') in improved and four and a half feet (4½') in unimproved areas.

e. Laying Length – thirty-two to fifty feet (32'-50') for cement mortar lined and coated welded steel pipe depending on the shop practice of the manufacturer or fabricator. Sufficient short pieces shall be provided to allow for two foot (2') adjustments within each one-half mile of straight pipe.

f. Pipe End Finish - The end finish of individual lengths of pipe to be provided under these Special Provisions shall be one of the following types, unless otherwise indicated on the Plans:

i. Bell and spigot pipe ends for joints with rubber gaskets.

ii. Bell and spigot pipe ends for field welded joints.

iii. Plain-ends fitted for butt straps for field welded joints.

iv. Plain-ends fitted with flanges.

v. Plain-ends for mechanically coupled field joints.

The types of joints proposed to be used shall have been thoroughly tested for water leaks at the design pressures. The Engineer may require Contractor to furnish a record of experience in installing the types of joints for comparable sizes of pipe called for on the Plans. Details of the type of pipe joints proposed to be used shall be included with the shop drawings and lay sheets submitted for the pipe.

Cement mortar lining and coating for WSP shall conform to AWWA C 205. Field joints shall be lined and coated to match pipe in accordance with AWWA C 205.

Bell and Spigot Joints with Rubber Gaskets for WSP shall employ joint rings (Carnegie rings) and shall be designed and fabricated to accommodate a rubber 0-ring gasket seal in accordance with AWWA C 303.

10-28 WATER PIPE – Transmission (greater than 12 inch diameter)(cont.)

The field welding of WSP with bell and spigot joint rings (Carnegie rings) or lap joints shall conform to Standard Drawing W-903. Lap joints shall conform to AWWA C 200.

Field welded butt-strap joints shall typically only be used for closure pieces and shall conform to Standard Drawing W-904. The ends of pipes to be fitted with butt straps for field welded joints shall conform to AWWA C 200.

When field conditions warrant and with the approval of the Engineer, straight butt strap welded joints may be used for directional changes in pipe alignment of up to five (5°) degrees.

(WSP) pipe flanges shall conform and be fitted to plain-end pipe in accordance with AWWA C 207, Class D, and AWWA C 200.

Ring gaskets for flanged joints shall be full faced with a thickness of one-eighth inch (⅛”). The material used for the ring gaskets shall be red rubber or neoprene suitable for a minimum of one hundred and fifty pounds per square inch (150 psi), cold water service.

Bolts shall be carbon steel ASTM A 307, Grade B. Nuts shall be heavy hex nuts conforming to ASTM A 563, Grade C3.

WSP ends for mechanically coupled field joints shall be plain and

conform to AWWA C 200 and these Standards Specifications. Mechanically coupled joints shall conform to the material, dimensions, and tests of AWWA C 219.

All plain-end pipe joined by flexible couplings shall be fitted with stiffener rings welded to the exterior pipe surface in a plane perpendicular to the axis of the pipe.

Stiffener rings shall have minimum dimensions of three eights inch (⅜”) thick by three inches (3”) in width. Stiffener rings that are to be integral with a joint harness shall be suitably increased in thickness and reinforced with plate gussets to adequately withstand the thrust from adjacent fittings. Stiffener rings and harness rings or lugs shall be installed at the pipe manufacturing or fabrication shop. Material for stiffener rings and plate gussets shall be carbon steel meeting the requirements of ASTM A 36 or ASTM A 283, Grade D.

All mechanically coupled field joints shall be encased with eight (8) mil minimum thickness polyethylene material.

Restrained Joints for WSP transmission lines shall conform to the requirements set forth in AWWA M 11, "Steel Pipe - A Guide for Design and Installation." Joints shall be one of the following types:

a. Lap welded slip joint – The joint shall conform to and be welded in accordance with Standard Drawing W-903 in section 38 of these Standard Specifications.

b. Double welded butt strap joint – Butt straps shall conform to and be welded in accordance with Standard Drawing W-904 in section 38 of these Standard Specifications.

c. Flanged and bolted – Flanges shall be in accordance with AWWA C 207 Class D for for operating pressures to one hundred and fifty pounds per square inch (150 psi) and surge pressures to two hundred and twenty five pounds per square inch (225 psi).

d. Mechanical coupling – Mechanical couplings shall be as specified in section 10-29 of these Standard Specifications and shall be harnessed for the maximum pressure in accordance with AWWA M 11.

e. Carnegie end rings restrained by means of welding the bell and spigot ring in accordance with Standard Drawing W-903 in section 38 of these Standard Specifications

Dimensions for standard and special fittings including tees, wyes, crosses, bends and elbows, reducers, flanged side and bottom outlets, access manholes, etc. shall conform to AWWA C 208. Materials and fabrication of standard and special fittings shall conform to AWWA C 200. All fittings shall be designed to have a strength at least equal to that of the adjacent straight pipe. Flanged outlets shall be designed in accordance with the AWWA Design Manual M 11.

The required transverse steel area in all welded steel pipe fittings shall be provided by the steel cylinder. The length of reducers shall not be less than the diameter of the largest end.

Cement mortar lining and coating of fittings shall conform to the applicable sections of AWWA C 205 and these Standard Specifications.

2. Concrete Cylinder Pipe (CCP)

All concrete cylinder pipe shall conform to the following:

10-28 WATER PIPE – Transmission (greater than 12 inch diameter)(cont.)

a. AWWA C 303, "Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type."

b. AWWA Manual M 9 "Concrete Pressure Pipe" except as modified herein.

Pipe shall comply with the following requirements:

a. Pipe shall be designed for one hundred and fifty pounds per square inch (150 psi) working pressure with an additional seventy-five pounds per square inch (75 psi) allowance for surge. Pipe shall be designed in accordance with ANSI/AWWA C 303, and AWWA Manual M9 to withstand the simultaneous application of external earth loads, HS-20 live load and internal pressures. Drawings shall be submitted to the Engineer for approval and shall include the following:

i. Pipeline layout showing stations and elevations;

ii. Details of standard pipe, joints, specials and fittings;

iii. Calculations for pipe design field welded joint restraint and fittings reinforcement;

iv. Details of joint bonding and calculations.

b. The cylinders shall be true right cylinders formed from one piece of sheet or coil steel. Field circumferential butt welds are not acceptable.

c. Minimum steel cylinders shall be ten (10) gage.

d. The nominal diameter or inside diameter of the pipe and other fabricated steel sections as shown on the plans is the clear diameter of the lined pipe after the application of the interior mortar lining

e. Laying Length – thirty two to forty feet (32'- 40') for concrete cylinder pipe depending on the shop practice of the manufacturer or fabricator. Sufficient short pieces shall be provided to allow for two foot (2') adjustments within each one-half mile of straight pipe.

f. Pipe End Finish - The end finish of individual lengths of CCP to be provided under these Standard Specifications shall be one of the following types, unless otherwise indicated on the Plans:

i. Bell and spigot pipe ends for joints with rubber gaskets.

ii. Bell and spigot pipe ends for field welded joints.

iii. Plain-ends fitted for butt straps for field welded joints.

iv. Plain-ends fitted with flanges.

v. Plain-ends for mechanically coupled field joints.

The types of joints proposed to be used shall have been thoroughly tested for water leaks at the design pressures. The Engineer may require Contractor to furnish a record of experience in installing the types of joints for comparable sizes of pipe called for on the Plans. Details of the type of pipe joints proposed to be used shall be included with the shop drawings and lay sheets submitted for the pipe.

The exposed inside and outside surfaces of the joints, flanges, reinforcement lugs, and all other exposed steel shall be protected from the

formation of rust with an AWWA approved coating applied at the time of manufacture or fabrication of the pipe.

The CCP ends shall employ joint rings (Carnegie rings) and shall be designed and fabricated to accommodate a rubber 0-ring gasket seal in accordance with AWWA C 303.

The field welding of CCP with bell and spigot joint rings (Carnegie rings) or lap joints shall conform to the Drawing W-903, Section 38 of these Standard Specifications. Lap joints shall conform to AWWA C 200.

Field welded butt-strap joints for CCP shall be typically used for closure pieces and shall conform to Standard Drawing W-904. The ends of pipes to be fitted with butt straps for field welded joints shall conform to AWWA C 200.

When field conditions warrant and with the approval of the Engineer, straight butt-strap welded joints may be used for directional changes in pipe alignment of up to five degrees (5°).

Steel pipe flanges for CCP shall conform and be fitted to plain-end pipe in accordance with AWWA C 207, Class D, and AWWA C 200.

Ring gaskets for flanged joints shall be full faced with a thickness of one eighth inch (⅛”). The material used for the ring gaskets shall be red rubber or neoprene suitable for a minimum of one hundred and fifty pounds per square inch (150 psi), cold water service.

Bolts shall be carbon steel ASTM A 307, Grade B. Nuts shall be heavy hex nuts conforming to ASTM A 563, Grade C3.

CCP ends for mechanically coupled field joints shall be plain and conform to AWWA C 200 and these Standard Specifications. Mechanically coupled joints shall conform to the material, dimensions, and tests of AWWA C 219.

All plain-end pipe joined by flexible couplings shall be fitted with stiffener rings welded to the exterior pipe surface in a plane perpendicular to the axis of the pipe. Stiffener rings shall have minimum dimensions of three eighths inch (⅜”) thick by three inches (3”) in width.

Stiffener rings that are to be integral with a joint harness shall be suitably increased in thickness and reinforced with plate gussets to adequately withstand the thrust from adjacent fittings. Stiffener rings and harness rings or lugs shall be installed at the pipe manufacturing or fabrication shop. Material

for stiffener rings and plate gussets shall be carbon steel meeting the requirements of ASTM A 36 or ASTM A 283, Grade D.

All mechanically coupled field joints shall be encased with eight (8) mil minimum thickness polyethylene material.

Restrained Joints for CCP transmission lines shall conform to the requirements set forth in AWWA M 9, "Concrete Pressure Pipe." Joints shall be one of the following types:

a. Lap welded slip joint – The joint shall conform to and be welded in accordance with Standard Drawing W-903 in section 38 of these Standard Specifications.

b. Double welded butt strap joint - Butt straps shall conform to and be welded in accordance with Standard Drawing W-904 in section 38 of these Standard Specifications.

c. Flanged and bolted – Flanges shall be in accordance with AWWA C 207 Class D for operating pressures to one hundred and fifty pounds per square inch (150 psi) and surge pressures to two hundred and twenty five pounds per square inch (225 psi).

d. Mechanical coupling – Mechanical couplings shall be as specified in section 10-29 of these Standard Specifications and shall be harnessed for the maximum pressure in accordance with AWWA M 9.

e. Carnegie end rings restrained by means of welding the bell and spigot ring in accordance with Standard Drawing W-903 in section 38 of these Standard Specifications.

Standard and special fittings for CCP shall include adapters, reducers, bends, tees, wyes, connections to mainline valves, closures, beveled pipe, restrained-joint pipe, short pipe, and pipe with outlets required for branches, access manholes, air valves, and blow-offs. The fabrication and manufacture of standard and special fittings shall conform to the requirements of Section 4 of AWWA C 303.

3. Ductile Iron Pipe (DIP)

All ductile iron pipe shall conform to the following:

a. AWWA C 104 (ANSI A21.4), “Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.”

b. AWWA C 110 (ANSI A21.10), " Ductile Iron and Gray Iron Fittings for Water."

c. AWWA C 111 (ANSI A21.11), “Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.”

d. AWWA C 150 (ANSI A21.50), “Thickness Design of Ductile-Iron Pipe.”

e. AWWA C 151 (ANSI A21.51), “Ductile Iron Pipe, Centrifugally Cast, for Water.”

f. AWWA C 153 (ANSI A21.53), "Ductile-Iron Compact Fittings for Water Service."

g. AWWA M41, "Ductile-Iron Pipe and Fittings."

DIP shall also comply with the following requirements:

a. The minimum wall thickness design shall be determined using AWWA C 150/A21.50.

b. The design working pressure shall be one hundred and fifty pounds per square inch (150 psi) minimum.

c. When determining the wall thickness of the pipe, the following shall be considered:

i. internal pressure, including static and transient pressure;

ii. external pressure, including trench loading and earth fill; and

iii. practical considerations for handling, shipping, lining and coating, or similar operations.

d. Nominal inside diameter shall not be less than the design diameter or size specified.

e. Hydrostatic testing shall be made before the application of cement-mortar lining.

f. Ductile iron pipe laying lengths shall be furnished in standard lengths suited to the manufacturer's shop practice and in accordance with AWWA C 151/A21.51. Sufficient field pieces shall be provided to allow for a two foot (2') adjustment - within each one-half mile of straight pipe.

All DIP and fittings shall be cement-mortar lined in accordance with AWWA C 104/A21.4.

Pipe shall be lined by a centrifugal process. Fittings shall be lined by a projection method or by hand application.

The entire ductile iron pipeline including fittings, valves and appurtenances shall be encased in polyethylene material with a minimum thickness of eight (8) mil. The polyethylene shall conform to and be installed in accordance with AWWA C 105/A21.5.

The end finish of individual lengths of DIP to be provided under these Standard Specifications shall be one of the following types, unless otherwise indicated on the Plans:

a. Bell and spigot pipe ends for joints with rubber gaskets.

b. Mechanically coupled field joints.

c. Plain-ends fitted with threaded flanges.

The types of joints proposed to be used shall have been thoroughly tested for water leaks at the design pressures. The Engineer may require Contractor to furnish a record of experience in installing the types of joints for comparable sizes of pipe called for on the Plans. Details of the type of pipe joints proposed to be used shall be included with the shop drawings and lay sheets submitted for the pipe.

The exposed inside and outside surfaces of the pipe joints shall be protected from the formation of rust with an AWWA approved coating applied at the time of manufacture of the pipe.

Bell and spigot joints with rubber gaskets for DIP shall conform to the requirements of AWWA C 111/A21.11 regarding push-on joints.

Mechanically coupled field joints, bolts and nuts for DIP shall conform to the requirements of AWWA C 111/A21.11. All mechanically coupled field joints shall be encased with a minimum eight (8) mil thick polyethylene.

Bolts shall be carbon steel conforming to ASTM A 307, Grade B. Nuts shall be heavy hex nuts conforming to ASTM A 563, Grade C3.

Ends fitted with threaded flanges for DIP shall conform to the requirements of AWWA C 115/A21.15.

Pipe ends fitted with restraining rings for DIP shall receive approval by the Engineer prior to the installation of the pipe. It is suggested that test documents from the manufacturer's testing documentation be submitted with the required pipe lay sheet submittals.

Restrained Joints for Ductile Iron transmission mains shall be one of the following types:

a. Flanged and bolted – Flanges shall be in accordance with AWWA C

110 or AWWA C 153 for operating pressures to one hundred and fifty pounds per square inch (150 psi) and surge pressures to two hundred and twenty five pounds per square inch (225 psi).

b. Push-on locking gasket such as "Field-Lok" gaskets as manufactured by U.S. Pipe.

c. Push-on joint restraint such as "TR-Flex" as manufactured by U.S. Pipe.

d. Wedge action joint mechanism such as "Megalug" as manufactured by EBAA Iron, Inc. or approved equal.

e. Mechanical coupling – Mechanical couplings shall be as specified in section 10-29 of these Standard Specifications.

Fittings and openings for DIP shall conform to the requirements of AWWA C 110/A21.10. Where outlets are required, tees shall be used, with the outlet branch being flanged.

Bolts and nuts for DIP shall meet the requirements of ASTM A 307, Grade B, and ASTM A 563, Grade C3, respectively.

10-29 BUTTERFLY VALVES & FLEXIBLE COUPLINGS (Transmission)

1. General

Butterfly valves shall be short bodied, tight closing, and rubber-seated with flanged ends. Butterfly valves shall comply with the requirements of AWWA C 504, Class 150B and these Standard Specifications. Valves shall be bubble-tight at rated pressures in either direction, and shall be satisfactory for throttling service and/or operation and for valve operation after long periods of inactivity. All butterfly valves shall be Triton XR or Groundhog valves as manufactured by the Henry Pratt Company, Lineseal III valves as manufactured by Mueller Company, or approved equals.

Valve discs shall rotate ninety degrees (90˚) from the full open position to the tight shut position. The valves shall allow for an angular mis-position of the disc up to one degree (1˚) off center without leakage. The manufacturer

shall have successfully manufactured tight-closing, rubber seated AWWA butterfly valves for a period of at least five (5) years with local installation list.

Butterfly valves shall be provided with manual actuators. The actuators shall provide sufficient output torque to operate the valves at a shutoff pressure of one hundred and fifty pounds per square inch (150 psi) and at a maximum flow velocity of sixteen feet per second (16 fps) when opening or closing. In no case shall the torque rating be less than required for Class 150B valves per AWWA C 504. The Engineer may request Contractor to provide torque and actuator calculations to verify compliance.

2. Butterfly Valve Materials and Construction

Materials for all parts and components shall be suitable for the intended use of the valve considering strength, ductility and corrosion protection. All materials shall conform to the requirements of AWWA C 504. Valves shall comply with NSF/ANSI 61.

Valve Disc: Valve discs shall be constructed from ductile iron ASTM A 536 for valve sizes thirty inches (30”) and larger, from cast iron ASTM A 126, Class B for valve sizes less than twenty inches (20”), or from cast iron ASTM A 48/A 48M Class 40 for twenty-four inch (24”) valves. Valve discs shall be furnished with 316 stainless steel seating edge, ground smooth and polished to mate with the rubber seat on the body. The disc shall not have any hollow chambers that can entrap water or ribs transverse to the flow stream. All surfaces shall be visually inspected and measured to assure all structural members are at full design parameters.

Valve Seat: All seats shall be Buna-N rubber in the body design. Valves twenty inches (20”) and smaller shall have bonded seats that meet the test procedures of ASTM D 429 Method B. Seats for valve sizes twenty-four inches (24”) and larger shall be retained in the valve body by mechanical means without retaining rings, segments, screws or hardware of any kind in the flow

stream. Seats shall be a full three hundred and sixty degrees (360°) without interruption and have a plurality of grooves mating with a spherical disc edge seating surface. Valve seats shall be field adjustable around the full three hundred and sixty degrees (360°) circumference and replaceable without dismantling operator, disc or shaft and without removing the valve from the line. Seats attached to the valve disc are not allowed.

Valve Shaft: All shafts shall be turned, ground and polished and constructed of 18-8 Type 304 stainless steel conforming to ASTM A 276. Valve

shaft seals shall consist of self-adjusting "V" type packing capable of replacement without removal of the valve shaft.

Valve Bearings: All valves shall be fitted with non-metallic sleeve-type bearings. Bearings shall be corrosion resistant and self-lubricating. Bearing load shall not exceed one-fifth of the compressible strength of the bearing or shaft material. Non-adjustable thrust bearings designed to center the valve disc shall be furnished with the valve assembly and be preset at the factory.

Manual Valve Actuator: Manual valve actuators shall be of the traveling nut or permanently lubricated worm gear reducer type suitable for continuously buried and submerged use. All actuator gearing shall be totally enclosed in a rugged case that is both water tight and lubricant tight.

Actuators shall be fully grease packed and totally sealed by gaskets, O-rings, or similar means before shipment. A gasketed removable cover plate shall be provided for maintenance purposes. Actuators shall have a built in packing leak bypass to eliminate possible leakage into the actuator housing. Stuffing boxes are not acceptable.

Manual valve actuators shall be capable of withstanding an input torque of four hundred and fifty foot-pounds (450 ft-lbs) against the open and closed stops. The valve disc shall be moved through its full stroke with a minimum number of turns of the operating shaft consistent with the torque limitations.

The valve actuator mechanism shall be self-locking and shall hold the valve disc rigidly in any intermediate position between full open and fully closed without creeping or fluttering. Machining and fitting of all parts shall be held to close tolerances to reduce backlash and to keep lost motion to a minimum.

The actuator shall be equipped with a standard water works two inch (2”) square wrench nut. The actuator shall be marked for direction of opening

and shall have a position indicator. Nuts deeper than thirty inches (30") shall have an extension to within twelve inches (12") of finished grade.

Valve Exterior Coating: The exterior of the butterfly valves shall be shop coated with two part liquid epoxy per AWWA C550. The coating shall have a nominal thickness of eight (8) mils. Machine finished bearing surfaces shall not be painted. Exposed machined surfaces shall be covered with slush grease or other readily removable protective coating before shipment.

Valve Interior Coating: All interior ferrous surfaces of the butterfly valves, including the disc, which are exposed to fluid flow shall be factory coated with a two part liquid epoxy coating conforming to AWWA C 550 for potable water. The coating shall have a nominal thickness of eight (8) mils.

With no exceptions, all damage to coating incurred during shipping shall be repaired with the original coating material only. The coating shall be NSF/ANSI 61 certified.

Bolts and Nuts: Bolts connecting valves to main shall be carbon steel ASTM A 307, Grade B. Nuts shall be heavy hex nuts conforming to ASTM A 563, Grade C3.

3. Flexible Couplings

Flexible couplings suitable for water main applications shall be as manufactured by Smith Blair, Inc., Series 411 or 413, or Dresser Industries, Inc., Style 38 or 162, or an approved equal. The steel middle ring of the flexible coupling shall be lined and coated with fusion bonded epoxy per AWWA C 213.

The flexible couplings shall be installed with provision for thrust restraint ties attached to the water main pipe. The thrust restraint ties on the pipe shall be welded lugs, lugs cast integrally with the pipe, or friction collars. Anchor studs placed perpendicular to the long axis of the pipe are unacceptable. Resistance to hydraulic thrust shall be adequate to sustain a force developed by a test pressure of two hundred and twenty five pounds per square inch (225 psi).

Flanged coupling adapters shall be Smith Blair 913, Romac Style FC400 or equal for steel piping with insulating gasket. Couplings shall be provided with thrust ties attached to the pipe with welding lugs, cast-in-place lugs, or friction collars. Lugs shall have a minimum thickness equal to that of adjacent flange and shall have holes the same size as those on the flange. Anchor studs placed perpendicular to the longitudinal axis of the pipe are unacceptable.

10-30 APPURTENANCES

Air Vacuum and Release Valves

Combination air vacuum and release valves for water transmission mains shall be two (2”) or four inches (4”) in size. The air vacuum and release valves shall have cast iron bodies and be equal to APCO Valve and Primer Corporation, Model 145C for the two-inch (2”) valve and Model 149C for the four-inch (4”) valve.

Blind Flanges and Dished Heads

Blind flanges and dished heads for water transmission mains shall conform to the requirements of AWWA C 207 and NSF/ANSI 61. Design pressure classification shall be equivalent to that of the immediately adjacent pipe, valve, or appurtenance. Blind flanges and dished heads shall be epoxy coated. The epoxy coating shall have a minimum thickness of eight (8) mils and shall conform to the requirements of AWWA C 213. Temporary blind flanges and dished heads that are used during construction of the transmission main do not need to be coated when approved by the Engineer.

10-31 FIRE HYDRANTS

All Standard (Low Risk) fire hydrants shall be as specified herein unless otherwise indicated on the Plans or Special Provisions.

1. All fire hydrants shall conform to AWWA C 502 for Dry-Barrel Fire Hydrants as currently in effect or amended and ANSI 61. An Affidavit of Compliance as per Section 1.7 of AWWA C 502. Standard shall be furnished with all hydrants or groups of hydrants. The Certificate of Compliance shall provide assurance that all material and manufacturing requirements have been met and head losses are within specified limits.

2. Table 3 of AWWA C 502 is amended to limit loss of head (drop in pressure) to a maximum of three pounds per square inch (3 psi) at a flow rate of one thousand gallons per minute (1000 gpm) through one four and one-half inch (4½") diameter pumper outlet nozzle.

3. Markings-All fire hydrants shall be clearly and permanently marked so as to be readily discernable and legible after hydrants have been installed. Such marking should include:

a. Name of manufacturer

b. Model name or number

c. Size of main valve opening

d. Date of manufacture

e. Direction of operation

f. Ground or bury line (mark to reflect point of bury to maximize breakaway features.)

4. Two (2) copies of operating manuals and/or descriptive literature shall be furnished with all fire hydrants or groups of hydrants supplied by the

same manufacturer. The manuals or literature shall include assembly drawings, schedule of parts, maintenance instructions, and complete tool kits.

5. A complete tool kit for those fire hydrants requiring special tools shall be provided.

6. In addition to the above, Standard fire hydrants shall meet the following requirements:

a. Size and Type of Inlet Connection:

i. Standard Hydrants-Dimension of the foot piece shall be as required to fit cast or ductile iron pipe of six inches (6") nominal inside diameter.

ii. Connection-Type of inlet connection for standard shall be either mechanical joint or "push-on" rubber ring. If the "push-on" rubber ring type is used the foot piece shall be provided with lugs for harnessing the hydrant to the branch or lead connection pipe or fitting.

b. Breakaway Features-A frangible section immediately above the ground or bury line is required. If breakable features depend upon bolts of reduced cross-section, hollowed out bolts will not be permitted.

c. Number and Size of Outlet Nozzles Standard Hydrants – Two (2) hose nozzles each with a nominal inside diameter of two and one-half inches (2½") and one (1) pumper nozzle with a nominal inside diameter of four and one-half inches (4½").

d. Outlet Nozzle Arrangement- Standard Hydrant-Nozzle arrangement requires that the two (2) two and one-half inch (2½") diameter hose nozzles be opposite (180°) of each other. The single four and one-half inch (4½") diameter pumper nozzle shall be at right angles (90°) to the hose nozzles. The horizontal centerline of all nozzles shall be on the same plane and not less than sixteen inches (16") above the hydrant ground flange or bury line.

e. Three hundred sixty Degree (360°) Nozzle Rotation-Nozzles, or the entire above ground section, shall allow three hundred sixty degree (360°) rotation to the exact desired position after installation.

f. Outlet Hose Nozzles and Threads-Hose nozzles shall be made of Grade I. VII, or X bronze. The hose nozzles shall be fastened into the hydrant outlet tap by a thread of not less than seven and one half (7½) threads per inch. A pin shall be employed to prevent the threaded outlet hose nozzle from turning or backing out. The cap or hose accepting end of the outlet nozzles shall be threaded with National (American) Standard Fire-Hose Coupling Screw Threads.

g. Nozzle Cap Materials-Grey cast or ductile iron caps with a recess at the inner end of the thread to retain a gasket. Caps shall be securely chained to the hydrant barrel with a metal chain having links made from stock not less than one-eighth inch (⅛") in diameter. The attachment shall permit free rotation of the cap.

h. Size of Hydrant-Nominal diameter of main valve shall be a minimum of five inches (5").

i. Main Valve Seat and Seat Ring-Shall be bronze to bronze in hydrants which have the main valve assembly in the lower end of the barrel. Threads shall be isolated from the waterway by O-ring seals.

j. Size and Shape of Operating Nut and Outlet Nozzle Cap Nuts-Seven eights inch (⅞") square, full section without undercutting or hollowing out. A threaded hole not to exceed one-quarter inch (¼") in diameter will be allowed in the operating nut for lubrication purposes. Any such hole shall be plugged flush with the top of the operating nut and be water tight.

k. Operating Stem, Nut, and Lubricate Reservoir-The nut shall be made of bronze. Threads shall be lubricated by an oil or grease reservoir sealed by double O-rings, top and bottom to prevent intrusion of moisture and dirt. Length of operating stem surface in contact with O-ring seals shall be protected by a bronze sleeve.

A weather shield shall be provided to prevent dirt and moisture from entering between the sides of the operating nut and the hold down nut, or bonnet opening. Wet top hydrants are not acceptable.

l. Direction of Rotation of Operating Nut-Open right (clockwise) south of the American River and open left (counter clockwise) north of the American River and for the area north of Folsom and

East of Power Inn Road as shown on Standard Drawing W-309 in Section 38 of these Standard Specifications. A clearly visible arrow and the word "open" shall be cast in relief on the top of the hydrant so as to designate the proper direction of opening.

m. Stuffing boxes, if used, shall be provided with O-ring seals.

n. Barrel Drain Outlet-None required. If hydrant is provided with such an outlet, it must be plugged with a threaded bronze or cast iron plug.

o. Toggle Joint Hydrants-Shall be provided with bronze parts as follows: nozzles, lower threaded stem or spindle, stem nuts, seat ring, gate pins, cotter pins, main valve gate threaded stud, and nut.

p. All nozzles, caps, operating nuts, O-rings, friction bearing threaded surfaces, and grease fittings shall be lubricated with the appropriate factory recommended lubricating material. All reservoirs designed to hold a designated quantity of lubricant shall be filled to maximum capacity.

7. A coat of aluminum exterior paint shall be applied as a color or finish coat over the primer coat on the top (above ground) section. All hydrant bonnets shall be painted with OSHA approved safety paint. The color shall be based on the diameter of the main that the hydrant is connected to, as follows:

Red: for 6" and smaller mains

Yellow: for 8" – 10" mains

Green: for 12" and larger mains

8. Bolts shall be carbon steel ASTM A 307, Grade B. Nuts shall be heavy hex nuts conforming to ASTM A 563, Grade C3.

10-32 VALVES

1. Gate valves shall be cast iron, bronze disc, parallel seat, and non-rising stem with a two inch (2") square operating nut. Valves shall conform to AWWA C 500. All interior and exterior ferrous surfaces shall be and coated with factory applied epoxy in accordance with AWWA C 550. Minimum thickness shall be eight (8) mils.

2. Resilient – Seated gate valves shall be cast iron, non-rising stem with a two inch (2") square operating nut. Valves shall conform to AWWA C 509. All interior and exterior ferrous surfaces shall be and coated with factory applied epoxy in accordance with AWWA C 550. Minimum thickness shall be eight (8) mils.

3. Valves provided shall open to the right (clockwise) south of the American River and to the left (counter clockwise) north of the American River and for the area north of Folsom Blvd. and east of Power Inn Road as shown on Standard Drawing W-309 in Section 38 of these Standard Specifications. The valves shall be furnished with flange, mechanical or push-on joints. Valves shall bear the registered certification mark of the AWWA.

4. Swing check valves are contained on an approved listing maintained by the Department of Utilities. Alternate swing check valves shall be added to this list upon review, test and acceptance by the Utility Department.

5. Bolts shall be carbon steel ASTM A 307, Grade B. Nuts shall be heavy hex nuts conforming to ASTM A 563, Grade C3.

10-33 VALVE BOXES AND COVERS, DROP CAPS, AND SERVICE VALVE BOXES

Valve boxes and valve box covers for streets and alleys shall be two-piece units conforming to Standard Drawing W-304. The valve box and cover shall be ductile iron with a minimum tensile strength of twenty five thousands pounds per square inch (25,000 psi). The riser portion shall be ten (10) gage – eight inch (8") steel pipe.

Drop caps and risers for non-traffic use in public utility easements shall conform to Standard Drawing W-304. The riser portion shall be ten (10) gage - eight inch (8”) steel pipe.

Service valve boxes shall be in conformance with Standard Drawings W-305 and W-307. The riser portion shall be ten (10) gage – eight inch (8") steel pipe.

10-34 WATER SERVICE CONNECTION MATERIALS

Water service material shall be either copper or polyethylene tubing. The Department of Utilities maintains a listing of approved water service connection fittings which establish a standard of material quality. Fitting used shall be limited to those on the list. Alternate material may be added to this list upon review, testing and acceptance by the Department of Utilities.

Copper service tubing shall conform to ASTM B 88, Type K, soft tempered.

Polyethylene tubing shall be two hundred pounds per square inch (200 psi), SDR-9 conforming to ASTM D 2737 and AWWA C 901 standards. Tubing shall be copper tube size and shall be manufactured for use with compression or Mueller Insta-tite fittings. Stainless steel insert stiffeners shall be used at all compression joints. Insert stiffeners shall be flared at one end and beveled at the approximately forty five degrees (45°) at the other end. Stiffeners shall be supplied by the fitting manufacturer. Tubing shall be clearly marked showing manufacturer's trade name, nominal size, type of material, pressure rating, and the seal of approval of an accredited testing laboratory.

Threads for underground water service connection fittings shall conform to AWWA C 800 Threads for Underground Service Line Fittings.

10-35 JOINT MATERIALS FOR CLAY PIPE

Joint materials for vitrified clay pipe shall be an approved type of factory-made mechanical compression joint conforming to the requirements of ASTM C 425. Banded rubber couplings and sleeves conforming to ASTM C 425 are acceptable.

10-36 JOINT MATERIALS FOR CONCRETE PIPE

Joint materials for concrete pipe shall be rubber gasket joints conforming to the requirements of ASTM C 443 and shall be flexible and able to withstand expansion, contraction, and settlement. All rubber gaskets shall be stored in as cool a place as practicable, preferably at 70º F. or less, and in no case shall the rubber gaskets be exposed to the direct rays of the sun. Rubber gaskets, of the type requiring lubrication, shall be lubricated with the lubricant recommended and supplied by the manufacturer of the pipe.

10-37 JOINT MATERIALS FOR MANHOLES

Joint materials for precast reinforced concrete manhole sections shall conform to one of the following:

1. Mortar proportioned as one (1) cubic foot of Portland Cement to two (2) cubic feet of concrete sand. All mortar shall be used within thirty (30) minutes after the mixing water has been added.

2. Preformed plastic sealing compound shall conform to Type 1 – Rope Form, one and one-half inch (1½") diameter, Federal Specification SS-S-210A.

10-38 FENCING – CHAIN LINK

1. All chain link fence and gates shall conform to the requirements set forth in Section 80-4 of the State Specifications and the Chain Link Fence Manufacturers Institute Product Manual (Standard Industrial), except as herein modified or as modified in the special provisions.

2. The carbon content of steel posts shall not exceed 0.82 percent (.82%).

3. The fence shall be constructed with 72-inch high fabric topped with three (3) strands of equally spaced barbed wire attached to 45-degree post top mounted breakaway arms for a total fence height of seven (7) feet unless otherwise shown on the Plans or specified in the Special Provisions.

4. Chain link fence fabric shall meet the requirements of zinc-coated steel chain link fence fabric, ASTM A 392 with Class I zinc coating. Unless otherwise indicated on the Plans or in the Special Provisions, the fabric shall be a two inch (2") mesh of nine (9) gauge wire, with a minimum breaking strength of twelve hundred and ninety (1,290) pounds. Selvage shall be twisted top and knuckled bottom.

FENCE MEMBER	DIMENSION O.D.	SECTION TYPE	MINIMALWEIGHT LBS./LINEAL FOOT
Line Post	2.375” 2.375”	Sch. 40 pipe Hi-strength tubing	3.65 3.12
Terminal, Corner, Latch Posts	2.875” 2.875”	Sch. 40 pipe Hi-strength tubing	5.79 4.64
Horizontal, Diagonal Braces, Top Rails	1.660” 1.660”	Sch. 40 pipe Hi-strength tubing	2.27 1.82
Gate Frames	2.375” 2.375”	Sch. 40 pipe Hi-strength tubing	3.65 3.12
Gate Posts: Gate Width Up thru 6’	2.875” 2.875”	Sch. 40 pipe Hi-strength tubing	5.79 4.64
Over 6’ thru 12’	4.500” 4.000”	Sch. 40 pipe Hi-strength tubing	10.70 4.64
Over 12’ thru 18’	5.563”	Sch. 40 pipe	14.62
Over 18’ to 24’ Max	6.625”	Sch. 40 pipe	18.97

5. Posts and rails shall be as specified above, unless otherwise indicated on the Plans or specified in the Special Provisions. Contractor shall have the option of section types to be used with the condition that the option exercised shall be uniform throughout the project.

6. Round posts, rails and /or braces shall be Schedule 40 pipe or high strength tubing as follows:

a. Schedule 40 sections shall be standard weight, hot dipped galvanized steel pipe in conformance with ASTM F 1083, with not less than 1.8 oz/sf Grade E zinc.

b. High strength tubing shall be steel pipe, cold-formed and welded per ASTM F 1043, Group 1C, minimum yield strength 50,000 psi steel. The external coating shall be Type B zinc, with a polymer film, 0.90 oz/sf minimum zinc, with a chromate conversion and verifiable polymer film. The internal coating shall be Type B, 0.90 oz/sf minimum zinc, or zinc pigmented 81% nominal coating with 0.30 mils minimum thickness.

c. Zinc weight shall be determined in accordance with ASTM A 90.

7. Fittings shall be hot-dip galvanized and shall be of malleable, cast iron, or pressed steel. Cap and support arm shall be combination post cap and barbed wire support arm, shall be hot dipp galvanized steel sized to post dimension, and shall be retained to posts with powder actuated Hilti or comparable stainless steel fasteners.

8. Barbed wire shall be Class 3, zinc coated, 12.5 gage wire with four point round, 14 gage barbs at 5-inch spacing in accordance with ASTM A 121.

9. Fabric is to be fastened to line posts and rails with 9 gage galvanized tie wires spaced approximately fourteen inches (14") apart and to bottom tension wire with nine (9) gauge galvanized hog rings spaced approximately fourteen (14") inches apart.

10. Unless otherwise set forth in the Special Provisions all fence shall be constructed with a top rail, and a bottom tension wire.

11. A Certificate of Compliance shall be furnished to the Engineer prior to the installation of any chain link fencing, gates or components stating that the steel and protective coatings comply with the above requirements. Said Certification shall be in accordance with the provisions of Section 6-1.07, “Certificates of Compliance”, of the State Specifications.

10-39 SOIL AMENDMENT

Soil amendment shall be the following type, unless otherwise indicated in the Special Provisions.

Composted Bark composed of ninety-five percent (95%) of the material passing through a one-fourth inch (¼") screen, fifty percent (50%) through a one-eighth inch (⅛") screen. Material shall be stabilized with Nitrogen (½ lb. actual nitrogen per cubic yard) and shall not contain more than 5,000 p.p.m soluble salt. The material shall weigh a minimum of 450 pounds per cubic yard by dry weight.

10-40 IRON SULFATE

Iron Sulfate shall be ferric sulfate in pelleted or granular form containing not less than eighteen and one-half percent (18.5%) iron expressed as metallic iron and shall be formulated to contain a sequestering agent (chelates).

Iron Sulfate shall conform to the requirements of the Agricultural Code of the State of California.

10-41 COMMERCIAL FERTILIZER

Commercial fertilizer shall be uniformly sized, homogenous pelleted form and shall be guaranteed to comply with the chemical analysis specified in the Special Provisions. Commercial fertilizer shall be as specified in the Special Provisions.

10-42 SEED

Seed shall be labeled in accordance with the California Department of Agriculture State Seed Law and Regulations effective on the date of invitation for bids. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will be subject to test at the discretion of the Landscape Architect or of the Engineer.

Seed shall be supplied in unopened containers by a commercial seed dealer. It may be either mixed or in separate containers for each lot. Seed shall be as specified in the Special Provisions.

10-43 PLANTS

Plants shall be the variety and sizes shown on the Plans and shall conform to the requirements of these Specifications.

Contractor shall place an order for the required number of plants including a reasonable number of replacement plants within ten (10) working days after he has received notice of award of the Contract. Contractor shall submit a copy of the order showing the number of plants ordered, from whom ordered and the anticipated delivery date, and request for substitutions for all plant materials that are unavailable to the Landscape Architect within fifteen (15) working days after award of the Contract. No substitutions will be made that are not requested as specified above.

All plants shall comply with Federal and State laws requiring inspection for plant diseases and infestations. Any inspection certificates required by law shall accompany each shipment of plants and certificates shall be delivered to the Landscape Architect.

Contractor shall obtain clearance from the County Agricultural Commissioner as required by law before planting plants delivered from outside the County. Evidence that such clearance has been obtained shall be filed with the Landscape Architect.

All plants furnished by Contractor shall be true to type or name as shown on the Plans and shall be tagged in accordance with the standard practice recommended by the American Association of Nurserymen.

Plants furnished by Contractor shall be healthy, shapely and well rooted. Roots shall show no evidence of having been restricted or deformed at any time. Plants shall be well grown, free from insects, disease or mechanical injury. No plants shall be transported to any planting area that is not thoroughly wet throughout the ball of earth surrounding the roots.

Plants shall be inspected by the Landscape Architect prior to planting. Any plants rejected shall be removed from the site and replaced by Contractor, at his expense.

10-44 PLASTIC IRRIGATION PIPE

Plastic pipe for irrigation systems shall be polyvinyl chloride (PVC) plastic pipe extruded from one hundred percent (100%) virgin material and shall conform to ASTM D 2241.

Plastic pipe on the supply side of the irrigation control valve shall be one or more of the following types as indicated in the Special Provisions.

1. 1¼" or smaller shall be PVC-1120 Schedule 40 solvent weld pipe.

2. 1½" or larger shall be PVC-1120 Schedule 40 integrally molded ring-tite pipe, or

3. PVC-1120 Class 315.

Plastic pipe on the discharge side of the irrigation control valve shall be PVC-1120 Class 200 solvent weld pipe.

10-45 PLASTIC POTABLE PIPE

Plastic pipe for potable water systems within City parks and recreation areas and where designated on the Plans, shall be polyvinyl chloride (PVC) plastic pipe extruded from one hundred percent (100%) virgin material conforming to ASTM D 2241. Plastic potable pipe one and one-half inches (1½") and smaller shall be PVC Class 315 solvent weld; two inches (2") and larger shall be Schedule 40 PVC.

10-46 PLASTIC IRRIGATION PIPE FITTINGS

Fittings for PVC plastic pipe shall be rigid polyvinyl chloride, Schedule 80 high impact fittings and shall be solvent weld type. Plastic fittings shall have a higher bursting pressure rating than the pipe which they join.

All joints utilizing ring tite fittings and pipe shall be sealed with rubber rings. Fittings shall be of the joint design as recommended by the manufacturer. Ring type plastic pipe and fittings shall be assembled with a non-toxic lubricant as recommended by the manufacturer.

10-47 ELECTRIC AUTOMATIC CONTROLLER

The irrigation system controller shall be a microprocessor based/micro electronics solid-state type, capable of fully automatic or manual operation of the system. It shall be housed in a wall mountable, weatherproof, lockable steel cabinet.

The controller shall operate on a minimum of 117 volts A.C. power input and be capable of operating up to two 23 volt A.C. electric remote control valves per station. The controller shall have a reset circuit breaker to protect it from field wire short circuits entering the controller.

The controller shall have a maximum of 24 stations. Each station of the 4 station and 6 station models shall have the capability of being programmed to operate for 0 to 60 minutes in 1 minute increments or 0 to 6 hours in 1 hour increments. Each station of the 8 station and 12 station models shall have the capability of being programmed to operate for 0 to 99 minutes in one minute

increments or 0 to 9.9 hours in 0.1 hour increments. The controller shall have two independent programs with three automatic starts per day for each. Each station on the controller shall be assignable to either or both programs. The controller shall have 14-day programming for flexibility in programming day starts. During operation, the controller shall provide a monitoring readout indicating station in operation and time remaining. The controller shall have a 12-hour AM/PM clock.

The 6, 8, 12 and 24 station models shall have a master valve/remote pump start circuit for use with a mainline master valve to pressurize system when the irrigation cycle starts, or to activate a remote pump start relay to the pump during the irrigation cycle.

The controller shall be capable of being operated manually at any time. A manual "single station" operation for programmed time or new time setting shall be possible without affecting the original program.

The controller shall have a factory preset back-up program for standby operation in the event of a program loss and a battery back-up circuit to maintain program during power loss.

The controller shall be as specified in the Special Provisions.

Electric Controller Enclosure Cabinet shall be as shown on the Standard Drawings in Section 38 of these Specifications. Cabinet shall be fabricated from 12 gauge cold rolled steel. Joints shall be seam welded and external welds ground smooth to a minimum one-eighth inch (⅛") radius. Enclosure shall receive one (1) coat of rust inhibiting primer and two (2) coats of Rustoleum – Ranch Green Paint, or approved equal.

10-48 IRRIGATION CONTROL CONDUCTORS

Irrigation Control Conductors shall be underground feeder types (U.F.) with 4/64" minimum thickness of TW grade polyvinyl chloride insulation.

Control conductors shall be No. 14 AWG, unless otherwise indicated in the Special Provisions. Insulation shall be any color except white.

Neutral conductors shall be No.12 AWG, unless otherwise indicated in the Special Provisions. Insulation shall be white.

10-49 BACKFLOW PREVENTION ASSEMBLY

Backflow Devices are contained on a listing of approved backflow prevention devices. Backflow devices used shall be limited to those on the list.

The list of approved backflow devices is available from the Engineer or from the Customer Service Office of the Utilities Department. Alternate backflow devices shall be subject to approval by the City Cross-connection Control Specialist.

10-50 ELECTRIC REMOTE CONTROL VALVES-SIZES ¾" TO 2"

Electric remote control valves shall have a brass or bronze body with straight or angle pattern. Valves shall be normally closed and shall be the same size as the pipeline which they control, unless otherwise indicated in the Special Provisions.

Electric remote control valves shall be capable of withstanding a working pressure of two hundred pounds per square inch (200 psi). Valves shall be completely serviceable from the top without removing the valve body from the system and shall have a wheel or nut type manual adjustment feature to regulate flow from fully open to closed. The adjustment shall remain in set position when the valve is operated manually or automatically. The adjustment feature shall regulate automatic closing time to not less than four (4) seconds. Each valve solenoid shall be designed for operation on a 24 volt 60 cycle AC circuit at a 3.1 watt maximum. All valves shall have a shut off ball or gate valve on the mainline side of the water flow adjacent to each valve.

10-51 MANUAL CONTROL VALVES

Manual control valves shall be straight or angle pattern globe valves of brass or bronze construction with replaceable compression discs and shall be of the same size as the pipeline which said valve serves, unless otherwise shown on the Plans. Control valves shall be capable of withstanding a working pressure of two hundred pounds per square inch (200 psi).

10-52 IRRIGATION VALVE BOXES

Irrigation valve boxes shall be one of the following types; as indicated on the Plans or in the Special Provisions, or directed by the Engineer:

1. Portland cement concrete boxes with a one piece concrete or cast iron cover, rated for an H2O traffic loading.

2. Plastic boxes conforming to ASTM D 638, tensile strength 3400 psi and impact strength of 1.5 pounds per inch.

Valve box extensions shall be of the same type as the valve box and all covers shall be lockable and be legibly marked “Water”.

10-53 QUICK COUPLING VALVES

Quick coupling valves shall be brass or bronze construction, single slot type with one inch (1") threaded pipe connection and one inch (1") key connection, guaranteed to withstand normal working pressure of one hundred and fifty pounds per square inch (150 psi) without leakage. Quick couplers shall be installed with swing joint assembly and shall be installed a minimum of one foot (1') from curbs and walks where applicable.

10-54 ELECTRONIC MARKER SYSTEM (EMS)

Electronic marker systems shall consist of a two-part system: Marker Locator and Markers.

Marker Locator: The EMS II shall consist of a CB-radio sized electronics package (4 lbs.) with a shoulder strap and a lightweight (1.5 lbs.) hand-held antenna probe. The electronics package shall produce an audible pulsating signal and have a meter indicating signal strength simultaneously. The probe shall operate on eight (8) standard “C” cell alkaline batteries, produce a ticking sound when it is on, and transmit low frequency radio signals to the marker. Contractor shall supply two (2) locators.

Markers: The EMS electronic markers shall be air core based and shall be reusable, with passive-tuned coil antennas encased in waterproof, high-stress, crack-resistant polyethylene, impervious to minerals, chemicals or temperature extremes. The markers shall be the mini-markers, approximately 8-¼" in diameter, color-coded and tuned to the frequency for water. The markers shall be buried approximately two inches (2") above the valve cover.

10-55 GROUT

This section specifies grout for uses other than masonry.

1. All grouts shall conform to applicable portions of the following:

ASTM C 33	Concrete Aggregates
ASTM C 40	Organic Impurities in Fine Aggregates for Concrete
ASTM C 88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	Material Finer Than 75 um (No. 200) Sieve in Mineral Aggregates by Washing

ASTM C 136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C 150	Portland Cement
ASTM C 289	Potential Reactivity of Aggregates (Chemical Method)
ASTM C 494	Chemical Admixtures for Concrete
ASTM C 881	Epoxy-Resin-Base Bonding Systems for Concrete
ASTM D 2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM E 329	Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction
CRD-C621	Corps of Engineers Specification for Nonshrink Grout

a. These provisions shall pertain to dry pack, cement, non-shrink, pressure and epoxy grouts, including adhesive capsules and polymer concrete.

b. Portland cement portion of grout shall be ASTM C 150 Type II or Type V, low alkali, containing less than 0.60 percent alkalies. Aggregate in grout shall be non-reactive and shall be washed before use. When sources of aggregate are changed, test reports shall be provided for the new material. The tests specified shall be performed prior to commencing grout work.

c. The fine aggregate portion of grout shall be hard, dense, durable particles of either sand or crushed stone regularly graded from coarse to fine and shall conform to ASTM C 33 as modified herein. When tested in accordance with ASTM C 136, gradation shall be such that one hundred percent (100%) by weight will pass a standard No. 8 mesh sleeve and no less than forty-five percent (45%) by weight will pass a standard No. 40 mesh sieve.

d. Variation from the specified gradations in individual tests will be acceptable if the average of three consecutive tests is within the specified limits and the variation is within the permissible variation listed below:

U.S. standard sieve size	Permissible variation in individual tests, percent
30 or coarse	2
50 or finer	0.5

e. Other tests shall be in accordance with the following specifications:

Test	Test Method	Requirements
Organic Impurities	ASTM C 40	Color lighter than standard
Amount of Material Passing No. 200 Sieve	ASTM C 117	3% maximum by weight
Soundness	ASTM C 88	10% maximum loss with sodium sulfate
Reactivity	ASTM C 289	Innocuous aggregate
Sand Equivalent	ASTM D 2419	Minimum 80

2. Grout admixtures shall conform to the following:

a. Admixtures shall be compatible with the grout. Calcium chloride or admixtures containing calcium chloride are not acceptable. Admixtures shall be used in accordance with the manufacturer's recommendations and shall be added separately to the grout mix. Water reducing retarder shall be ASTM C 494 Type D and shall be Master Builders Pozzolith 300-R, Sika Corporation Plastiment, or equal. Lubricant additive for cement pressure grouting shall be Intrusion Prepakt Intrusion Aid, Sika Intraplast N, or equal.

b. Water for washing aggregate, for mixing and for curing shall be free from oil and deleterious amounts of acids, alkalies, and organic materials; shall not contain more than 1000 mg/1 of chlorides as Cl, nor more than 1300 mg/1 of sulfates as SO_4; and shall not contain an amount of impurities that may cause a change of more than twenty-five percent (25%) in the setting time of the cement nor a reduction of more than five percent (5%) in the compressive strength of the grout at fourteen (14) days when compared with the result obtained with distilled water. Additionally, water used for curing shall not contain an amount of impurities sufficient to discolor the grout.

3. Drypack Grout

a. Drypack grout shall be used for built-up surfaces, setting miscellaneous metal items and minor repairs and shall be a mixture of approximately one (1) part cement, 1-1/2 to two (2)

parts sand, water reducing retarder, and sufficient water to make a stiff workable mix.

b. Surfaces required to be built up with drypack grout shall be roughened with a wire brush, cleaned, and immediately coated with an acrylic bonding agent such as Burke Acrylic Bondcrete, or equal, at the rate of 200 sq. ft. per gallon. Follow with placement of the grout after a minimum of one hour and after the film is dry to the touch. Install bonding agent in strict accordance with manufacturer's instructions. The drypack grout shall be applied in bands or strips to form a covering of the required thickness. The covering shall be smooth. Construction joints in the grout shall be sloped and shall be cleaned and wetted before application is resumed.

c. Drypack grout shall be cured as for Cast-In-Place Concrete. Grout shall not be placed during freezing weather unless adequate protection is provided.

4. Cement Grout

a. Cement grout shall be used for filling nonbearing portions of equipment pads and pressure grouting and shall be a mixture of one (1) part cement, two (2) parts sand, proportioned by volume, admixtures for pressure grouting, and sufficient water to form a workable mix.

b. Except for the specialized equipment for pressure grouting, mixing and placing apparatus shall be similar to that normally used for cast-in-place concrete. Grout shall be mixed for a period of at least one (1) minute. Diluted grout shall be agitated to keep ingredients mixed.

5. Nonshrink Grout

a. Nonshrink, nonmetallic aggregate grout shall be used for the bearing surfaces of machinery and equipment bases, column base plates and bearing plates. Nonshrink metallic aggregate grout shall be used for setting anchor bolts and grouting reinforcing steel holes. Nonmetallic aggregate grout shall be Five Star Products, Inc. Five Star Grout, Master Builders Masterflow 928, Burke Company Non-Ferrous, Non-Shrink Grout, or equal. Grout shall meet the requirements of CRD-C621 and shall be placed in accordance with manufacturer's instructions.

b. Holes required for grouting shall be blown clean with compressed air and left free of dust or standing water. Horizontal holes for grouting shall be drilled at a slight downward angle to facilitate holding the grout until setting is complete. Bolts or reinforcing steel installed in horizontal grout holes shall be bent slightly accordingly.

6. Epoxy Grout

a. Epoxy grout shall be used for repairing cracks by pressure grouting or gravity flow, repairing structural concrete, and may be used for setting reinforcing dowels or anchor bolts into holes for grouting. Except as noted below, epoxy grout shall be a high modulus, two (2)component, moisture insensitive, one hundred percent (100%) solids, thermosetting modified polyamid epoxy compound. The consistency shall be a paste form capable of not sagging in horizontal or overhead anchoring configurations. Material shall conform to ASTM C 881 Type 1, Grade 3, such as Master Builder Concresive 1440 series, Sika Corporation Sikadur Hi-Mod Series, Adhesive Technology Corporation Solidbond 200 or equal, and shall have a heat deflection temperature in excess of 130 degrees F.

b. Epoxy for pressure grouting/crack injection shall be a two (2) component, moisture insensitive, high modulus, injection grade, one hundred percent (100%) solids, blend of epoxy-resin compounds. The consistency shall be as required to achieve complete penetration in hairline cracks and larger. Material shall conform to ASTM C 881 Type 1 Grade 1, such as Sika Corporation Sikadur 52, Master Builders Concresive LPL, Adhesive Technology Corporation SLV 300 series, or equal.

c. Concrete shall be primed in accordance with the grout manufacturer's instructions.

d. Use of epoxy grout for anchorage of bolts or reinforcing dowels shall be subject to the following conditions:

e. Use shall be limited to locations where exposure, on an intermittent or continuous basis, to acid concentrations higher than ten percent (10%), to chlorine gas, or to machine or diesel oils, is extremely unlikely.

f. Use shall be limited to applications where exposure to fire or exposure to concrete or rod temperature above the product's heat

deflection temperature or 120 degrees F (whichever is less) is extremely unlikely. Overhead applications (such as pipe supports) because of the above concerns, shall be disallowed.

g. Approval from Engineer for specific application and from supplier of equipment to be anchored, if applicable.

h. Anchor diameter and grade of steel shall be per contract documents or per equipment supplier specifications. Anchor shall be threaded or deformed full length of embedment and shall be free of rust, scale, grease, and oils. Embedment depth and hole diameter shall be as specified. Holes shall have rough surfaces, such as can be achieved using a rotary percussion drill. Holes shall be blown clean with compressed air and be free of dust or standing water prior to application of grout. Anchor shall be left undisturbed and unloaded for full curing period. Anchors shall not be placed in concrete below twenty-five degrees (25°)F.

10-56 POLYMER CONCRETE (FOR RESURFACING OR PATCHING)

Polymer concrete (for resurfacing or patching) shall consist of a liquid binder and dry aggregate mixed together to make a mortar or grout of a consistency as required for the application. The liquid binder shall be a chemical and oil resistant, stress relieved, low modulus, moisture insensitive, two-component epoxy-resin compound. The consistency shall be similar to lightweight oil for proper mixing with aggregate. Material shall conform to ASTM C 881 Type 3 Grade 1, such as Sika Corporation Sikadur Lo-Mod series, Adhesive Engineering Concresive 1470, Adhesive Technology Corporation 400 series, or equal.

The aggregate shall be oven dry in sealed packages until time of mixing, and shall be of size and consistency compatible with recommendations of manufacturer of liquid binder for intended application.

Primer, if required for polymer concrete, shall be provided per manufacturer's recommendation.

10-57 ADHESIVE CAPSULES FOR DOWEL ANCHORAGE

Adhesive resin capsules may be used for setting and anchoring reinforcing dowels or anchor bolts into predrilled holes in concrete.

Adhesive resin capsules shall consist of sealed glass capsules containing pre-measured amounts of a polyester or vinylester resin, quartz sand aggregate and a hardener contained in a separate vial within the capsule. Adhesive capsules shall be Hilti HVA Capsules, Molly Parabond Capsules, or equal.

10-58 PRESSURE GROUTING

Pressure grouting equipment shall include a mixer and holdover agitator tanks and shall be designed to place grout at pressures up to fifty (50) psi. Gauges shall be provided to indicate pressure used. The mixer shall be provided with a meter capable of indicating to 1/10 of a cubic foot the volume of grout used.

Grouting, once commenced, shall be completed without stoppage. In case of breakdown of equipment, the Contractor shall wash out the grouting system sufficiently to ensure fresh grout and adequate bond and penetration will occur upon restarting the grouting operation. Grout pressure shall be maintained until grout has set.

Section 11

PRECONSTRUCTION PHOTOGRAPHS

11-1 REQUIREMENT

Preconstruction photographs are required when specifically called for in the special provisions or on the plans.

11-2 SPECIFICATION

When pre-construction photographs are required, Contractor shall provide the Engineer with a printed digital 4” x 6” photo and compact disk (CD) or approve storage media. The photographs shall be taken at one hundred foot (100’) intervals, or closer as necessary to document existing conditions, along the route of the project before any work is started. Each view shall contain the date, project name, lateral or street, and station. This data shall not block the important areas of the picture and should be of the smallest size possible consistent with legible presentation of the required information when a 4” X 6” print is viewed.

All prints shall show good details in both shaded and sunlit areas. Negatives may be of any size provided minimum negative resolution through out the major area of the negative is 100 lines per inch multiplied by the enlargement factor necessary to produce an 8” X 10” print, or, if digital photos are used a minimum resolution of 4 mega pixels is required.

Prints shall be submitted in a three ring photo album binder with clear plastic covered fillers, four photos each side, grouped according to the street, lateral or line, and in sequence. On the cover of the binder shall appear the names of the project and Contractor. Each group of prints shall be identified by a label which projects beyond the edge of filler and is easily recognized. Negatives, CD, or other storage media may be placed within the filler sleeves or submitted separately.

At the option of Contractor, a video recording in an acceptable digital format may be submitted in lieu of pre-construction photographs. All essential features of the project area are to be recorded and all orientations of the view recorded in an accurate manner satisfactory to the Engineer.

Contractor shall submit the pre-construction photographs or digital video recording to the Engineer for review and approval prior to the starting of work.

11-3 PAYMENT

Payment for preconstruction photographs shall be at the lump sum price bid and shall include full compensation for providing all labor, materials, tools, and equipment necessary to furnish the required products.

Section 12

CLEARING AND GRUBBING, AND TREE REMOVAL

12-1 TREES

Unless specifically indicated on the Plans or set forth in the Special Provisions no trees may be removed without direct authority of the Engineer.

For the purposes of this section trees shall be considered as those having a trunk diameter of three inches (3”) and greater measured at a height of three feet (3’) above the ground.

In cases where tree removal is shown on the Plans or is called for by the Special Provisions the Contract may either require a lump sum price for removal of all trees or a unit price per each tree.

12-2 CLEARING AND GRUBBING

1. General

Clearing and grubbing shall consist of removing all objectionable material from within the rights-of-way, construction areas, or other areas that may be specified in the Special Provisions or as indicated on the plans which interferes with the work.

2. Vegetation and Debris

All vegetation such as weeds, grass, shrubbery, roots, and stumps and debris such as broken concrete and trash shall be removed. Tree branches which extend over roadways shall be trimmed to provide a minimum vertical clearance of fourteen feet (14’). Contractor shall have a California, C61 license, allowing him/her to perform D49 tree work. All work shall comply with both the American National Standards Institute (ANSI) Standard Practices for Tree Care Operations and the City of Sacramento Tree Ordinance Title 12.56-12.64. Trees, shrubbery, lawns, and other vegetation adjacent to the work that is not to be removed shall be protected from injury or damage resulting from Contractor’s operations.

3. Existing Facilities

Existing facilities such as pavements, curbs, gutters, sidewalks, lawn sprinklers, mailboxes, fences, pipes, and culverts that interfere with the work shall be removed under the item of clearing and grubbing unless the Plans or Special Provisions provide for separate items.

The methods of removing existing facilities shall conform to Section 13 of these Specifications.

4. Disposal

Materials resulting from clearing and grubbing operations and that are not to be salvaged or otherwise used shall be disposed of outside the project limits at an appropriate site and at the expense of Contractor.

12-3 PAYMENT

In a lump sum contract all clearing and grubbing is included in the lump sum bid. In unit price contracts, payment for clearing or for clearing and grubbing shall be at the lump sum price bid and shall include full compensation for all work required to complete this item. Payment for tree removal will be either at the lump sum price bid or at the price bid per each tree to remove as indicated in the Contract Documents. Where no separate bid item is included for tree removal, tree removal shall be included in "clearing" or "clearing and grubbing".

Section 13

EXISTING FACILITIES

13-1 PROTECTION

Existing facilities within the rights-of-way and construction areas that do not interfere with the work shall be protected from damage. Existing improvements, utilities, and adjacent property shall be protected from damage resulting from Contractor's operations. All trees, lawn, shrubbery, fences, walls, irrigation systems, and other improvements including, but not limited to, existing pavements, sidewalks, street improvements and underground utilities and other improvements not to be removed shall be protected from damage by Contractor throughout the construction period.

Contractor shall be responsible for repairing damage to existing improvements or replacing in kind at the Engineer's option.

All signs and street marking damage due to Contractor's operation shall be replaced in kind by Contractor. In the case of partial damage to lane stripes and traffic lettering the whole stripe or letter shall be replaced. Temporary markings and striping shall be installed within three (3) working days of damage. All painted or other disfiguring marks on the pavement, sidewalk or gutters shall be removed by Contractor before the work has been accepted.

13-2 MAINTAINING WATER, SEWER, AND DRAINAGE FLOWS

Contractor shall be responsible for maintaining all existing water, sewer, and drainage facilities within the limits of the project until new improvements are complete and functioning.

Contractor may elect to cut existing water service laterals and/or sewer services or tunnel beneath them. All water service laterals or sewer services cut by trench excavation or other construction activities shall become the responsibility of Contractor to repair. Maximum time of interruption of water service to any residence or business shall be four (4) hours. Any cut sewer services shall be replaced or repaired by nightfall of the same day per Standard Drawings S-230, S-260, and S-265 of Section 38 of the Standard Specifications.

Should Contractor choose to cut existing water service laterals or sewer services, Contractor shall notify the Engineer at least three (3) working days in advance and shall give residences and businesses twenty-four (24) hour notice of interruption of service.

Should Contractor desire City forces to cut and repair existing water, sewer, or drain services, Contractor shall contact the Engineer at least three (3) working days in advance to schedule and coordinate the work. No compensation will be paid to Contractor for the repair by City crews of any water service laterals or sewer services accidentally or purposely cut by Contractor and all such work performed by City crews at the request of Contractor shall be at Contractor's expense. Any work performed or materials provided by City crews to repair and maintain existing drainage systems shall be at Contractor's expense or shall be deducted from amounts owed to Contractor.

Whenever, in the opinion of the Engineer, there arises an emergency situation within the limits of the project that involves maintenance of water, sewer, or drainage, or a situation that poses a danger to the public safety, or inconvenience and/or unreasonable nuisance to the general public, City's forces may be called upon to perform any work necessary to relieve the emergency. Contractor's attention is directed to Section 5-12 "Provisions for Emergencies."

If such emergency is the result of negligence by Contractor, the cost of any corrective measures taken or work performed by City crews shall be billed directly to Contractor or may be deducted from any payments owed to Contractor. The performance of such emergency work by the City forces shall not relieve Contractor of any responsibilities, obligations, or liabilities under the contract for the project.

Should it become necessary for Contractor to temporarily divert or convey flows carried by existing water, sewer, or drainage systems (which include, but are not necessarily limited to, pipelines, channels and pump stations), Contractor shall prepare a detailed, effective plan including, at minimum, the quantity of flow to be conveyed and/or the volume to be impounded, the number, size, and material type of any pipes, the size and configuration of any channel, the size and configuration of any impoundment basin, all pumping information (if applicable), the point of discharge and discharge details.

The plan shall be submitted to the Engineer for approval a minimum of ten (10) working days prior to the start of any work affected thereby and Contractor shall not begin such work until the plan is approved and is on file with the Engineer.

No separate payment will be paid to Contractor for maintenance of existing facilities; the cost of this work shall be included in the various contract items of work.

13-3 REMOVING/RELOCATING

Existing facilities that interfere with the work shall be removed, reset, relocated, adjusted or otherwise worked on as specified herein, on the Plans, or as directed by the Engineer. Removed facilities that are not to be salvaged or otherwise used shall be disposed of away from the project. Holes or depressions resulting from the removed facilities shall be filled, compacted, and brought to grade at the direction of the Engineer.

1. Asphalt and Concrete

Asphalt and concrete such as pavements, curbs, gutters and sidewalks that are to be removed shall be cut to neat, straight lines with an approved saw or other means acceptable to the Engineer. Where the edge of the pavement removal is within two (2) feet of existing building, curb and gutter, or existing pavement edge, the remaining pavement shall also be removed and replaced. The exact limit of the asphalt and concrete to be removed shall be determined in the field by the Engineer.

2. Mailboxes

Existing mailboxes and supports shall be removed and reset where shown on the Plans or as directed by the Engineer. Existing posts shall be removed and transported from the job site and replaced with 4 X 4 pressure treated Douglas fir posts conforming to the provisions of Section 56-2.02B, "Wood Posts and Braces" of the State Specifications. The mailboxes shall be suitably mounted on a platform which shall be set three and one-half feet (3½') to four feet (4') above the ground. Posts shall be set at least two feet (2') in the ground and firmly positioned by tamping. Existing newspaper receptacles shall be attached to new posts.

Existing mailbox supports constructed of material other than normal 4 X 4 wooden posts shall be stacked in the owner's yard for his recovery. Contractor shall replace with 4 X 4 wooden posts as described above.

3. Fences

Fences shall be relocated where shown on the Plans or as directed by the Engineer. Fence shall be relocated to provide three foot (3') minimum clearance from relocated or new fire hydrants. Replace only deteriorated fence parts.

The intent of this specification is for Contractor to relocate the fence in a more suitable location without completely rebuilding it and with an absolute minimum of effort and expense. It may not be known how much of any type of fencing Contractor will be required to replace. Contractor shall submit a unit price per lineal foot of fence to replace regardless of type or quantity.

4. Sprinklers and lights

Lawn sprinkler system pipes, heads, and yard lighting systems shall be relocated and re-plumbed to insure continued operation to an equal or better condition.

5. Pipes and Culverts

Pipes and culverts that are no longer to be used shall be removed if they are within two feet (2') of sub-grade. Such pipes that are lower than the aforementioned, shall be removed or the ends shall be plugged with concrete at the option of Contractor.

6. Abandonment of water service

Abandon the water service by closing corporation stop and crimping and cutting water service adjacent to the distribution main.

7. Existing Utilities

Unless otherwise noted, the location, alignment, and depth of existing underground utilities as shown on the Plans is taken from public records and no responsibility is assumed for the accuracy thereof. For the most part, underground utility services are not shown on the Plans. Attention is directed to the provisions in Section 6-19, "Main and Trunkline Utilities." The cost of relocating existing overhead and/or underground utilities not specified on the plans to be relocated, but which Contractor elects to relocate or cut and reconnect at his/her own convenience shall be borne by Contractor.

13-4 PAVEMENT FOR TRENCH SURFACE RESTORATION

Contractor shall restore surfaces in kind (using the same material as existing) unless otherwise noted on the Plans or Special Provisions.

Asphalt pavement surface restoration for trenches shall conform to the applicable provisions of Sections 10, 22, 26 and 27.

Restoration of existing concrete pavement shall consist of a minimum of six (6) inches of Portland cement concrete. Portland cement concrete pavement and its placement shall conform to the requirements of Sections 10 and 19.

13-5 PAYMENT

There will be no separate payment for existing utilities work as described in this section but full compensation will be considered as included in the bid for items of work Contractor deems appropriate.

Section 14

EARTHWORK, EXCAVATION, EMBANKMENT AND SUBGRADE

14-1 ROADWAY EXCAVATION AND BACKFILL

In the Contract this item shall consist of excavating, removing, and satisfactory disposal of all material within the limits of the work for roadways, drainage channels, ditches, and any other work as may be specified in the Special Provisions or shown on the Plans. Suitable excavated material may be used for embankment and for backfilling. The rough excavation shall be carried to such depths that sufficient material will be left above the finished grade to allow for compaction to the required grade. Should Contractor excavate below the designated lines he will be required to replace the material with suitably compacted import material or Class "D" Concrete as determined by the Engineer, without cost to the City.

No excavation shall be started on a project until approval has been given by the Engineer. This approval is to assure all necessary surveys, cross sections, and measurements which may be required for determining the quantities removed are preformed.

If all or part of the excavated material is to be used as fill, and preparation for the fill placement has not been made, the Engineer may require the stockpiling of this material. The Engineer shall have the right to select excavated material to be used in fill.

Payment for excavation shall be based on cross section measurements taken prior to the beginning of work and the final lines and grades of the finished section. Payment shall be made per cubic yard of material excavated in accordance with the Plans.

14-2 STRUCTURE EXCAVATION AND BACKFILL

Structure excavation shall consist of excavation performed to place structures such as footings, walls, etc. Payment for structure excavation and backfilling shall be considered as included in the prices paid for the various items of work involved and no separate payment will be made therefore.

Excavation for placement of manholes will be paid for under the price bid for manholes, complete in place.

Backfill material shall be specified in the Special Provisions or indicated on the Plans. The backfill material shall be compacted by mechanically

tamping in maximum eight-inch (8”) layers so as to achieve a minimum relative compaction of ninety-five percent (95%).

Material excavated in excess of that required for backfilling will be disposed of away from the site of the work, unless otherwise permitted by the Engineer.

14-3 TRENCH EXCAVATION AND BACKFILL

Trench excavation shall consist of the excavation required to install pipelines and its cost will not be paid for separately but compensation will be included in the price bid for placing pipe.

Before excavation of the pipe trench in fill areas of roadway embankments, the fill area or embankment shall be completed to a height above the pipe invert grade line of not less than twice the internal pipe diameter or to final fill or embankment subgrade, whichever is lower, but in no case less than twelve inches (12”) above the top of the pipe. Such embankment shall be compacted to a minimum relative compaction of ninety percent (90%) for a distance on each side of the pipe equal to a least two (2) pipe diameters. The remainder embankment shall be compacted as specified elsewhere in these Specifications for the type of construction being preformed, or as specified in the Special Provisions or on the Plans.

Backfill shall be placed as shown on Standard Drawing T-80, shall be provided by Contractor and shall be placed in accordance with these Standard Specifications and the pipe manufacturer’s recommendations. Initial backfill shall be the material between the top of the bedding material and six inches (6”) above the top of the bell or barrel if the pipe does not have a bell.

Initial backfill shall be placed immediately after pipe joints have been completed, inspected and passed by the Engineer. The material shall be carefully placed so as not to disturb or damage the pipe, and shall be brought up evenly on both sides. Initial backfill material shall be placed in layers not exceeding eight inches (8”) in depth before compaction at or near optimum moisture content. Contractor shall place initial backfill—by shovel slicing, tamping, and/or vibratory compaction in order to produce firmly compacted material under the haunches of the pipe. Compaction shall be by mechanical pneumatic or vibratory compaction equipment approved by the Engineer. Care shall be used to avoid dislodging the pipe. No wedging or blocking of the pipe shall be permitted. Ponding and jetting methods of achieving compaction shall not be allowed. The compacted material must achieve a relative compaction of at least ninety percent (90%) as determined by ASTM D 698.

When the bedding material for the pipe consists of crushed rock, sand shall not be used as initial backfill material.

Unless otherwise approved by Engineer, trench backfill, as shown on Standard Drawing T-80, shall be provided, and placed to grade by Contractor, in accordance with these Standard Specifications and the pipe manufacturer's recommendations. Trench backfill shall be the material between the initial backfill and the top of trench or sub-grade. The material for trench backfill may be of job excavated, native material provided that such material is free of organic materials or other unsuitable materials as determined by the Engineer that may cause voids or depressions to develop during or after placement of the backfill. Rocks, stones and solid earth chunks exceeding three inches (3") in greatest dimension shall be removed from the trench backfill material.

Unless otherwise indicated on the Plans or specified in the Special Provisions, trench backfill material shall be placed in layers not exceeding eight inches (8") in depth before compaction at or near optimum moisture content. Until the total backfill above the top of the pipe exceeds three feet (3'), machine-placed backfill material shall not be allowed to "freefall" more than two feet (2').

Unless otherwise shown on the Plans or specified in the Special Provisions, compaction of trench backfill material shall be by mechanical pneumatic or vibratory compaction equipment. Minimum relative compaction of trench backfill material shall be ninety percent (90%) when tested according to ASTM D 1557, except that the top six inches (6") below the subgrade shall be compacted to a relative compaction of ninety-five percent (95%). Trenches in easements outside the street rights-of-way may be compacted to ninety percent (90%) relative compaction throughout the depth. Compaction testing will be performed by the Engineer and the cost thereof will be borne by the City, except that retests of areas which fail to meet the required compaction will be charged to Contractor and deducted from any payment due Contractor for work performed under the terms of the Proposal.

Ponding and jetting methods of achieving compaction will not be allowed.

Upon written request by Contractor, and upon approval of the Engineer, the trench may be completely backfilled to the bottom of the AC pavement with Control Density Fill backfill provided in conformance with 10-16, "Controlled Density Fill". For pipes and conduits two inches (2") and smaller, bedding, initial backfill, and trench backfill shall be slurry cement placed to the bottom of the AC pavement.

14-4 TEMPORARY PAVING

Unless stated otherwise in Contract documents, at the end of the day

and prior to opening to traffic, trenches shall be temporarily paved to provide a smooth riding surface. The paving material may be asphalt concrete or temporary paving, "cut back" or other Engineer approved material. Contractor may use non-skid plates to cover trenching when approved by the Engineer. Contractor shall nail down plates, and at edges Contractor shall create and maintain a uniform taper using temporary paving to ensure a smooth traveling surface over the plate.

Cutback shall be placed on the completed aggregate base course, constructed per the Plans and Special Provisions and shall be placed so that the compacted thickness is not less than two inches (2").

Compaction of temporary paving shall be performed using steel wheel rollers or mechanical equipment approved by the Engineer. Compaction by wheel rolling with backhoes or other rubber tire construction equipment shall not be allowed. The temporary paving shall be placed and maintained so that the maximum deviation does not exceed one-half inch (½") using a ten (10) foot straight edge placed in any direction. If, in the opinion of the Engineer, the temporary paving is not properly maintained, Engineer may direct Contractor to install permanent asphalt concrete pavement at no additional cost to the City of Sacramento.

14-5 EMBANKMENT AND FILL

Fill on a roadway will normally be made with material excavated on the same work unless otherwise indicated by the Special Provisions or Plans.

Fill will be paid for per cubic yard measured in place by computing the yardage between the original ground elevation and the final grades as shown on the Plans.

Tests performed to determine relative compaction shall be performed using the following methods:

1. ASTM D 1557 laboratory test for maximum dry density at optimum moisture

2. ASTM D 2922 field test for in-place wet density by nuclear methods.

3. ASTM D 3017 field test for in-place moisture content by nuclear methods.

Relative compaction shall mean the ratio of the field dry density to the laboratory maximum dry density expressed as a percentage.

In general, construction of fill shall be in accordance with the methods set forth in the State Specifications. The relative compaction shall be at least ninety percent (90%), unless otherwise indicated.

14-6 LANDSCAPE FILL

Landscape fill shall consist of fertile, friable soil of loamy character. It shall be obtained from well-drained arable land outside of the project limits and shall be free from subsoil, refuse, roots, heavy or stiff clay, stones larger than one inch (1") in size, coarse sand, noxious weeds, such as Bermuda, Nut Grass and Morning Glory, sticks, brush, litter and other deleterious substances. Topsoil shall be capable of sustaining healthy plant life.

Landscape fill will be paid for per cubic yard, measured in place by computing the yardage between the original ground elevation and the final grades as shown on the Plans; which price shall include full compensation for all labor, equipment and materials necessary for placement of landscape fill. The relative compaction shall be eighty-five percent (85%), unless otherwise indicated.

14-7 SUBGRADE

Sub-grades for pavement, curb and gutter, sidewalk, lined channels and ditches, or for rock base under pavements shall be finished accurately and true to the lines and sections shown on the Plans, within a tolerance of ±.05 feet. The top six inches (6") of sub-grade immediately prior to placing subsequent material thereon shall have a relative compaction of not less than ninety-five percent (95%). The sub-grade shall be free of segregated material and shall be smooth and true to the required grade and cross section. Contractor shall repair, at his expense, any damage to a prepared sub-grade caused by his operations or by use of public traffic. No material shall be placed upon the prepared sub-grade until it is in a condition meeting the requirements specified. Unless otherwise provided by the Special Provisions, the finishing of sub-grade will not be paid for as a separate item but this work will be included by Contractor under such items as Contractor deems appropriate.

14-8 UNSUITABLE MATERIAL/IMPORT

1. Definition

Unsuitable Material for roadway sub-base and trench backfill is defined as soil the Engineer determines to be:

a. Loose, unstable or yielding, or

b. Unable to be compacted to specified density using ordinary methods at optimum moisture content, or

c. Contains visible or excessive deleterious material as determined by the Engineer, or

d. Too wet to be properly compacted and circumstances prevent processing suitable in-place drying prior to being used as backfill; or

e. Otherwise unsuitable for planned use.

2. Handling Trench Unsuitable Material

Whenever the bottom of the trench is soft or rocky, or rendered not suitable by the Engineer for pipe bedding, the unsuitable material shall be removed to a minimum depth of six inches (6”), or deeper as determined by the Engineer, for pipelines or twelve inches (12”) for manholes or appurtenant structures. Whenever excavated native soil is rendered by the Engineer to be unsuitable for trench strata backfill, Contractor shall remove and replace with import material approved by the Engineer.

For drainage, sewer and water pipelines the unsuitable material shall be replaced with Class 2 aggregate base or approved equal and shall be compacted to 90% relative compaction. For manholes and appurtenant structures the unsuitable material shall be replaced with material subject to the approval of the Engineer.

The cost to remove and replace unsuitable bedding material to the above specified depths shall be included in the specific bid item cost. Excavation of unsuitable material beyond these depths, so ordered removed by the Engineer, will be paid as extra work as provided in Section 4 unless otherwise specified in the Special Provisions.

The cost to haul and replace native soil that is unsuitable for trench strata backfill shall be a separate bid item that includes the import material price and the transporting expenses for both unsuitable and the import material. The cost to replace unsuitable material rendered unsuitable due to any act or omission of Contractor or due to inclement weather shall be borne by Contractor and there will be no compensation therefore.

Excavated unsuitable material shall be the property of Contractor and shall be disposed of away from the project site. For off site disposal, Contractor shall have written permission from the owner upon whose property the disposal is to be made before any material is deposited thereon.

The quantity of unsuitable material/import for trenches shown on the Proposal is for bidding purposes only. The unit price indicated will not be adjusted because the actual quantity varies from the quantity shown on the

Proposal. Payment for handling Unsuitable Material/Import shall be at the contract unit price bid per tonnage of import.

3. Handling Roadway Unsuitable Material

For road sub-grades unsuitable material shall be replaced with pit run base, aggregate base Class II, cement treated bases, lime treated bases, and with geogrid.

Payment for handling Roadway Unsuitable Material/Import shall be at the contract unit price bid per ton, shall be based solely on the tonnage of import, and shall include full compensation for furnishing all labor, materials, tools and equipment, and for performing all work necessary to complete this item in place.

As an alternate the Engineer may direct Contractor to furnish and place geotextile fabric below the bedding materials. The geotextile material shall be a high modulus woven fabric, and shall be inert to commonly encountered chemicals, rot-proof, and resistant to ultraviolet light, insects and rodents. The geotextile fabric shall have a minimum grab tensile strength of two hundred pounds (200 lbs.) in any direction as measured in accordance with ASTM D 4632, a Mullen burst strength of at least four hundred pounds per square inch (400 psi) per ASTM D 3786, and an Equivalent Opening Size no larger than the U.S. Standard Sieve Number 50 as determined by ASTM D 4751. Geotextile fabric shall be Mirafi 600X or equal. Each roll of fabric shall be handled and placed in accordance with the manufacturer's recommendations. Furnishing and placing of geotextile fabric will be paid for as extra work as defined in 4-6, "Extra Work Force Account" unless otherwise indicated.

Where geogrid is utilized Contractor shall furnish equipment required for satisfactory progress and completion of the project. Before placement of the geogrid, the site shall be cleared of all topsoil, trees, stumps, rocks and other debris. The grade shall be reasonably smoothed, minimizing all ruts, depressions, and other distortions that would inhibit smooth and proper placement of the geogrid. Geogrid shall be placed in accordance with the suppliers installation recommendations, but in no case shall grid ties be placed less than twenty feet apart or grid overlaps be less than two feet.

Geogrid shall be laid either at the elevation and alignment as shown on the Plans or to the limits approved by the Engineer in the field and shall be oriented such that the roll length runs parallel to the roadway. When geogrid rolls are placed side-by-side, or end-to-end, they shall be overlapped a minimum of two feet or a greater distance recommended by the supplier and approved by the Engineer. Overlap geogrid in the direction that fill will be spread. Geogrid material shall be tensioned by hand and secured to the ground surface.

Care shall be taken to ensure that geogrid sections do not separate at overlaps during construction. Placement of geogrids around corners may require cutting of geogrid product and diagonal overlapping to ensure that excessive buckling of grid material does not occur. No more than two layers of geogrid are to be placed in direct contact with one another.

When very soft subgrade soils are encountered, fill material placed over the geogrid shall be back dumped from trucks and bladed onto the geogrid in such a manner that the fill rolls onto the geogrid ahead (e.g. by gradually raising the dozer blade while moving forward), Geogrid installation procedures shall be performed so that the geogrid does not "roll" or substantially deflect ahead of the operation and possibly fold over onto itself as this undermines the structural integrity of the geogrid. Care shall be taken during the initial lifts to avoid failing the weak structure of the subgrade by preventing heavy equipment from placing the initial lifts. On firmer but still structurally unsuitable subgrades, pneumatic tired vehicles may operate directly upon the geogrid at slow speeds, less than 5 MPH, provided the geogrid does not require a protective coating.

Tracked construction equipment shall not operate directly on the geogrid. A minimum fill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. Care shall be taken by the operators to avoid sudden sharp turning. Fill material shall be placed over the geogrid to depth and dimensions shown on the plans or as approved by the Engineer. The backfill material placed in contact with the geogrid will be the approved aggregate base material or a material with a maximum aggregate size of one and one-half inche (1 ½") and approved by the Engineer. For damaged or torn geogrids, or for geogrids with protective coatings, any damage to the coating incurred during transportation, storage or installation shall be repaired or replaced to the satisfaction of the Engineer by Contractor at their expense. The coating shall be restored to its original condition.

14-9 PAYMENT

Payment shall be at the unit price per cubic yard qnd shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in the installation, and all other necessary work as directed by the Engineer to conform with this item.

Section 15

WATER USED IN CONSTRUCTION

15-1 WATER USED IN CONSTRUCTION

Elsewhere in these Specifications there is specified the quality of water used for concrete. This paragraph is intended to cover only water used in construction.

The application of water shall be under the control of the Engineer at all times and shall be applied in the amounts and at the locations designated by the Engineer or as specified.

At the option of Contractor, excavation areas may be watered prior to excavating the material.

All equipment used for the application of water shall be equipped with a positive means of shut off.

Unless otherwise permitted by the Engineer, at least one mobile unit with a minimum capacity of 1,000 gallons shall be available for applying water on the project at all times.

Water for compacting embankment material, sub-base, base and surfacing material, and for controlling dust shall be applied by means of pressure-type distributors that will insure a uniform application of water.

If Contractor elects to do so, he may use chemical additives in water used for compaction. If such additives are used, furnishing and applying the additives shall be at Contractor's expense. The right is reserved by the Engineer to prohibit the use of a particular type of additive, to designate the locations where a particular type of additive is to be used, if the Engineer has reasonable grounds for believing that such use will be in any way detrimental to the work.

Arrangements for obtaining water needed for construction purposes must be made with the supplying agency. Proof of such arrangement, including method of reimbursement, shall be subject to inspection and approval by the Engineer.

Unless otherwise approved by the Department of Utilities, connections to the City's water distribution system used to fill tank trucks or other such equipment, shall include an air gap to separate the water supply from the equipment to be filled. The Air-gap separation shall be at least double the diameter of the supply pipe, measured vertically from the flood rim of the receiving vessel to the supply pipe; however, in no case shall this separation be less than one inch (1"). In no case will a direct connection to the City's water supply be allowed.

Water used in construction, including compacting fill, preparing sub-grade, dust control, mixing concrete, concrete curing, laying and compacting any type of base material, settling backfill in trenches or at structures, or water used for any other purpose shall be provided and paid for in accordance with the Department of Utilities "Water Hydrant Policy". A copy of said policy is available at Customer Services, 1395-35th Avenue.

15-2 PAYMENT

There will be no separate payment for water used during construction, but the price therefore shall be considered included in whatever items Contractor deems appropriate.

Section 16

WATER QUALITY CONTROL

16-1 GROUND WATER DISCHARGES

Contractor shall be responsible for the control, removal, and disposal of any groundwater that may be encountered in the course of excavating and backfilling trenches, placing pipe, or constructing any other improvements associated with the project. Unless approved in writing by the Engineer, groundwater and/or water from trench dewatering shall be free of sediment and other construction materials before entering the City sewer or storm drain system. A dewatering plan, including a water de-sedimentation plan, shall be submitted to the Engineer for approval prior to any pumping or discharging of water to the City storm drain system.

Issues which require the regulation of groundwater discharges include: influence on existing or unknown contaminate plumes, exceeding sewer and drainage capacity, excessive demands on facility infrastructure, pumping costs, and maintenance worker safety.

It is the responsibility of the contractor to verify that groundwater is free of contamination through a regular monitoring program.

All Groundwater discharges within the City of Sacramento must be arranged through the Water Quality Section of the Department of Utilities, (916)808-1400, 1395 35th Avenue, Sacramento CA 95822.

DISCHARGE TO SEWER SYSTEM

If 25,000 gallons of water per day, or more, is discharged to the City's Combined Sewer/Stormwater System, or Separate Sewer System, Contractor will be required to obtain a discharge permit from the Sacramento County Regional Sanitation District Industrial Waste Section (916-875-6470). The City will reimburse Contractor for fees paid to the County to obtain a discharge permit, but Contractor shall be responsible to pay any fines levied if Contractor does not comply with the permit requirements. Discharges of 25,000 gallons of water, or more, also require a Memorandum of Understanding (MOU) with the City of Sacramento. See www.sacstormwater .org for MOU language. Fees will be waived for City sponsored projects. Contractor should allow 2-3 weeks for MOU process.

All new groundwater discharges to the City of Sacramento's combined or Separated Sewers must be regulated and monitored by the Department of

Utilities (refer City Council Resolution #92-439) Groundwater discharges to the City's sewer system are defined as follows:

1. Construction dewatering discharges
2. Treated or untreated contaminated groundwater cleanup discharges
3. Uncontaminated groundwater discharges

Currently, two types of groundwater discharges to the combined and separate sewer system are recognized by the Department of Utilities, which are: limited discharges and long-term discharges. These types of discharges are described as follows:

1. "Limited discharges"

Limited discharges are short groundwater discharges of 7-days duration or less and must be approved through the Department of Utilities by an acceptance letter.

2. "Long-term discharges"

Long term discharges are groundwater discharges of greater duration than 7-days. Long-term discharges must be approved through the Department of Utilities and the City Clerk through the MOU process.

DISCHARGES TO THE STORM DRAINAGE SYSTEM

Any groundwater discharges to the separate storm drainage system must be secured with an individual National Pollutant Discharge Elimination System (NPDES) permit from the California Regional Water Quality Control Board (Water Board) and an MOU from the City. The NPDES permit must be received prior to the City issuing an MOU to discharge to the City's storm drainage system.

If discharge is either four months or less in duration or the average dry weather discharge does not exceed 0.25 MGD, then the discharge can be covered under the General NPDES Permit for Dewatering and other Low Threat Discharges to Surface Waters. A Notice of Intent and filling fee must be filed with the Water Board for each project. Receiving water limitations are included in the permit.

16-2 WATER QUALITY CONTROL

These requirements consist of regulations contained in the National Pollution Discharge Elimination System (NPDES) Municipal Stormwater Permit issued to the City.

Contractor shall comply with all City and County of Sacramento air pollution control rules, regulations, ordinances, and statutes which apply to any work performed pursuant to the contract, including any air pollution control rules, regulations, ordinances, and statutes, specified in the Government Code. Contractor shall be responsible for the control of dust within the limits of the project at all times including weekends and holidays in addition to normal working days. Contractor shall take whatever steps are necessary or required by the Engineer to eliminate the nuisance of blowing dust without causing sediment, debris or litter to enter the City storm drain system.

16-3 EROSION, SEDIMENT, AND POLLUTION CONTROL

Contractor shall be responsible for controlling erosion and sedimentation within the limits of the project at all times during the course of construction including evenings, weekends and holidays in addition to normal working days. Contractor shall prevent sediment and construction debris from entering the City storm drain system.

Contractor shall provide the following erosion, sediment, and pollution control Best Management Practices (BMPs) when and where applicable:

Contractor shall place Filter Bags in and Gravel bags around any storm drain inlets which receive runoff from the limits of the construction zone, including storage and staging areas. Alternative storm drain inlet protection BMPs may be used with approval of the Engineer. (See Section 38, drawings Q-20 and Q-30)

Contractor shall cover piles of material and/or place gravel berms (or approved equal) around material piles as required to prevent migration of material to gutters or storm drains.

Contractor shall keep gutter flowlines unimpeded and free of soil, debris and construction materials at all times.

Contractor shall stabilized construction entrance at any soil to concrete/asphalt interface used by Contractor vehicles and equipment in accordance with Section 38, drawing Q-10.

Contractor shall place silt fences, fiber rolls or approved equal at any soil to concrete/asphalt interface at which soil may be washed onto the concrete/asphalt in accordance with Section 38, drawings Q-40 and Q-50.

Wash water, slurry and sediment from concrete or asphalt saw-cutting operations shall not be allowed to enter the City storm drain system, but

instead must be collected and disposed of, by Contractor, in a manner approved by the Engineer.

Contractor is required to implement, at a minimum, the following housekeeping practices:

Site Cleanup:

Contractor shall be responsible for the control of dust, mud and debris resulting from Contractor's operations within the limits of the project at all times including weekends and holidays in addition to normal working hours. Contractor shall take whatever steps are necessary or required by the Engineer and daily clean up throughout the project shall be required as Contractor progresses with the work.

Daily or as needed, all paved areas within the limits of the project shall be cleaned and free of sediments, asphalt, concrete and any other construction debris. Contractor shall not clean sediment and debris from the street by using water to wash down streets. The streets shall only be washed after the streets have been thoroughly swept and/or vacuumed and inlet protection has been placed at all storm drain inlets to catch any remaining sediments from the streets.

Spillage of earth, gravel, concrete, asphalt, or other materials resulting from hauling operations along or across any public traveled way shall be removed immediately by Contractor at their expense. If site is not kept sufficiently clean, the City will take measures to clean it and subtract the cost thereof from payments owing the Contractor.

Solid Waste Management:

Contractor shall maintain a clean construction site. Contractor shall provide designated areas for waste collection. The waste collection areas shall be leak-proof containers with lids or covers. Site trash shall be collected daily and placed in the disposal containers. Contractor shall make arrangements for regular waste collection. Contractor shall also regularly inspect the waste disposal areas to determine if potential pollutant discharges exist.

Hazardous Material Storage and Delivery Area:

Contractor shall provide one central hazardous material storage and delivery area (HMSDA) for the duration of the project. Examples of hazardous materials include pesticides and herbicides; fertilizers; detergents; petroleum products; acids; lime; glues; paint; solvents and curing compounds. This area shall be protected such that polluted runoff will not be allowed to leave the

HMSDA site. Contractor shall regularly inspect the HMSDA site to ensure that any hazardous or non-hazardous materials have not spilled.

Concrete Waste Management:

Contractor shall arrange for concrete wastes to be disposed of off-site or in one designated on-site area. Concrete wastes, including left-over concrete and material from washing out the concrete truck, shall not be disposed or washed into the storm drain system. A designated on-site concrete waste containment area shall be provided. The site shall be bermed and lined to keep concrete waste from leaving the containment area. The dried concrete waste shall be removed and disposed of properly by Contractor at their expense.

Spill Prevention and Control:

Contractor shall be responsible for instructing employees and sub-contractors about preventing spills of hazardous materials such as equipment fuel, and about controlling spills if they occur. Proper spill control and cleanup materials and procedures shall be kept on site near the storage and equipment fueling areas and updated as materials change on site. Contractor is strictly responsible for the prevention, clean-up and consequences of any hazardous materials spills.

Throughout the duration of the project Contractor shall inspect and maintain, in effective condition, all erosion, sediment, and pollution control BMPs before and after each storm event and as needed. Contractor shall immediately correct or replace any ineffective BMPs.

More information about control measures and housekeeping practices can be obtained by referring to the City of Sacramento's Administrative and Technical Procedures Manual for Grading, Erosion and Sediment Control available at 1395 35th Avenue, Sacramento, CA 95822.

Contractor shall prepare and submit an erosion, sediment and pollution control plan (ESC Plan) to the Engineer for review. The submittal shall include a description of all erosion, sediment and pollution control BMPs proposed to be used to prevent sediment and other sources of pollution from entering the City storm drain system as well as a site plan showing their placement. The ESC Plan shall be submitted a minimum of 48 hours prior to start of the work. **Contractor shall not begin work until an accepted ESC Plan is on file with the Engineer**. The erosion, sediment and pollution control plan shall be updated as necessary and re-submitted to the Engineer.

16-4 ENFORCEMENT

Per City Code Sections 15.88, 13.16 and 1.28, Contractor shall be subject to Notice of Violations (NOVs) resulting in possible Stop Work Orders and Administrative Penalties of up to $4,999 per day for non-compliance of this section of the Special Provisions.

Per the State's Porter Cologne Water Quality Act, Contractor shall also be subject to inspection by Staff from the Central Valley Regional Water Quality Control Board who have the authority to issue Notices of Violation (NOVs) and Penalties of up to $10,000 per day for non-compliance. Contractor shall be liable for any fines issued to the project by the State or Federal Government for NPDES non-compliance due to Contractor negligence.

The City reserves the right to take corrective action and withhold the City's costs for corrective action from progress payments or final payment in accordance with Section 7, Retention of Sums Charged against Contractor, of the Agreement. Any fines, including third-party claims, levied against the Agency as a result of Contractor's non-compliance are Contractor's sole responsibility and will be withheld from progress payments or final payment in accordance with Section 7, Retention of Sums Charged against Contractor, of the Agreement.

16-5 PAYMENT

There will be no separate payment for Water Quality Control and the cost therefore shall be considered included in whatever item Contractor deems appropriate.

Section 17

LAYING AGGREGATE BASE

17-1 LAYING AGGREGATE BASES

Aggregate bases shall be placed on the prepared sub-grade to such a depth that when thoroughly compacted it will conform to the grades and dimensions shown on the Plans. The material shall be placed from vehicles through an approved spreader box or other device. At locations which are inaccessible to spreading equipment, the material may be spread by any means to obtain the specified results. Material shall be placed and compacted in layers not to exceed six inches (6”).

Segregation of the material shall be avoided and the material, as spread, shall be free from pockets of rock or fine material. Segregated material must be remixed by harrowing and blading.

After placing the material and shaping it by blade the compaction shall be accomplished by tandem steel-wheel rollers weighing not less than 12-tons. In lieu of tandem steel-wheel rollers, a pneumatic-tired roller of either the single or double-axle type may be used. A pneumatic-tired roller must have a width not less than four feet (4’) nor more than seven feet (7’). The space between the side walls of adjacent tires shall not be greater than five inches (5”), and on the double axle type the rear tires shall be staggered with relation to the front tires. Such a roller will be equipped with mechanical means of distributing the contact pressure uniformly among all tires and all tires shall be uniformly inflated. The roller must be so constructed that the weight per tire can be varied between 1000 and 2000 lbs. The operating weight of a pneumatic roller shall be subject to the control of the Engineer. Alternative compacting equipment may be used when approved by the Engineer.

Areas inaccessible to the roller shall be compacted by power tamping until the base material is compacted to a relative compaction of at least 95 percent.

Aggregate bases shall be compacted to a minimum relative compaction of ninety-five percent (95%) in accordance with the testing requirements of Section 14-5 of these Specifications.

The surface after compaction shall be tight and smooth and conform to the requirements of Section 26 of the State Specifications. All water applied to the aggregate base as it is placed on the job shall conform to Section 15 of these Specifications.

17-2 PAYMENT

Payment for laying aggregate base shall be either at the contract price bid per ton or per cubic yard delivered to the job and placed according to the Plans and Specifications. Quantities of aggregate base to be paid for by the cubic yard will be calculated on the basis of the dimensions shown on the Plans adjusted by the amount of any change ordered by the Engineer. No allowances will be made for any aggregate base place outside said dimensions unless otherwise directed by the Engineer.

The weight of material to be paid for will be determined by deducting from the weight of material delivered to the work, the weight of water in the material, at the time of weighing, as determined by California Test 226, in excess of one percentage point more than the optimum moisture content as determined by ASTM D 1557. The weight of water deducted as provided herein will not be paid for.

Payment shall include full compensation for furnishing the material, placing it on the roadway, applying water, compacting the material, finishing the surface, and furnishing all labor and equipment necessary to perform the work.

17-3 LAYING ROAD-MIXED AND PLANT-MIXED CEMENT TREATED BASES

Road-mixed and plant-mixed cement treated bases shall be spread and compacted in accordance with Section 27 of the State Specifications.

17-4 LAYING LIME TREATED BASE

Road-mixed lime treated base shall be constructed in accordance with Section 24 of the State Specification.

Lime to be mixed with the existing material shall conform to the requirements set forth in Section 10-10 of these Specifications.

The percentage of hydrated lime to be added by weight shall be as set forth in the Special Provisions.

Removal of rocks greater than two and one-half inches (2½") in size shall be included in the cost of the base in place.

Lime treated base shall be compacted to a minimum relative compaction of ninety-five percent (95%) in accordance with Section 14-5 of these Specifications.

Lime treated base shall be paid for at the contract price bid per square yard which shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in constructing lime treated base, complete in place, as shown on the Plans and as directed by the Engineer.

Section 18

HEADERS

18-1 GENERAL DESCRIPTION

Headers shall be placed upon an approved subgrade prepared in conformance with the requirements of Section 14 of these Specifications. Headers shall be set so that the top edge does not vary more than one-quarter inch (¼") from a true, straight line in the length of the header, and shall be placed to the required grade and alignment of the edge of the finished pavement. They shall be supported so that during the entire operation of placing, rolling, and finishing the pavement, they will not, at any time, deviate laterally more than one-quarter inch (¼") or vertically more than one-eight inch (⅛") from proper line and grade.

18-2 HEADER JOINTS

Header joints shall be so designed that a non-yielding support is obtained and double supporting stakes shall be provided at the joints. Headers shall be spliced with a section of pressure treated Douglas Fir four feet (4') in length, shall be the same cross sectional dimension as the header and shall be nailed lengthwise, lapping the joints.

18-3 HEADER MATERIAL

Headers shall be pressure treated Douglas Fir, in accordance with Standard Grading Rules of the West Coast Lumbermen's Association, and shall consist of at least two inch thick nominal lumber. Their depth shall be equal to the specified depth of the edge of the asphalt pavement plus at least one half the depth of the aggregate base material, but shall not be less than six inches (6") deep. Timbers with rounded edges, ends or corners, or split ends, shall not be used.

Headers shall be secured by nailing to pressure treated Douglas Fir side stakes spaced not more than four feet (4') apart and driven vertically in such a manner that their tops shall be one inch (1") below the top edge of the header. These stakes shall not be less than nominal 2x3 lumber, and shall be driven a minimum of eighteen inches (18") below the subgrade elevation. The length and depth shall be increased when the character of the soil is such that it will not provide sufficient rigidity.

18-4 MANTENANCE OF HEADERS

Headers must be trued up and maintained to the required line and grade

for a distance of at least one (1) day's run ahead of the placing of asphaltic concrete. When headers do not conform to the correct line and grade, or have become loose, this shall be considered sufficient cause to stop work until the fault is corrected to the satisfaction of the Engineer.

18-5 PAYMENT

Payment for headers shall be either at the lump sum price bid or the price bid per lineal foot, as indicated in the contract documents, and shall include full compensation for furnishing all labor, materials, tools, equipment, processing and incidentals and for doing all work involved in placing and maintaining headers.

Section 19

PORTLAND CEMENT CONCRETE PAVEMENT, JOINTS AND CURING

19-1 GENERAL DESCRIPTION

Portland Cement concrete pavement shall be constructed to the dimensions, lines and grades shown on the Plans. Unless otherwise provided in the Special Provisions, the pavement shall be constructed of Class "B" concrete, conforming to the requirements of Section 10-5 of these Specifications. Unless otherwise indicated in the Special Provisions, the Portland Cement used in the concrete shall be Type II as described in Section 10-1 of these Specifications.

19-2 SUBGRADE

Sub-grade for concrete pavement shall be prepared as specified in Section 14-7 of these Specifications. Sub-grade shall also be free of all loose and extraneous material when concrete is placed thereon and shall be uniformly moist. Any excess water on the surface shall be removed prior to placing concrete as directed by the Engineer.

19-3 SIDE FORMS

Side forms shall be furnished and installed in accordance with Section 18 of these Specifications.

19-4 CONCRETE CUTTING

Where new concrete is to join existing concrete, the existing concrete shall be cut to a true line to a minimum depth of one and one-half inches (1½") with a power driven abrasive type saw.

19-5 EXPANSION JOINTS IN ALLEY PAVEMENT

An expansion joint shall be placed ten feet (10') from each end of the work and every twenty feet (20') there from and at other places shown on the Plans. The expansion joint material shall be not less than three-eighths inch (⅜") in thickness and shall conform to Section 10-4 of these Specifications.

19-6 PLACING CONCRETE PAVEMENT

Contractor shall make adequate advance arrangements for preventing delay in delivery and placing of the concrete. An interval of more than 45 minutes between placing of any 2 consecutive batches or loads shall constitute cause for stopping paving operations, and Contractor shall make a contact joint at his expense at the location and of the type directed by the Engineer in the concrete already placed.

Slip-form paving and finishing machines shall be in satisfactory adjustment and operational condition. Prior to placing concrete, Contractor shall demonstrate proper adjustment of all screeds and floats on slip-form pavers by measurements from grade stakes driven to known elevation. Satisfactory operation and adjustment of all propulsion and control equipment, including pre-erected grade and alignment lines, shall be demonstrated by moving slip-form pavers and finishing machines over a five hundred foot (500') length of prepared sub-grade with all propulsion and control equipment fully operational.

Unless otherwise required by these Specifications, the Plans or the Special Provisions, pavement shall be constructed in twelve foot (12') traffic lane widths separated by contact joints, or monolithically in multiples of twelve foot (12') traffic lane widths with a longitudinal weakened plane joint at each traffic lane line.

All concrete shall be placed while fresh. The use of water for retempering any concrete will not be permitted. The temperature of the concrete mix at the time of placement shall not exceed 90° F.

19-7 FINISHING CONCRETE PAVEMENT

The surface of the concrete shall be finished smooth and true to grade with wooden floats. Floats shall be operated from the end of the pavement and parallel with the centerline of the pavement by means of a long handle.

The edge of the float shall be used to cut down all high areas and the material so removed shall be floated into the depressions until a true surface is obtained.

Finishers and floatmen shall be required to remain at work, after placing of concrete has stopped, long enough to complete the finishing of the pavement when the concrete has hardened sufficiently.

19-8 CURING PORTLAND CEMENT CONCRETE PAVEMENT

The curing of Portland Cement concrete pavement shall be with a pigmented sealing compound as specified in Section 10-6 of these Specifications. The application of the sealing compound shall be in accordance with the requirements of Section 90-7.01B of the State Specifications.

19-9 PROTECTION OF PAVEMENT

Contractor shall protect the surface of the concrete pavement against all damage and markings, both from pedestrian and other traffic. Barriers shall be placed at the proper locations to protect the concrete from traffic.

The concrete pavement shall be maintained at a temperature of not less than 45°F for 72 hours after placement. When required by the Engineer, Contractor shall submit a written outline of his proposed methods for protecting the concrete pavement and maintaining the required temperature.

When required by the Special Provisions, bridges or other devices of the type shown on the Plans, or approved by the Engineer, shall be installed across the pavement to provide crossing for the public and private traffic such as will prevent damaging or marking the pavement.

The crossing devices shall be maintained in satisfactory condition throughout the period of use at any location, and, when no longer required, shall be removed by and become the property of Contractor.

After the Engineer has ordered the pavement opened to traffic, Contractor will not be held responsible for damage resulting from its use by public traffic, provided, however, that Contractor shall be liable for any damage to the newly laid pavement caused by his operations or due to an inferior product.

19-10 PAVEMENT DAMAGE AND REPAIR

All damage done to or openings cut in concrete pavement or alley crossings during the progress of the work shall be repaired by Contractor under the direction of the Engineer, using for such repairs, materials conforming to the requirements of these Specifications.

19-11 PAYMENT

Clearing, grubbing, and tree removal prior to grading for laying of concrete pavement shall be paid for as set forth in Section 12 of these Specifications.

Excavation and fill will be paid for as provided for in Section 14 of these Specifications.

Sub-grade preparation shall be paid for in accordance with Section 14-7 of these Specifications.

Payment for portland cement concrete pavement shall be per cubic yard of concrete required to construct the pavement to the lines, grade and to the thickness shown on the Plans. Should the sub-grade be low or irregular, thus requiring additional yardage above that computed from the thickness specified on the Plans, no allowance shall be made for such additional concrete yardage.

The price paid per cubic yard for furnishing and placing portland cement concrete in pavements shall include full compensation for preparing and finishing the sub-grade, cutting existing concrete, furnishing and placing the concrete, furnishing and placing pre-moulded joint filler, furnishing and installing expansion joint material, finishing concrete surface, furnishing and applying curing compound and bond breaker, protecting the pavement, repairing any damage thereto before final acceptance and all other labor and materials to complete the work.

Section 20

CONCRETE IN STRUCTURES

20- 1 GENERAL

"Concrete in structures" shall mean concrete placed in structures such as culverts, headwalls, retaining walls, drop inlets, pump sumps, drain inlets, slabs, foundations and other concrete structures. Concrete in structures shall be Class "A" unless otherwise indicated. Concrete in pavements, curbs, gutters, and sidewalks, shall be specifically excluded from this section.

The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of publications in effect at the time of bid shall govern.

American Concrete Institute (ACI) Standard:

ACI SP-15	Field Reference Manual: Standard Specifications for Structural Concrete with Selected ACI and ASTM references.
ACI 211	Recommended Practice for Selecting Proportions for Concrete.
ACI 301	Structural Concrete for Buildings.
ACI 302	Guide for Concrete Floor and Slab Construction.
ACI 304	Guide for Measuring, Mixing and Placing Concrete.
ACI 305	Hot Weather Concreting.
ACI 306	Cold Weather Concreting.
ACI 309	Consolidation of Concrete.
ACI 318	Building Code Requirement for Reinforced Concrete, with Commentary.
ACI 347	Guide to Formwork for Concrete
ACI SP-4	Publication 4 Formwork for Concrete

American Society for Testing and Materials (ASTM) Standards:

ASTM C 31	Method of Making and Curing Concrete Test Specimens.
ASTM C 33	Concrete Aggregates.
ASTM C 39	Compressive Strength of Cylindrical Concrete Specimens.
ASTM C 94	Ready Mixed Concrete.
ASTM C 143	Slump of Portland Cement Concrete.
ASTM C 150	Portland Cement.
ASTM C 171	Sheet Materials for Curing Concrete.
ASTM C 172	Method of Sampling Freshly Mixed Concrete.
ASTM C 192	Making and Curing Concrete Test Specimens in the Laboratory.
ASTM C 227	Test for Potential Alkali Reactivity of Cement-Aggregate Combinations.
ASTM C 231	Air Content of Freshly Mixed Concrete by the Pressure Method.
ASTM C 260	Air Entraining Admixture for Concrete.
ASTM C 289	Test of Potential Reactivity of Aggregates.
ASTM C 295	Petrographic Examination of Aggregates.
ASTM C 309	Liquid Membrane Forming Compounds for Curing Concrete.
ASTM D 98	Calcium Chloride.
ASTM D 1785	Poly (Vinyl Chloride 40, 80 and 120.) PVC Plastic Pipe, Schedules
ASTM C 138	Unit Weight, Yield and Air Content of Concrete
ASTM C 173	Air Content of Concrete by the Volumetric Method

U.S. Dept. of Commerce, National Bureau of Standards Publications, Product Standards:

PS1	Construction and Industrial Plywood

West Coast Lumber Inspection Bureau (WCLB) Standard:

No. 16	Standard Grading and Dressing Rules for Douglas Fir, Western Hemlock, Western Red Cedar, White Fir, and Sitka Spruce Lumber.

National Forest Products Association (NFPA):National Design Specification for stress grade lumber and its fastening.

Western Wood Products Association (WWPA): Western Lumber Grading Rules.

Concrete shall also conform to Section 10 of the Standard Specifications.

Notes pertaining to concrete on the Plan sheets are a part of these Specifications.

Contractor shall submit the following in accordance with Section 5-7:

1. Proposed mix designs, including admixtures and curing material

2. Certificate of Compliance that concrete meets the specified requirements and delivery tickets for all concrete delivered to the project site.

3. Shop Drawings including:

a. Formwork:

Drawings of all formwork showing form plywood patterns, formwork, and ties.

b. Concrete placement:

Vertical limits of concrete placements horizontal lifts, and construction joints.

c. Shoring:

Drawings and structural calculations showing members, connections, and anchorage of the proposed shoring system. Calculations and drawings shall be stamped by a Civil Engineer currently licensed in the State of California.

20-2 FOOTINGS

Footing elevations shown on the Plans shall be considered as approximate only and only when excavation is completed and the character of the supporting natural ground is ascertained can the elevation of the bottom of footings be determined by the Engineer.

20-3 DRAIN INLETS

Drain Inlets shall conform to the Standard Drawings contained within Section 38 of these Specifications.

Concrete for drain inlets shall be Class "A" or "B", and shall conform to Section 10 of these Specifications. The concrete box portion of the drain inlet shall be cast to the proper grade in a maximum of two (2) placements of concrete. Use of grout to adjust the drain inlet frame to the proper grade will not be permitted without specific approval of the Engineer.

Reinforcing bar supports or other approved means shall be used to hold the frame at proper grade during final placement of concrete. Broken pieces of concrete, or other debris, shall not be used for this purpose. At the option of Contractor, drain inlets may be furnished and installed as precast units, or the units may be combined precast and cast-in-place structures, provided the structures in place substantially conform to cast-in-place construction as specified in these Specifications.

20-4 CONCRETE FORMWORK

Forms shall be designed, constructed, and maintained so as to insure that after removal of forms, the formed concrete will have true surfaces free of offset, waviness or bulges, and will conform accurately to the indicated shapes, dimensions, lines, elevations, and positions.

Form shall be provided with accessories and openings in forms as required for placement of equipment and materials. Remove forms after concrete has cured.

Unless otherwise specified or approved by the Engineer, form materials shall be as follows:

1. Plywood:

PS 1, B-B Plyform Class 1, EXT-APA, edge-sealed, 5/8" thick when studs are spaced 12" on center and 3/4" thick when studs are spaced 16" on center. As an alternate OSB may be used, of equal quality, strength and dimensions.

2. Wood strips for forming reveals, chamfers and quirks:

Any close grain hardwood or softwood, free of knots.

3. Framing lumber:

Douglas Fir "Standard" grade, sized to uniform width and depth.

4. Sheathing:

Douglas Fir "Construction" grade boards and sheathing, 10" maximum width.

Form accessories shall be as follows:

1. Form Ties:

Ties for concrete building structures, exposed to view shall be adjustable type, arranged to leave no metal within 1" of surface. They shall have no lugs, cones, or other devices that will leave holes larger than 1" diameter in exposed concrete surfaces. In all other instances, “Snap” ties and spreaders shall be used with approved clamps or separate metal spreaders. Do not use wood spreaders or wire ties.

2. Form Coatings:

Burke Concrete Accessories, Inc.'s "Burke Release", Nox-Crete, or approved equal. Apply per manufacturer's printed instructions.

Contractor shall provide openings for mechanical and electrical work and work of other sections shall place items to be incorporated in concrete and support on formwork and shall seal forms around openings to prevent concrete seepage.

The design and engineering of all formwork, falsework and shoring, as well as its construction and protection, is Contractor's responsibility and shall conform to ACI 347 unless otherwise directed or approved.

Forms for exposed concrete surfaces shall be designed and constructed so that the formed surface of the concrete does not undulate excessively in any direction between studs, joists, form stiffeners, form fasteners, or wales. Undulations exceeding either 3/32 inch or 1/270 of the center to center distance between studs, joists, form stiffeners, form fasteners or wales will be considered to be excessive.

Forms shall be constructed to provide concrete conforming to dimensions shown, and to tolerance limits listed in ACI 301 "Specifications for Structural Concrete for Buildings".

Installation of forms shall conform to ACI 301, 347, P4 and this section. Forms shall be designed for easy removal. Contractor shall not pry against face of concrete, shall use wooden wedges only, and, in order that reused forms will not contain patches resulting from alterations, forms for concrete exposed-to-view shall be reused only on identical sections.

Forms shall not be used if there is any evidence of surface wear or tear which would impair the quality of the exposed-to-view concrete. Forms shall be thoroughly cleaned and re-lubricated before reuses. Formwork for exposed-to-view concrete shall be observed continuously while concrete is being placed to see that there are no changes of elevation, plumbness, or camber. If, during construction, any weakness develops and the falsework shows any undue settlement or distortion, the work shall be stopped, the affected construction removed, if permanently damaged, and the falsework strengthened.

Forms shall be substantial, true to line and level, sufficiently tight to prevent leakage and shall conform to indicated dimensions. Locate form ties for exposed concrete in straight horizontal and vertical lines and as indicated on Drawings and specified herein. Provide cleanout holes at bottom of forms. Remove debris before concrete is placed. Construct forms for exposed surfaces so that joints in forms are either horizontal or vertical and are located to the pattern indicated.

External corners on all concrete shall be formed with chamfer strips in corners of forms to form bevel at external angles. All form joints in forms for exposed-to-view concrete shall be sealed with specified form tape to prevent leakage. Camber soffits to accommodate anticipated deflections caused by wet concrete and construction loads. Provide positive means of adjustment for shores and struts. Take up settlement as concrete is placed.

20-5 REMOVAL OF FORMS

Remove forms, shoring and bracing carefully to avoid damage to fresh concrete, but not before concrete is capable of self support and support of

construction loads. Do not pull tie rods until concrete is hard enough to permit withdrawal without damage to concrete. Pull ties that are entirely withdrawn from wall toward inside face.

Regardless of strengths attained by concrete, leave forms in place for following periods when supporting:

1. Vertical surfaces: 3 days minimum

2. Slabs, on grade: 7 days minimum

3. Beams, girders and elevated slabs: 15 days minimum, but do not remove vertical support until concrete has reached its 28-day strength.

Before reuse of plywood forms, thoroughly clean, sand and recoat them with form coating. Do not reuse plywood that has torn grain, patches, worn edges, damaged phenolic resin covered surfaces, or other defects which would impair texture of finished surface. Other wood forms shall be prepared for reuse by thorough cleaning and recoat with form coating. Repair damaged forms and replace loose or damaged boards.

Live loading of new construction while reshoring is under way is not permitted. Do not over stress new construction by over tightening reshores. Leave reshores in place until concrete has reached its specified 28-day strength. Reshore floors that support shores under wet concrete, or leave original shores in place. Reshores shall have at least half the capacity of the shores above and be distributed in approximately the same pattern. Leave these reshores in place until freshly placed concrete has reached 75% of its specified 28-day strength.

For concrete exposed-to-view in completed structures use specified "B-B" or better plyform plywood or phenolic resin covered form board.

For concealed concrete, plywood, lumber or steel is acceptable. Footings may be poured directly against earth banks where soil conditions are such that vertical banks will remain stable during placing operations. Earth forms at walls are not permitted.

20-6 REINFORCEMENT

Reinforcement shall conform to Section 21 of the Standard Specifications.

20-7 DESIGN OF MIXES

Contractor shall be responsible to design concrete mixtures resulting in the required 28-day compressive strength and other required characteristics. Design of mixes shall be in accordance with Section 10.

20- 8 PREPARING TO PLACE CONCRETE

Contractor shall provide inserts, required or shown on the Plans: embedded items, including installation of work built into concrete such as waterstop sleeves, anchor bolts, wood nailers, reglets, frames and sleeves for piping, conduit and fittings. Forms shall be cut and reinforced as required to accommodate them. No concrete shall be placed until all inserted items are installed in their proper locations, secured against displacement, cleaned, inspected and approved. Furnish ties and supports necessary to keep embedded items in place when concrete is placed.

Contractor shall remove excess water from forms before concrete is deposited, and shall remove hardened concrete, debris, and foreign materials from interior of forms and from surfaces of mixing and conveying equipment.

Prior to placing concrete, Contractor shall wet wood forms sufficiently to tighten up cracks and shall wet all other materials sufficiently to reduce suction and maintain concrete workability.

Contractor shall lightly dampen subgrade no more than 24 hours in advance of concrete placement, but do not muddy. Reroll where necessary for smoothness and remove loose earth material.

Set screeds for flatwork placement at walls and at maximum of 8-foot horizontal distance between adjacent screeds.

Concrete shall not be placed during rainy weather unless approved measures are taken to prevent damage to concrete.

20- 9 FLATNESS TOLERANCE FOR FLOOR SLABS

Finish slabs monolithically. Uniformly slope floor slabs to provide positive draining of indicated areas. Special care shall be taken so that a smooth, even joint is obtained between successive pours.

Finished surfaces shall be true plane surfaces with no deviation in excess of 1/8 inch measured using a 10 feet long straight edge.

Replace or repair any slab which fails to meet this standard. If slabs fail to drain as indicated, remove drains and faulty floor section and refinish topping so that it drains according to the Drawings. No deviations will be allowed.

20-10 PLACING CONCRETE

Place concrete only after subgrade, forms, and reinforcement have been approved. Limit free vertical drop in concrete walls or columns to three (3) feet. In other concrete, limit the drop to five (5) feet. Deposit concrete in horizontal layers not more than 18" deep and continue pouring until section is completed. Control rate of pouring and depth of layers so that each layer will be covered within one hour after it is poured. Pour columns to top and allow to settle two (2) hours before additional concrete is placed. Place concrete continuously between pour joints.

Grout mix shall be regular concrete mix with ½ the large aggregate omitted. Use to cover the following before additional concrete is placed:

1. Flat form surfaces next to congested steel.

2. Construction joints.

3. Top of column and wall footings.

4. On surfaces where concrete has set.

Vibration and tamping shall be performed as concrete is placed in forms, to work concrete around reinforcing steel, built-in items and into corners and angles. Extra care shall be given to work architectural concrete around inserts, reveals, quirks, corners and plastic cones of ties to preclude rock pockets, air pockets, and other defects, and to produce sharp corners, edges and smooth surfaces. Provide mechanical vibrators operated by experienced workers for agitating concrete in forms. Vibrate thoroughly within five (5) minutes after layer is placed. Carry vibration well into previous layer. Vibrators shall not be used to transport concrete inside forms. Internal vibrators shall maintain a speed of not less than 7,000 impulses per minute when submerged in concrete. Supplement vibration by suitable methods to eliminate voids along forms for full depth of layer as directed. Do not allow vibrators to strike overlaid plywood surfaces. Do not use vibrators to work concrete along forms. Keep at least one spare vibrator on job at all times while concrete is being placed. Comply with ACI Committee 309 Consolidation of Concrete, Committee Report.

Upon completion of a pour and after concrete has partially hardened, wash scum or laitance off concrete surface with stiff brush and stream of

water. When work is resumed, brush clean with wire brushes or sandblast, then place fresh concrete.

The following applies when pumping concrete:

1. General:

Do not use aluminum or aluminum lined pipe. Prevent concrete from contacting aluminum fittings

2. Mix:

Do not add more water to mix unless approved by the Engineer. Check that the mix design entered on delivery ticket complies with that ordered.

20-11 CONSTRUCTION JOINTS

The location and design of joints not shown or specified are subject to approval of the Engineer prior to placement of concrete.

Where Horizontal joints occur in exposed concrete, set smooth painted wood strips in form to provide a straight and level joint in which upper pour laps lower pour. Place concrete level with, but not above top of pour joint strip as shown on Drawings. Allow 24 hours before concrete is placed over horizontal joints. Remove loose material and laitance. Clean by sandblasting, or wire brushing. Allow enough time between placing of adjacent pour sections to provide for initial shrinkage. Horizontal joints will not be allowed in beams, girders and slabs unless otherwise indicated.

Vertical joints not shown on the Drawings shall be so made and located as to least impair the strength of the structure and shall be approved by the Engineer prior to placement of concrete.

20-12 EXPANSION JOINTS AND RUBBER WATERSTOPS

When premoulded joint filler is shown on the Plans or specified, the filler shall be placed in correct position before concrete is placed against the filler. The edges of the concrete at the joint shall be edger finished. Unless otherwise provided in the Special Provisions, expansion joint material shall be as specified in Section 10-4 of these Specifications.

Rubber water stops shall be placed where shown on the Plans, and shall conform to the requirements of Section 51-1.14 of the State Specifications.

20- 13 CURING OF CONCRETE

Concrete shall be cured in accordance with Section 90-7 of the State Standard Specifications.

20- 14 SURFACE FINISHES OF CONCRETE STRUCTURES

The ordinary surface finish required on concrete structures shall be that obtained by careful forming, proper consolidation and even texture of concrete.

Immediately after forms have been removed, all form bolts shall be cut off one inch (1") below the finished surface of the structure or snap ties removed. Remove honeycombed and other defective concrete to sound concrete, but not less than 1" deep. Make the walls of the cut area perpendicular to the surface. Do not feather out the edges. Dampen the patch area and the adjacent area six (6) inches around the patch area. Brush the patch area with a bond of neat cement and water paste and apply patching mortar when the water sheen is off the bond. The holes remaining shall be filled with cement mortar using one (1) part cement to two (2) parts sand with the least water required to produce a workable mass. Rework this mortar until it is the stiffest consistency that will permit placing. After entirely filling voids, strike off the mortar slightly higher than the surrounding surface, let set for one hour and finish flush with the surrounding surface.

Any defects in the concrete surface caused by poor material in the forms, poor form construction, or by voids or pockets in the concrete, yet are not sufficiently severe to cause rejection of the pour, will be repaired and finished to make the surface finish uniform. The Engineer will direct Contractor to correct such defects and they shall be repaired without extra compensation.

The surface finish of any structure may be given further treatment if such a requirement is called out on the plans or by the Special Provisions.

20-15 FINISHING FORMED SURFACES

Finish formed surfaces by removing any and all fins. The tolerances of finished formed surfaces shall conform to ACI 301.

20-16 FLATWORK

Place floor slabs on grade in alternate strips. Place each unit against construction joint forms with formed control joints perpendicular to the poured strips. Pour slabs-on-grade against a moist subgrade. Wet the subgrade the day before placing concrete. Moisten subgrade just ahead of concrete as it is

placed. Do not place concrete in standing water. Provide new, clean cut, sharp-edged wood headers at construction joints of suspended slabs. Deposit concrete evenly, consolidated with mechanical vibrators, particularly at side forms, and screed to indicated elevations and contours. Maintain full indicated thickness of slab over all parts of cambered support. Concrete shall be compacted with a grid tamper to eliminate voids and pockets and to produce a uniformly dense slab. Where ground slabs are left to receive deferred finishes, provide protection against contamination from time of placing concrete until time of placing finish. Remove contamination mechanically leaving a clean surface.

Joint location and detail shall be as indicated. Tooling is required at control and pour joints.

Control joints

After concrete surface is screeded, cut concrete with a cutting bar, or other approved tool, approximately 1/4" thick x 2" deep. Form straight clean lines. After slot is formed in stiff concrete, insert 1/8" thick x 1-1/2" strip of tempered hardboard or plastic joint form zip strip. Butt strips neatly to line and flush with concrete surface. Finish slab flush with top of hardboard strips without tooling.

2. Construction joints:

Form construction joints with 2" nominal dressed lumber, or approved steel forms. Provide enough stakes to prevent sagging and misalignment under construction loads. Leave forms in place as long as possible and remove without chipping the edge of the slab. Protect the slab edge until the adjacent slab is placed.

3. Expansion joints

Provide sponge neoprene joint filler where shown on the Drawings. Place filler to provide space for sealant as indicated. Seal joints with specified sealant per manufacturer's printed instructions. Thickness of filler material is indicated.

Contractor shall apply a medium broom finish just after final troweling to all flat slabs not specified to receive another finish.

Where wood float finish is indicated, screed slabs to elevations indicated. Compact with motor driven disk type compactor float and bull float to smooth, even surface. Perform final finishing with wood hand floats to give finished surface uniform, slightly roughened texture.

Where steel trowel finish is indicated, tamp fresh concrete with a grid tamper enough to raise a thin bed of mortar to surface. Before finishing, remove any excess water. Level and compact with motor drive disk type compactor float. Immediately after floating, the surface shall be further leveled and compacted with a motor driven rotary trowel with flat-pitched blades. Final troweling shall be done with steel hand trowel after surfaces have become hard enough to produce a hard, dense, smooth, burnished surface.

20-17 GROUTING AND DRYPACKING

Grout shall consist of one (1) part cement, two (2) parts sand and sufficient water that the grout will just flow under its own weight. Water reducing and workable agent may be added at Contractor's option.

Drypack shall consist of one (1) part cement, 2 parts sand, with just enough water to bind the materials together.

Dampen surfaces before grouting and slush with neat cement. Force grout into place and rod so as to fill all voids and provide uniform bearing under plates. Provide smooth finish on exposed surfaces and damp cure for at least three (3) days.

Non-shrink grout shall be used exclusively under structural steel base plates in accordance with manufacturer's printed instructions.

When concrete overlay bonding is required, the surface of the existing concrete is to be roughened by sandblasting to remove loose material, rust and oils. Sufficient cement matrix should be removed to expose surface aggregates and to form a roughened surface for bonding. Clean with a high pressure water jet and allow to surface dry. Immediately apply an acrylic bonding agent such as Burke Acrylic Bondcrete at the rate of 200 sq. ft. per gallon and follow with placement of the concrete overlay after a minimum of one hour and after the film is dry to the touch. Install bonding agent in strict accord with manufacturer's instructions.

20-18 WEEP HOLES IN WALLS

Weep holes or drains in walls shall be provided as shown on the Plans and with drain rock backing or as indicated. Placement of the drain rock behind the weep hole shall be made in a manner satisfactory to the Engineer.

20-19 CONCRETE PLACED UNDER WATER

Unless specifically indicated on the Plans or called for by the Special Provisions, no concrete may be poured underwater without approval of the Engineer. When underwater placement of concrete is so approved, the placement shall be by approved tremie or bottom dump bucket. The consistency of the concrete shall be varied to suit this type of placement and must meet the approval of the Engineer. Underwater pours shall be continuous until completed. Pouring of concrete in running water will not be permitted.

20-20 QUALITY CONTROL

The Engineer will be responsible for the routine quality control testing of concrete mixes. Contractor shall assist the Engineer in obtaining samples of fresh concrete.

Slump Test: Slump test shall be performed at the job site by the Engineer in accordance with ASTM Test Method C 143.

Compressive Strength Tests: Each day concrete is poured, the Engineer shall mold four concrete test cylinders in accordance with ASTM C 31. Contractor shall pay for the service of an independent testing company to cure and test the concrete cylinders in accordance with ASTM C 39 and C 172. Cylinders shall be tested at 7 days, 14 days, 21 days, and 28 days. Methods of sampling and testing concrete mixtures shall include but not be limited to the following:

Composite Samples:	ASTM C 172.
Specimen Preparation:	ASTM C 31.
Compressive Strength:	ASTM C 39.
Air content:	ASTM C 173 or C 231.
Slump:	ASTM C 143.
Unit Weight:	ASTM C 138

Evaluation and acceptance of concrete and concrete structures shall be in accordance with Chapters 17 and 18 of ACI 301.

Any retesting and inspection of concrete due to inadequacy, deficiency, failure, or removal shall be done at Contractor's expense.

20-21 MEASUREMENT OF QUANTITIES

The volume of concrete to be paid for shall be determined by computation from the dimensions of the structures as shown on the Plans and as amended by approved change order. No deduction will be made for volume of reinforcing steel.

20-22 PAYMENT FOR CONCRETE IN STRUCTURES

The price bid per cubic yard for concrete in structures shall include full compensation for all excavation and backfill, unless there is a separate payment for that item, for furnishing and building all necessary forms, for furnishing and placing all concrete, for furnishing and placing all reinforcing steel, for furnishing and placing expansion joint material and rubber water stop if shown on the Plans, for curing the concrete, for weep holes in walls, for finishing all concrete surfaces, and for doing such other work as may be necessary to construct concrete in structures as indicated on the Plans and in the special provisions.

Unless otherwise indicated in the Special Provisions payment for drop inlets shall be at the unit price bid per each and shall include full compensation for excavation, backfill, furnishing all material, labor, tools and equipment and doing all work necessary for construction, complete in place.

Section 21

PLACING STEEL REINFORCEMENT

21-1 MATERIALS

Provide reinforcing steel as shown on the Plans. Conform to Section 10-23 of these Standard Specifications except as modified herein. All materials covered by this Section shall be manufactured in the United States.

The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of publications at the time of bid shall govern.

American Concrete Institute (ACI) Standard

ACI 318	Building Code Requirements for Reinforced Concrete.
ACI SP-66	ACI Detailing Manual.

American Welding Society (AWS)

AWS D 12.1	Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction.

Concrete Steel Reinforcing Institute (CRSI)

1 MSP	Manual of Standard Practice
1 SPLBK	Reinforcement Anchorages and Splices
1 PLACE	Placing Reinforcing Bars

Use galvanized steel chairs and accessories or plastic coated units for work exposed to view, weather, or moisture so that finished surfaces will not be marred or stained; use precast concrete only (no metal), suitably sized for load distribution, in slabs-on-grade. Use no supports of wood or other cellulose material.

21-2 SUBMITTALS

Before starting concrete work, submit shop drawings in accordance with Section 5. Comply with requirements of ACI 318, ACI SP-66, CRSI 1MSP, CRSI

1SPLBK, and CRSI 1DET. Show bar size, dimensions, bends, placing, and construction joint details. Submit drawing showing locations of any construction joints not shown on the plans. Maximum submittal drawing size shall be 22-inches by 34-inches. Submit type, size, and location of all slab and bar supports. Hooks, lap splices, bends and offsets shall be in accordance with the drawings. Obtain approval before shop fabrication. Such approval is intended only as an additional precaution against errors, and shall not be construed as relieving Contractor of his responsibilities for the accuracy of the information.

Submit Certificate of Compliance stating that reinforcement complies with specified requirements. Reinforcing steel shall be properly identified. Contractor shall bear costs for test of steel by an approved laboratory if the reinforcing steel is not properly identified.

21-3 CLEANING

Reinforcing steel, before being placed in the forms, shall be thoroughly cleaned of loose mill and rust scale, mortar, oil, dirt, and of coatings of any character which would reduce or destroy the bond. Clean surfaces to be welded of loose scale and all foreign material. Clean welds each time electrode is changed. Chip burned edges clean before welds are deposited.

21-4 BENDING

Bending and Forming: Fabricate indicated size bars into shapes and lengths shown on approved shop drawings by methods not injurious to materials. Do not heat reinforcement for bending. Bars with kinks or bends not in schedule will be rejected

Reinforcing steel shall conform accurately to the dimensions shown on the Plans. The term “standard hook” used herein shall conform to ACI SP-66.

Bends for all bars other than stirrups, tie hooks, and standard hooks shall have diameters on the inside of the bar not less than allowed by the above references.

21-5 PREPARATION FOR PLACING

Bundle reinforcement and tag with suitable identification to facilitate sorting and placing, and transport and store at site so as not to damage material.

Prior to installation of reinforcing steel work, Contractor shall inspect surfaces to receive work, and arrange for satisfactory correction of defects in workmanship and material that could have adverse affect on reinforcing steel

work.

Contractor shall receive approval in writing from the Engineer of all reinforcing work prior to ordering concrete for placement.

21-6 PLACING

Conform to CRSI 1 MSP, and CRSI 1 PLACE except as modified herein.

At each location during concrete placing, inspect reinforcement and maintain bars in correct positions. Templates to maintain the correct position of reinforcing may be required. Contractor shall install templates, if required by the inspector, at no additional cost to the City.

Reinforcing bars shall be firmly and securely held in place at the intersections by wiring with No. 14 or No. 16 wire and by using concrete or metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to hold the reinforcement in its proper place as the concrete is poured. These supporting devices and the wire shall be furnished by Contractor at his own expense.

The clear distance between parallel bars shall not be less than two and one-half (2½) diameters of the bar with a minimum of two inches (2”). Reinforcing bars shall have a minimum concrete cover of not less than twice the bar diameter and in no case less than one and one-half inches (1½”). The concrete cover of slab steel may be less than this minimum if so shown on the Plans. Reinforcing bars shall have a minimum concrete cover of three inches (3”) from edges that are placed against earth or that are to be submerged in water.

Wire mesh used for reinforcement shall be rolled flat before placing concrete unless shown differently on the Plans. Mesh reinforcement shall be held firmly in place against vertical or transverse movement by means of devices satisfactory to the Engineer.

21-7 WELDS AND SPLICING

Reinforcing bars for beams and for longitudinal slab spans shall not be spliced, except as shown on the Plans. Splices of tensile reinforcement at points of maximum stress shall be avoided. Where bars are spliced, they shall be either lapped at least forty-five (45) bar diameters for No. 8 bars and smaller and sixty (60) bar diameters for Nos. 9, 10, and 11 bars. No lapped splices will be permitted at points where the section is not sufficient to provide a minimum distance to two inches (2”) between the splice and the nearest adjacent bar or the surface of the concrete.

In lapped splices, the bars shall be placed in contact and wired together

in such a manner as to maintain a clearance of not less than the minimum clear distance to other bars and the minimum clear distance to the surface of the concrete. Splices shall be staggered at least the length required for a lapped splice and not more than one-third (1/3) of the bars may be spliced at one location provided the specific clearances are maintained.

Where wire mesh reinforcement is spliced, it shall be lapped at least the dimension of one (1) mesh.

21-8 PAYMENT FOR PLACING STEEL REINFORCEMENT

Payment for reinforcing steel shall not be made separately unless so indicated by the Special Provisions, but shall be included in other bid items and shall include full compensation for furnishing all steel, for cutting and bending, for placing, for furnishing all wire, stirrups, hangers, and placement devices for cleaning the reinforcement, and for insuring the proper placement of the steel reinforcement in the finished structure.

Section 22

ASPHALTIC CONCRETE

22-1 ASPHALTIC CONCRETE TYPE AND MIX DESIGN

Asphaltic concrete shall be Type A (coarse) or as designated on the Plans or specified in the Special Provisions, and shall conform to the provisions of Section 39 of the State Specifications.

Asphaltic concrete shall be produced in conformance with the requirements of a job-mix formula. The job-mix formula will take into consideration the quality of the aggregate, the type of asphalt binder material, the immersion compression retention index, the void relationships and other criteria, and said job-mix formula shall be the responsibility of Contractor. The amount of asphalt binder material, as a percentage of the total weight of the mixture shall be determined by California Test 367.

Contractor shall be responsible for designing a job-mix formula by the material supplier or through an approved testing laboratory, and shall submit it to the Engineer for approval ten (10) working days prior to any mixing and/or placing of asphaltic concrete.

During the production of either mineral aggregate or asphaltic concrete, the Engineer or Contractor may request that adjustments be made in the job-mix formula. Such request shall be in writing and substantiated through the material supplier or an approved testing laboratory. Consideration will be given promptly to such request.

22-2 MATERIALS FOR ASPHALTIC CONCRETE

Aggregate material shall conform to the requirements of Section 39 of the State Specifications for three-quarter inch (¾") maximum aggregate for major streets and one half inch (½") for residential streets or as determined by the Engineer. Where two lifts are placed, the Engineer may require that the base course be ¾" maximum aggregate and the surface course be ½"maximum aggregate. Consideration shall be given to percentage of heavy vehicles and bus stop locations.

Paving asphalts shall meet the requirements of Section 10-18 of these Specifications.

Unless otherwise indicated on the Plans or in the Special Provisions, asphalt binder to be mixed with aggregate shall be steam-refined paving asphalt: PG 64-10 or PG 64-16 for residential and collector streets and PG 70-10

for on/off ramps, Intersections, arterials, and thoroughfares. Use ARHM-GG (Asphalt Rubber hot Mix – Gap Graded) with PG 64-16 for overlays, unless otherwise indicated.

22-3 MIXING EQUIPMENT FOR ASPHALTIC CONCRETE

Mixing equipment shall conform to that specified in Section 39 of the State Specifications.

22-4 GENERAL REQUIREMENTS FOR PLACING ASPHALT CONCRETE AND ASPHALT CONCRETE OVERLAYS

Contractor shall notify the public seventy-two (72) hours prior to the start of work by placing door hangers to all business and residences that may be affected by the work as determined by the Engineer. Contractor may be required to contact business owners in person to explain the work schedule as determined by the engineer. No work shall be permitted until the public has been notified.

If Required by the Engineer, Contractor shall notify the following City departments and agencies seven (7) days prior to performing the work: Public Works Solid Waste Division (Street Cleaning Section), Public Works Parking Division, Public Works Street Maintenance Section (Traffic Signs and Markings Section and Traffic Signals and Lighting Section), Police Department Communications Center, Fire Department Communications Center, and Sacramento Metro Regional Transit (bus stops and light rail). If required, Contractor shall contact the appropriate representative of each City department or agency, and provide a work schedule in writing.

Contractor shall be responsible for trimming of trees necessary to perform the work as determined by the Engineer. Contractor shall obtain a tree-trimming permit from City Tree Services Division prior to trimming trees.

Contractor shall be responsible for removing all yard waste and debris effecting the work at his expense. Yard waste shall not be relocated to planter strips, pedestrian areas, or other areas not approved by the Engineer. Garbage cans that are temporarily removed from the street shall be placed back in their original position at the end of the workday.

Contractor shall be responsible for removing all vegetation from the roadway surface and edge of pavement, and sweeping in advance of placing the pavement operation (prior to tack coat) to the satisfaction of the Engineer.

Contractor shall clean, sweep, and maintain the cleanliness of the streets to be paved to the satisfaction of the Engineer throughout the course of the work. Materials spilled or dispersed as a result of the work on adjacent

streets shall also be cleaned at the expense of Contractor. The street shall be swept with a mechanical type pickup machine and shall be left thoroughly clean and clear of any pavement grindings at the end of each working day. The machine shall spray adequate amounts of water to control dust.

Contractor shall remove and dispose of existing pavement markers prior to placing asphalt. All thermoplastic limit lines, crosswalks, and legends applied to the road surface shall be scarified prior to placing the overlay. Excess crack seal shall be removed as directed by the Engineer.

Contractor shall place temporary pavement delineation necessary for the safety of vehicular and pedestrian traffic. Temporary pavement delineation layout shall be approved by the Engineer.

All manholes and utility covers concealed with asphalt concrete shall be carefully referenced out ("cross-tied") prior to the placement of asphalt by Contractor. All exposed survey monuments shall be referenced out prior to the overlay, covered by an appropriate method approved by the Engineer, and uncovered after the overlay without disturbing or damaging the survey monument. All relevant iron (manholes, water valves, etc.) shall be lowered prior to pavement planing as directed by the Engineer. Contractor shall submit "cross ties" to the Engineer prior to the lowering of iron.

Contractor shall coordinate the removal of on-street parking with the Engineer Seventy-two (72) hours prior to the start of work in accordance with Section 6-18 of these specifications.

22-5 PAVEMENT KEYCUTTING, CONFORMS, AND PLANING

Where specified by the Engineer, pavement planing shall be done to profile the street to a planer surface. The general depth of planing shall be equal to the depth of the overlay unless otherwise approved by the Engineer.

Where specified by the Engineer, pavement keycutting shall be done to provide a key wedge against existing gutter lips. Asphalt concrete removal shall be to a minimum depth of one and a half inch (1½") adjacent to the lip and shall be tapered to the existing pavement grade over a distance of eight feet (8') minimum, from the gutter lip. At cross streets, where the condition of the side street is very good, pavement keycutting shall continue in a straight line from curb line to curb line parallel to the direction of work as directed by the Engineer.

At the beginning and ending limits of pavement keycutting, a planed pavement conform shall be constructed to the drawings shown in Section 38 of these Standard Specifications or as directed by the Engineer. At cross streets,

where the condition of the side street is poor, planed pavement conforms shall be done between the lip of the main street to the curb return of the side streets. When the beginning or ending limit of work is a crossing street, a fifty feet (50') planed conform extending to the round corner of the crossing street shall be constructed except that an eighteen foot (18') planed pavement conform shall be constructed on residential streets. The conform shall span the full width of the street for a distance of fifty feet (50') back from the limit line or feature resulting in the discontinuity in the work. At bridge decks, the conform shall span the full width of the street for a distance of fifty feet (50'). The depth of cut shall be equal to the depth of overlay at the limit of work and shall be progressively decreased to zero (0") over the conform length.

Where specified by the Engineer, pavement planing shall be done to retain the existing street elevation. The depth of planing below the gutter lip shall be equal to the specified thickness of asphalt concrete. The depth of planing at the centerline shall be equal to the specified thickness of asphalt concrete to be placed on the street, and shall increase from the lip of gutter to the street centerline linearly should the specified depths differ.

Contractor shall exercise care to avoid damaging the gutter lips during the grinding operations. Damaged gutter lips which have spalls in excess of one inch (1") deep by five inches (5") long shall be repaired at Contractor's expense.

Grinding operations shall be completed to the satisfaction of the Engineer prior to beginning the paving operation.

Contractor shall remove existing asphalt concrete from the top of the gutter pan and from the face of gutter lip as directed by the Engineer.

The grindings shall become the property of Contractor and disposed of off-site.

At the end of the workday, there shall not be any elevation difference between planed pavement and unplaned pavement in the traveled vehicle lanes and all curb ramps. Any differences that parallel the centerline of the street in a longitudinal direction shall be sloped by either a temporary asphalt plant mix cut back or additional planing, to produce a bevel within the planed pavement. The slope of either the cutback or the bevel shall be not greater than one-inch (1") vertical in twelve inches (12") horizontal. Other than for curb ramps, elevation differences between planed pavement and lips of gutters are not required to be sloped.

Elevation differences perpendicular to the centerline of the street, in a transverse direction, or elevation differences between the planed street and

cross-streets, shall be sloped as directed by the Engineer with cutback and shall not exceed one inch (1") vertical in twelve inches (12") horizontal.

If Contractor fails to slope elevation differences as required by these Special Provisions, Contractor shall pay administrative penalties of $500 per each infraction per each calendar day elevation differences are not sloped.

Not more than three (3) calendar days shall elapse between the time pavement planing and/or pavement keycutting begins on any particular section of roadway and the time that the asphalt concrete surfacing is placed unless approved by the Engineer.

22-6 PLACING

Placing of asphaltic concrete shall conform to the requirements of Section 39 of the State Specifications. The maximum paving lift shall be three inches (3") thick.

Contractor shall fill and level all surface irregularities and ruts to ensure compliance with specified tolerances.

Contractor shall use a thirty foot (30') leveling ski on the free floating edge unless otherwise approved.

Before placing asphaltic concrete surface course on an asphaltic concrete base course, a tack coat shall be applied unless otherwise approved.

The material shall be brought to the site of the work in suitable vehicles so equipped that they will operate properly with the spreading equipment being used. The Engineer shall have the right to remove any vehicle from service which is not operating satisfactorily in the spreading of the material. Tarpaulins shall be provided for all trucks and shall be used whenever the Engineer may direct.

Asphaltic concrete shall not be placed on a wet base or subgrade, and the ambient air temperature shall be 50°F. and rising. The temperature of the mix shall not exceed 320°F. nor shall it be laid at a temperature below 250°F unless authorized by the Engineer.

When base course and surface course are used, the extent to which the base course may be laid ahead of the surface course, and the requirement for a tack coat, shall be determined by the Engineer.

22-7 TACK COAT

Tack coats shall be in conformance with the requirements of Section 39 "Paint Binder (tack coat)" of the State Specifications. A tack coat shall be applied to all planed surfaces, paved surfaces to be resurfaced, vertical surfaces of existing pavements, curbs, gutters, and construction joints, and other surfaces as directed by the Engineer.

Tack coats shall be SS-1 asphalt emulsion unless otherwise approved. The proportion of SS-1 and water shall be 80/20, or as determined by the engineer, and shall be applied to the surface at an application rate from .02 to 0.10 gallons per square yard. Typical application rates vary from .05 gallons per square yard for smooth finished surfaces to .10 gallons per square yard for planed pavement surfaces.

Prior to applying tack coat, the street surface shall be swept clean by brooming or washed clean to the satisfaction of the Engineer. The length of the tack coat placed in advance of the paving operation shall be determined by the Engineer to minimized degradation of the tack coat by vehicular traffic. The street surface shall also be free of moisture and dry to the satisfaction of the Engineer.

Under cold weather conditions, the Engineer may approve the use and application rate of PG 64-10 or PG 64-16 paving asphalt as a tack coat.

22-8 SPREADING AND COMPACTING

Spreading and compacting requirements shall be in conformance with Section 39 of the State Specifications except as noted herein. Compaction shall be subject to density testing as defined in Section 22-9 and 22-10 of these specifications in accordance with California Test Methods 304 and 308.

Contractor shall furnish a minimum of two (2) ten (10) ton steel wheel rollers and one (1) twelve (12) ton pneumatic tired roller unless otherwise approved by the Engineer. Vibratory rollers may be substituted when approved by the Engineer.

The initial or breakdown rolling of surface course shall be followed by additional rolling consisting of three (3) complete coverage with a pneumatic-tire roller, while the temperature of the mixture is at or above 150° F. The final rolling of surface course shall be performed with a ten (10) ton, two (2) axle tandem roller.

The rolling of the asphaltic concrete material shall commence immediately after its placement. Rolling shall continue until all ruts and

surface imperfections are eliminated and the proper degree of compaction is achieved. Finish rolling shall be accomplished with a steel wheel tandem roller. A vibrating roller may be used as the finish roller provided that it meets the requirements for a finish roller as herein specified and is operated with the vibratory unit turned off. Rolling shall commence at the lower edge and shall progress toward the highest portion, except that when compacting layers which exceed 0.25-foot in compacted thickness rolling shall commence at the center and shall progress outwards.

At the commencement of the asphaltic concrete paving operations, Contractor shall cooperate with City forces in establishing and agreeing upon a rolling pattern that will insure the obtainment of the maximum possible density in the compacted asphaltic concrete surface. Once the rolling pattern is established, Contractor shall follow this pattern unless otherwise directed by the Engineer.

The City will perform compaction testing at no cost to Contractor. Contractor shall cooperate fully with City forces to take such tests, and shall make all provisions to allow the Engineer to sample the asphaltic concrete mixture from the completed surface immediately following placement by the lay-down machine.

When a straightedge twelve feet (12') long is laid on the finished surface and parallel with the center line, the surface shall not vary more than 0.01-foot from the lower edge of the straightedge. The transverse slope of the finished surface shall be uniform to a degree such that no depressions greater than 0.02-foot are present when tested with a straightedge twelve feet (12') long laid in a direction transverse to the center line and extending from edge to edge of a twelve foot (12') traffic lane. Contractor shall conform to the tolerance requirements of this specification unless otherwise approved by the Engineer in writing prior to the start of work. Contractor shall request information regarding tolerances for streets having a parabolic section prior to the start of work.

Contractor shall place asphalt such that its finished surface is ¼ to ½ inches above the gutter lip.

Pavement surface shall be deemed unacceptable should the surface hold water, the pavement ravel, an uneven gradation of mix be visible, or cracking occur during rolling. Pavement shall be removed by surface planing (a minimum depth of one and one-half inches (1½") when using one-half inch (½") mix, and two inches (2") inches when using three-quarter inch mix), and repaved to the satisfaction of the Engineer. Areas to be removed and replaced will be determined by the Engineer. Should a significant amount of surface be deemed unacceptable, the entire travel lane shall be resurfaced. A series of

spot patches will not be accepted. The mix design used during resurfacing shall be the same as the adjacent pavement.

Pursuant to Section 5-14 of these Specifications, the Engineer will have the right and authority, but shall not be obligated, to retain imperfect work instead of requiring the imperfect work to be removed and reconstructed. Patch paving of imperfect work will not be allowed, and the amount of the deduction shall be based on full travel lane widths from beginning to end of the work limits or two nearest intersections as determined by the Engineer.

22-9 PAVEMENT DENSITY TESTING

Pavement density will be determined by comparing the average density of cores taken from the compacted pavement to the maximum theoretical density as determined by ASTM D 2041. As required by the Engineer, the pavement will be inspected on a lot basis. A lot will consist of either five hundred (500) tons of asphalt for a surfacing project or four hundred (400) lineal feet of pavement for a trenching project. One sample shall be taken from each lot on a random basis. One laboratory-compacted specimen shall be prepared from each lot.

Cores for determining the density of compacted pavement will be taken on a lot basis with a minimum of three cores per lot. The density of each core shall be determined per ASTM D 2726-89. The cores shall be four inches (4”) in diameter.

Contractor shall plug core holes taken by the material tester with asphalt compacted greater than ninety percent (90%) of relative compaction if cores are taken the same day as Contractor’s paving operations. The core holes shall be plugged prior to the end of the workday. If required to facilitate the taking of cores, Contractor shall leave lane closures in place for a reasonable period of time (approximately thirty minutes after pavement has cooled enough to drive on).

22-10 PAY FACTORS

For all asphalt pavement subject to acceptance testing, the lot will be paid for using the following pay factors:

In Place relative Compaction	Payment Factor
97.1% or higher (over-asphalted mix)	90%
92% – 97%	100%
89%-91.9% (marginal air voids)	85%
88.9%or less (unacceptable air voids)	Not acceptable (60% if otherwise approved)

The amount paid shall be at the unit price bid times the pay factor. For lots with average densities of 91.9% or less, the Engineer reserves the right to deem the lot as not acceptable and require the work to be removed and reconstructed. Unless otherwise approved by the Engineer, lots with average densities of less than 89% relative compaction shall be removed and reconstructed.

22-11 PAVEMENT REINFORCING FABRIC

Pavement reinforcing fabric shall be non-woven polyester, polyproplyene, or polypropylene/nylon materials conforming to the requirements of the below indicated ASTMs:

Weight, Oz./sq.yd. ASTM D 1910	3.0 to 8.0
Grab Tensile Strength (1-inch grip), Pounds ASTM D 1117	90 min.
Elongation at Break, Percent, ASTM D 1117	40 min
Fabric Thickness Mils., ASTM D 461	12 to 100.

The fabric shall retain the physical properties listed herein after being in contact with asphalt concrete at temperatures of up to 325° F. for five (5) minutes (±15 seconds).

Pavement reinforcing fabric shall be accompanied by a Certificate of Compliance signed by the manufacturer stating that the fabric complies with these Specifications. The fabric shall be protected from exposure to ultraviolet rays and kept dry until placed. Before spreading asphalt binder, large cracks, spalls and chuckholes shall be repaired as directed by the Engineer and such repair work will be paid for as extra work-force account as provided in Section 4-6 of these Specifications.

Immediately prior to placing the fabric, an asphalt binder shall be applied to the street surface. Asphalt binder for pavement reinforcing fabric shall conform to the provisions of Section 10-18 of these specifications and shall be the same grade of the mix design.

Asphalt binder for pavement reinforcing fabric shall be applied at an approximate rate of 0.25 gallons per square yard of surface covered. The width of the asphalt binder spread shall be the width of the fabric mat plus three inches (3”) on each side. Asphalt binder shall be applied at a temperature of not less than 290° F.

The fabric shall be stretched, aligned and placed with no wrinkles that lap. The test for lapping shall be made by gathering together the fabric in a wrinkle. If the height of the doubled portion of extra fabric is one-half inch (½”) or more, the fabric shall be cut to remove the wrinkle then lapped in the direction of paving. Laps in excess of two inches (2") shall be removed.

If manual lay down methods are used, the fabric shall be unrolled, stretched, aligned and placed in increments of approximately thirty feet (30’).

Adjacent borders of the fabric shall be lapped two to four inches (2-4”). The preceding roll shall lap two to four inches (2-4”) over the following roll in the direction of paving at ends of rolls or at any break.

Seating of the fabric with rolling equipment after placing will be permitted. Turning of the paving machine and other vehicles shall be gradual and kept to a minimum to avoid damage.

A small quantity of asphalt concrete may be spread over the fabric immediately in advance of placing asphalt concrete surfacing in order to prevent fabric from being picked up by construction equipment.

Public traffic shall not be allowed on the bare reinforcing fabric, except that public cross traffic shall be allowed to cross the fabric, under traffic control, after Contractor has placed a small quantity of asphalt concrete over the fabric.

Care shall be taken to avoid tracking binder material onto the pavement reinforcing fabric or distorting the fabric during seating of the fabric with rolling equipment.

22-12 PAYMENT FOR ASPHALTIC CONCRETE

Payment for asphaltic concrete pavement shall be at a price per ton of delivered and place material or at a price per square foot for finished pavement. The method used on any work will be shown by the list of quantities on the Proposal and by the type of unit price requested in the Proposal.

Payment for asphaltic concrete pavement by either of the above two methods, as may be specified in the Proposal for that particular work, shall include full compensation for furnishing and placing the material without additional compensation. Tack coat, where required, shall also be furnished without additional compensation and as part of the bid per ton or per square foot of asphaltic concrete pavement.

Payment for pavement key cutting shall be at the unit price per lineal foot of street surface planed and shall include full compensation for furnishing all labor, materials tools, equipment and incidentals, and for doing all work involved in placing pavement reinforcing fabric, complete in place, as specified herein.

Payment for pavement conforms and pavement planing shall be at the unit price per square yard and shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in placing pavement reinforcing fabric, complete in place, as specified herein.

Payment for pavement reinforcing fabric shall be at the unit price bid per square yard of street surface actually covered as determined by the Engineer, and shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in placing pavement reinforcing fabric, complete in place, as specified herein.

Payment for full compensation for advance spreading of asphalt concrete over the fabric and for furnishing and placing the asphalt binder in accordance with the requirements of this Section shall be considered as included in the contract prices paid per ton for asphalt concrete surfacing and no additional compensation will be allowed therefore.

Section 23

BITUMINOUS SEALS

23-1 BITUMINOUS SEAL TYPES AND MIX DESIGN

Bituminous seals shall conform to the requirements of Section 37 of the State Specifications except as noted herein. Bituminous seal types shall be produced in conformance with the requirements of a job-mix formula. The job-mix formula will take into consideration the quality of the asphalt emulsion, aggregate, mineral filler, and specified additives.

Contractor shall be responsible for designing a job-mix formula by the material supplier or through a testing laboratory capable of performing the applicable International Slurry Seal Association (ISSA) tests, and shall submit it to the Engineer for approval ten (10) working days prior to the start of work.

During the course of the work, the Engineer or Contractor may request that adjustments be made in the job-mix formula. Such request shall be in writing and substantiated through the material supplier or an approved testing laboratory. Consideration will be given promptly to such request. Bituminous seal types and typical uses are as follows:

1. Sand Seal

Sand seals shall be used to seal pavement cuts such as recent trench excavations and after the raising of utility covers.

2. Slurry Seal (Type 2)

Slurry Seals, Type 2, shall be used to extend the life of existing residential streets in good condition.

3. Slurry Seal (Type 3)

Slurry Seal, Type 3, shall be used to extend the life of existing major streets in good condition.

4. Seal Coat (Chip Seal)

Seal Coat, Chip Seal, shall not be used, except as the base course of a cape seal.

5. Cape Seal

Cape Seal shall be used to extend the life of existing streets in fair condition.

23-2 SAND SEALS

1. Asphalt Emulsion

The emulsified asphalt shall be SS-1 unless otherwise approved. The proportion of SS-1 and added water shall be 80/20, or as determined by the engineer. The resulting mixture shall contain one part of asphalt emulsion (which contains up to 43 percent added water) and not more than one part of total added water. Under cold weather conditions, the Engineer may approve the use of viscosity grade AR-4000 paving asphalt as a base material for sand seals.

2. Sand

Sand shall be free from dirt and other deleterious substance.

23-3 SLURRY SEALS

1. Asphalt Emulsion

The emulsified asphalt shall be designated as grade PMCQS-1h. The polymer within the asphalt emulsion shall be, at the option of Contractor, either Neoprene, SBR, EVA or SBS. Solid polymers such as EVA or SBS shall be adequately blended into the asphalt prior to emulsification. If a liquid latex such as Neoprene, SBR or similar is used, the latex shall be “co-milled” into the emulsion through the water phase during manufacturing. Each load of polymer asphaltic emulsion shall have a certificate from the asphalt emulsion manufacturer guaranteeing that either asphalt blending or “co-milling” processes were used. The certificate shall also state the percentage of the solid rubber polymer added by weight of the asphalt as well as the composition of the polymer. The addition of latex to the emulsion after emulsion manufacturing is prohibited. The polymer modified asphalt emulsion shall conform to the following specifications:

TEST	TEST METHOD	REQUIREMENT	
Tests on emulsion:			
		Min.	Max.
Viscosity SSF, @ 77◦ F, seconds	AASHTO T 59	15	90
Settlement, 5 days, %	AASHTO T 59	--	5
Storage Stability Test, 1 day, %	AASHTO T 59	--	1.0
Distillation: Oil distillate by volume of emulsion, % (Residue by Low-Temperature)	AASHTO T 59	--	3
Vacuum Distillation, %	ASTM D 244. 133-137	57	--
Tests on residue using CTM 331			
Penetration, 77°F, 100 grams for 5 seconds, dmm	AASHTO T 59	40	65
Solubility in Trichloroethylene, %	ASTM D 2042	97.5	--
Ductility, 77°F, 5cm/min, cm (RTFO Aged Residue)	AASHTO T 51	60	--
Ring & Ball Softening Point, ◦ F	AASHTO T 53	123	--
Polymer Content, % Solid polymer content based on weight of asphalt.	CTM 401	3.0	--
Torsional Recovery, %	CTM 332	18	--

2. Mineral Aggregate

Slurry seal aggregate for all roads shall conform to ISSA Type II aggregate and shall be manufactured crushed stone such as granite, slag, limestone, chat, or other high quality aggregate, or combination thereof. To assure the material is totally crushed, 100% of the parent aggregate shall be larger than the largest stone in the gradation to be used.

When tested in accordance to AASHTO T27 (ASTM C 136) and AASHTO T11 (ASTM C 117), the aggregate gradation (including the mineral filler) shall be within following bands.

Type II Slurry Seal (residential streets)

Sieve Sizes	Passing Percentage	Stockpile Tolerance
9.5 mm (3/8”)	100	+/- 5%
4.75 mm (#4)	94-100	+/- 5%
2.36 mm (#8)	65-90	+/- 5%
1.18 mm (#16)	40-70	+/- 5%
600 um (#30)	25-50	+/- 5%
330 um (#50)	18-30	+/- 4%
150 um (#100)	10-21	+/- 3%
75 um (#200)	5-15	+/- 2%

Type III Slurry Seal (major streets)

Sieve Sizes	Passing Percentage	Stockpile Tolerance
9.5 mm (3/8")	100	+/- 5%
4.75 mm (#4)	70-90	+/- 5%
2.36 mm (#8)	48-70	+/- 5%
1.18 mm (#16)	28-50	+/- 5%
600 um (#30)	19-34	+/- 5%
330 um (#50)	12-25	+/- 4%
150 um (#100)	7-18	+/- 3%
75 um (#200)	5-15	+/- 2%

After the target gradation has been submitted and identified in the mix design, the percent passing each sieve shall not vary by more than the stockpile tolerance and still remain within the gradation band during the application of slurry seal. The mineral aggregate shall also conform to the following:

Test	Test Method	Requirements
Sand Equivalent	ASTM D 2419	60 Minimum
Loss in L.A. Rattler (100 Revolutions)	CTM 211	10% Maximum
Loss in L.A. Rattler (500 Revolutions)	CTM 211	35% Maximum
Durability Index	ASTM D 3744	60 Minimum

Mineral Filler - Mineral Filler shall be Portland Cement, hydrated lime, limestone dust, fly ash or other approved filler meeting the requirements of ASTM D 242 shall be used as required by the mix design. The mineral filler shall be considered as part of the aggregate in calculations regarding slurry seal asphalt content.

3. Water

The water added to the slurry seal shall be potable and free of harmful salts and contaminates.

4. Additives

Additives may be used to accelerate or retard the mixing and setting characteristics of the slurry seal, or to improve the resulting finished surface. The use of additives in the slurry mix (or individual materials) shall be made initially in quantities predetermined by the mix design with field adjustments if required. If the use of additive during application requires a greater than + or - 1.0% deviation from the recommendations of the mix design, a new mix design will be performed to verify system performance at higher or lower additive levels.

Water, and additives, if used, shall be added to ensure proper workability and:

a. Permit the unrestricted flow of traffic on the slurry seal no more than one (1) hour after placement without the occurrence of bleeding, raveling, separation, or other distress.

b. Prevent the development of bleeding, raveling, separation, or other distress within fifteen (15) days after placing the slurry seal.

5. Compatibility

The Engineer may require the compatibility of the aggregate, emulsion, mineral filler, and other additives shall to be verified by the mix design prior tot the start of work. The Engineer may require the following tests to determine compatibility:

TEST	DESCRIPTION	SPECIFICATION
ISSA TB-113	Mix Time	Controllable to 180 sec minimum
ISSA TB-139	Wet Cohesion	
	30 minutes min	12kg-cm minimum
	60 minutes min	20kg-cm minimum
ISSA TB-109	Excess Asphalt by LWT Sand Adhesion	$50g/ft^2$ maximum ($538g/m^2$ maximum)
ISSA TB-114	Wet Stripping	Pass (90% minimum)
ISSA TB-100	Wet Track Abrasion Loss One hour soak	$50g/ft^2$ maximum ($807g/m^2$ maximum)

The Wet Track Abrasion test is used to determine the minimum asphalt content.

Contractor may be required to have the laboratory report the quantitative effects of moisture content on the unit weight of the aggregate (bulking effect). The report must clearly show the proportions of aggregate, mineral filler (min. and max.), water (min. and max.), additive(s) (usage), and asphalt emulsion based on the dry weight of the aggregate (percentages).

6. Application

Type II slurry seal shall be placed at a rate of approximately twelve (12) to fifteen (15) pounds per square yard. The exact rate will be as determined by specific weight of aggregate, the surface demand of the pavement, and the size of the largest particle size of the aggregate. Slurry seal shall not be placed when the existing pavement or air temperature is below 55 degrees

Fahrenheit (15 degrees C) and falling, or during unsuitable weather, but may be applied when both pavement and air temperature are above 45 degrees Fahrenheit (7 degrees C) and rising.

Unless the Engineer makes other arrangements, all intersections are to be slurry sealed where there are two or more blocks in line. Contractor shall seal all alley returns adjacent to streets that are to be sealed back to the property line. Where two streets that are to be sealed intersect, Contractor shall seal the entire pavement in the intersection, including the round corner area. Where light rail is encountered, Contractor shall seal up to the concrete pad. Areas to be slurry sealed that are inaccessible to the spreader box may be spread by other approved means.

Contractor shall remove all excess material, which is placed outside asphalt pavement areas. Hand tools shall be available in order to remove spillage.

Where the completed slurry is not uniform in color, the street shall be treated to eliminate the color variation at Contractor's expense. The method of treatment will be subject to approval by the Engineer. Contractor shall repair and reseal all areas of the streets, which have not been sealed properly or completely at no additional cost to the City.

Contractor shall be responsible for sweeping the streets and sidewalks which excessive raveling may occur after placing of the slurry seal, at no additional cost to the City, as directed by the Engineer. When requested by the Engineer, Contractor will send to the Engineer a daily report containing the following information:

a. Tons of dry aggregate consumed that day.
b. Tons of asphalt emulsion consumed that day; and
c. Surface area covered that day.

6. Machine Calibration And Verification

Mixer-spreader trucks to be used in performance of the work shall be calibrated in the presence of the Engineer prior to construction. Contractor shall document the way in which the mechanical proportioning devices are calibrated and correlated to the metered delivery of each material at various settings. No mixer-spreader truck will be allowed to work on the project until the calibration has been completed and accepted by the Engineer within at least one (1) working day prior to start of work.

7 Spreading Equipment

The slurry mixture shall be uniformly spread by means of a controlled spreader box conforming to the following requirements:

All spreader boxes over 7-1/2 feet in length shall have baffles.

Spreader box, rubber strike off, and drag mops shall be maintained in such manner as to prevent chatter (washboarding) in the finished mat. If washboarding occurs, that area shall be corrected to eliminate the washboard.

The rear flexible strike-off blade shall make close contact with the pavement and shall be capable of being adjusted to the various crown slopes so as to apply a uniform seal coat. Blades shall be changed as frequently as necessary to prevent longitudinal scouring.

The maximum speed of the application equipment shall not be greater than 180 feet per minute. At least two (2) operational spreader trucks shall be available at the job site during the spreading operation except when continuous placement type mixer-spreader trucks are used.

23-4 CHIP SEALS

1. Asphalt Emulsion

The asphalt emulsion use for chip seal shall be a cationic polymer modified asphalt emulsion grade PMCRS-2h. The polymer in the emulsion shall be, at the option of Contractor, either Neoprene, SBR, EVA or SBS. Solid polymers such as EVA or SBS shall be adequately blended into the asphalt prior to emulsification. If a liquid latex such as Neoprene, SBR or similar is used, the latex shall be "co-milled" into the emulsion through the water phase during manufacturing.

Each load of polymer asphaltic emulsion shall have a certificate from the asphalt emulsion manufacturer guaranteeing that either asphalt blending or "co-milling" processes were used. The certificate shall also state the percentage of the solid rubber polymer added to the asphaltic emulsion by weight of the asphalt as well as the composition of the polymer. The addition of latex to the emulsion after emulsion manufacturing is prohibited.

Cationic type asphalt emulsion Grade PMCRS-2h shall conform to the following requirement when tested in accordance with the specified test methods:

TEST	TEST METHOD	REQUIREMENT	
Tests on emulsion:		Min.	Max.
Viscosity SSF, @ 122◦ F, seconds	AASHTO T 59	100	250
Settlement, 5 days, %	AASHTO T 59	--	5
Sieve Test, %	AASHTO T 59	--	1.0
Demulsibility, 35 ml. 0.8% sodium dioctyl sulfosuccinate, %	AASHTO T 59	60	95
Particle Charge	AASHTO T 59		Positive
Distillation: Oil distillate by volume of emulsion, %	AASHTO T 59	--	3
Residue by Evaporation, %	CTM 331	65	--
Tests on residue from Evaporation using CTM 331:			
Penetration, 77°F, 100g, 5 seconds, dmm	AASHTO T 59	40	65
Solubility in Trichloroethylene, %	ASTM D 2042	97.5	--
Ductility, 77°F, 5cm/min, cm (RTFO Aged Residue)	AASHTO T 51	60	--
Ring & Ball Softening Point, ◦F	AASHTO T 53	123	--
Polymer Content *, % *Solid polymer content based on weight of asphalt.	CTM 401	3.0	--
Torsional Recovery, %	CTM 332	18	--

2. Medium Fine Screenings

Screening shall consist of broken stone, crushed gravel, or both. At least 90 percent of the screenings, by weight, shall consist of crushed particles as determined by CTM 205. Screenings shall be clean and free from dirt and other deleterious substances.

The percentage composition of the screenings, by weight, shall conform to the following grading:

Sieve Sizes	Percent Passing
3/8”	100
No. 4	30 - 60
No. 8	0 - 15
No. 16	0 - 5
No. 30	0 - 3
No. 200	0 – 2

Screenings shall conform to the following quality requirements:

	CTM	Requirements
Los Angeles Rattler Loss at 100 Revolutions	211	10% Maximum
Los Angeles Rattler Loss at 500 Revolutions	211	40% Maximum
Film Stripping, %	302	10% Maximum
Cleanness Value	227	85 Minimum

3. Application

The chip seal asphalt emulsion application rate shall range between 0.20 and 0.35 gallons per square yard. Application of fog seal will not be required.

Each distributor truck shall be equipped, at all times, with its proper measuring stick and calibration card. On-site calibration of distributor trucks, for determining actual spread rate of asphalt emulsion, shall be performed when directed by the Engineer. The Engineer may sample the asphalt emulsion at any time during application. Samples of asphalt emulsion shall be taken from the spray bar of a distributor truck at mid-load.

When requested by the Engineer, Contractor will send to the Engineer a daily report containing the following information:

a. Tons of dry aggregate consumed that day.
b. Tons of asphalt emulsion consumed that day; and
c. Surface area covered that day.

4 Finishing

The Engineer shall have the final decision when traffic shall be permitted to resume. The surface of the chip seal coat shall be swept or broomed no sooner than 4 hours after the placement of the chip seal to maintain the surface free of loose screenings and removal of excess screenings from all paved areas including gutters, sidewalks and driveways until the slurry seal has been applied as coverage. Contractor shall be responsible for any damages to the vehicles, pedestrians and residents due to loose screenings. Contractor is responsible for additional sweeping if requested by the Engineer.

5. Maintaining Traffic

Contractor shall place temporary C6 “LOOSE GRAVEL” with 15-MPH speed limit signs installed at the entrance and at 150 feet intervals on both sides of the streets.

23-5 CAPE SEALS

1 Materials

The materials for cape seal consist of those for a slurry seal placed over a chip seal.

2. Application

The slurry seal coat shall be applied no sooner than seven (7) calendar days and no later than fourteen (14) calendar days after the chip seal coat is applied.

Cape seal shall be placed at a rate of approximately eighteen (18) to thirty (30) pounds per square yards. The exact rate will be as determined by specific weight of aggregate, the surface demand of the pavement, and the size of the largest particle size of the aggregate.

Residual Asphalt	7.5% - 13.5% (approx. 12.0 - 22.0% emulsion) based on dry weight of aggregate
Mineral Filler	0.0% - 2.0% Based on dry weight of aggregate.
Additives	As needed to control mixing and setting times
Water	As needed to achieve proper mix consistency.
Residual Asphalt	6.5% - 12.5% (approx. 10.5% - 19.5% emulsion) Based on dry weight of aggregate

23-6 GENERAL REQUIREMENTS

Contractor shall coordinate the removal of on-street parking with the Engineer Seventy-two (72) hours prior to the start of work in accordance with Section 6-18 of these specifications.

Immediately prior to apply slurry or chip seal, the pavement surface shall be cleaned by sweeping all streets with a mechanical power broom prior to sealing or other means necessary to remove all loose particles from the pavement. All dirt, silt, vegetation and other objectionable material that may prevent adhesion of the seal coat to the existing pavement will be removed. The Engineer may require particularly dirty streets to be flushed with water (City permit is required if City Fire Hydrants are being used). The Engineer must approve all flushing operations. Contractor shall be responsible for cleaning sidewalks and driveways soiled by flushing operations.

Contractor shall remove thermoplastic stripes/markings, preformed traffic stripes or markings and raised pavement markers prior to seal coat operation. Contractor shall place temporary pavement delineation necessary for the safe movement of vehicular and pedestrian traffic. The layout of temporary pavement delineation shall be approved by the Engineer.

Utility covers, maintenance holes, and other permanent facilities shall be protected from coverage by the chip seal, and referenced for prompt location and cleaning following slurry seal operations. Contractor shall be responsible for covering, locating, removing, cleaning and protecting the above items during and following the cape seal operations. The methods of protection, referencing, locating and cleaning shall be submitted by Contractor and shall be subject to approval by the Engineer prior to any resurfacing. All protective coverings shall be removed from maintenance hole covers, water valve boxes, and other utility covers each day before opening the street to traffic.

Contractor at his expense shall be responsible for removing all yard waste and debris placed in the street between the time of City pickup and the completion of the work. Yard waste shall not be relocated to planter strips, pedestrian areas, or other areas not approved by the Engineer. Garbage cans that are temporarily removed from the street shall be placed back in their original position at the end of the workday.

Contractor shall submit to the Engineer for review and approval a plan showing traffic control measures for vehicles and pedestrians affected by the construction work. Contractor will not be allowed to begin work until the Engineer has approved the plan.

The traffic control plan shall show advance warning signs to minimize public inconvenience and traffic impacts on the quality of the work. The traffic control plan shall also include any temporary light signal modifications necessary for the efficient movement of traffic. Two-way traffic must be maintained for all major streets at all times, unless otherwise approved by the Engineer. Unless otherwise approved, all streets shall have a minimum of one (1) ten (10) foot wide lane open to traffic in each direction at all times. If Contractor cannot maintain two lanes of traffic, the Engineer may approve the reduction of the number of lanes to one twelve feet (12') lane and the use of flag persons and delineation in accordance with the Work Area Traffic Control Handbook (WATCH). Contractor shall provide the Engineer with one week of advanced notice for any special closure considerations, which should be included in the required traffic control plan.

Construction operations shall be conducted in such a manner as to cause as little inconvenience as possible to abutting property owners. All businesses/residents shall have access to their driveways at all times.

Contractor shall not be allowed to close the entire width of streets, and shall sand driveways as necessary during seal coat operations. Black sand shall be used for sanding and shall be mechanically and evenly spread or broadcast.

Contractor shall schedule slurry and chip sealing such that access to an area is maintained and that residents will be within 1000 feet of an open street with a route out of the area being slurry sealed. However, the Engineer has the right to modify the above criteria to accommodate the residents' needs.

Contractor shall notify the public seventy-two (72) hours prior to the start of work by placing door hangers to all business and residences that may be affected by the work as determined by the Engineer. Contractor may be required to contact business owners in person to explain the work schedule as determined by the engineer. No work shall be permitted until the public has been notified.

If Required by the Engineer, Contractor shall notify the following City departments and agencies seven (7) days prior to performing the work: Public Works Solid Waste Division, (Street Cleaning Section) Public Works Parking Division, Public Works Street Maintenance section, (Traffic Signs and Markings Section, Traffic Signals and Lighting Section), Police Department Communications Center, Fire Department Communications Center, Sacramento Metro Regional Transit (bus stops and light rail). If required, Contractor shall contact the appropriate representative of each City department or agency, and provide a work schedule in writing.

Contractor shall clean, sweep, and maintain the cleanliness of the streets to be paved to the satisfaction of the Engineer throughout the course of the work. Materials spilled or dispersed as a result of the work on adjacent streets shall also be cleaned at the expense of Contractor. The street shall be swept with a mechanical type pickup machine and shall be left thoroughly clean at the end of each working day. The machine shall spray adequate amounts of water to control dust.

23-7 PLACING

Concrete bridge decks shall not be slurry sealed or chip sealed unless otherwise directed by the Engineer.

All undulations and speed humps shall be sealed unless otherwise directed by the Engineer.

All through driving lanes shall be spread in full lane width pulls only. Sealing of driveway aprons, returns, and other incidental work shall be accomplished concurrently with application of the street. The joint between the pavement and the PCC gutter shall be slurry sealed by placing an overlap of

the lip of the gutter a minimum of 3/4 inches and a maximum of 2 inches. Chip seal shall be applied 1” away from the gutter lips and not in the gutter pan.

When slurry or chip seal starts or finishes, a straight-line cut-off shall be obtained by laying down a strip of building paper or other approved material. Contractor shall remove such paper and any excess slurry or chip after the application thereof. Edge limits of the slurry or chip on both sides of the street shall be maintained in a neat and uniform line.

When feasible, all joints and curb lines shall be pulled by machine to keep handwork to a minimum. Ridges or bumps in the finish surface will not be permitted.

Building paper shall be placed at transverse joints and over previously placed slurry seals to avoid the double placement of seals. Other methods to avoid double placement may be used if first approved by the Engineer.

Existing blue fire hydrant locators shall be removed prior to placing of the chip seal and slurry seal. New "raised, blue dot, hydrant marking devices" shall be installed by Contractor after the slurry seal has been set for three (3) calendar days, but no later than seven (7) calendar days after placement of the slurry seal. Contractor shall place the new approved "blue dot, hydrant marking devices" with approved two-part epoxy adhesive per the instruction and at the locations determined by the Engineer.

23-8 PAYMENT

Measurement for payment shall be taken from edge of pavement to edge of pavement, or from lip of the gutter to lip of gutter.

Payment for Bituminous Seals shall be at the unit price bid per square yard and shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals to perform all work involved in slurry sealing, as specified in these Special Provisions and as directed by the Engineer.

Section 24

CURBS, GUTTERS AND SIDEWALKS

24-1 CONCRETE IN CURBS, GUTTERS, AND SIDEWALKS

Concrete in curbs, gutters, and sidewalks shall be Class "B", as specified in Section 10-5 of these Specifications. The cement shall be Type II as set forth in Section 10-1 of these Specifications. Fly ash shall not be substituted for cement if subgrade is expansive clay or if the “R Value” is ten or less.

When placing new concrete next to the existing concrete, Contractor shall match the color of the existing concrete. The color additive and amount may vary, and shall be approved by the Engineer prior to placing the new concrete. Without prior approval, new concrete that does not match the color of the existing concrete shall be removed and replaced at Contractor’s expense.

24-2 CONCRETE CUTTING

Where new concrete is to join existing concrete, the exact limits of existing concrete removal shall be determined by the Engineer prior to saw cutting. Concrete saws shall be water-equipped for dust control. Contractor shall take the necessary precautions to prevent cut material and saw cutting run-off from entering the City’s storm drain system.

24-3 SUBGRADE AND AGGREGATE BASE

Subgrade shall be prepared as specified in Section 14-7, and aggregate base shall be prepared as specified in Section 17-1 of these specifications. A minimum of six inches (6”) of Class 2 aggregate base shall be placed under all curb, gutter, sidewalk and driveways, except that twelve inches (12”) of Class 2 aggregate base shall be placed if the subgrade is expansive clay or the “R Value” is ten or less. Prior to placing concrete, aggregate base shall be uniformly moist, and any excess water shall be removed.

24-4 FORMWORK - NON EXTRUDED CONSTRUCTION

Forms for curb, gutter, and sidewalk shall be of a width equal to the full depth of the curb and gutter and wood forms shall be a minimum of one and one half inches (1 1/2") thick. Warped forms and forms not having a smooth straight upper edge shall not be used. Benders, or thin plank forms, rigidly placed, may be used for returns and other curves.

All forms must be carefully set to proper alignment and grades and shall be rigidly held in place by the use of not less than five (5) pairs of stakes to every

twenty-foot (20') section, unless otherwise approved. Clamps, spreaders, and braces shall be used when necessary to obtain tolerances specified herein.

Sidewalks shall be set with the upper edge true to line and grade and shall be rigidly held in place by stakes placed on the outside of the forms and set flush with the top edge of the form. The side forms shall not be removed for at least eight (8) hours after concrete finishing has been completed.

24-5 EXTRUDED (SLIP-FORM) CONSTRUCTION

Extrusion machines shall be properly adjusted and in satisfactory operating condition. Prior to placing concrete, contractor shall demonstrate proper adjustment of all screeds and floats by measurements from grade stakes driven to known elevations. Satisfactory operation and adjustment of all propulsion and control equipment, including pre-erected grade and alignment lines, shall be demonstrated to the satisfaction of the Engineer prior to and during the extrusion of concrete.

Concrete used with extruded construction shall be of such consistency that, after extrusion, it will maintain the shape of the curb section without support. Concrete shall be fed to the machine at a uniform rate. The machine shall be operated under sufficient uniform restraint to forward motion to produce a well-compacted mass of concrete free from surface pits. Finishing with a brush application of grout to repair defects will not be permitted.

Unless otherwise indicated in the Contract Documents, extruded concrete curb shall be anchored to existing pavement by the use of dowel reinforcing, an approved adhesive, or both, as directed by the Engineer. If an adhesive is used, the surface shall be thoroughly cleaned prior to its application. The existing pavement shall be cleaned by wire brush, by blast cleaning, or as approved by the Engineer. The cleaned surface shall be free from dust, loose material, or oil. The adhesive shall conform to Section 95-2.03 “Epoxy Resign Adhesive for Bonding New Concrete to Old Concrete”, of the State Specifications.

24-6 EXPANSION JOINTS AND SCORE LINES

In curbs, gutters, and sidewalks, expansion (weakened planed) joints shall be placed at curb returns, top of driveway transitions, light poles, fire hydrants, beginning of drain inlet transition, other fixed objects, or where directed by the engineer. Expansion joints shall be placed every sixty feet (60'). The joint material shall be three-eights inches (⅜”) thick, a minimum of two and one-half inches (2½") deep, and shall conform to Section 10-4 of these Specifications. Expansion joints must be at right angles to the line of the work.

Deep-score lines shall be one and one-half inches (1½") deep, one-eighth inch to one-quarter inch (⅛"- ¼") in width, and placed every twelve feet (12')

with a standard four-foot (4') bite score in between. Expansion joints, score lines, and bite scores shall conform to the Standard Drawings of Section 38 of these Specifications.

When placing new concrete next to the existing concrete, Contractor shall match the score lines of the existing concrete. The score lines spacing may vary and shall be approved by the Engineer prior to placing the new concrete. Without prior approval, new concrete that does not match the score lines of the existing concrete shall be removed and replaced at Contractor's expense.

24-7 FINISHING CONCRETE SURFACES

The top and exposed surface of the concrete shall be finished, whereby the concrete is poured to form or extruded, properly screeded, floated, troweled, edged, and smoothly finished, after which it shall be broomed with a fine hair push broom drawn over the surface transverse to the line of work.

Non-extruded concrete shall be placed in the forms in layers not to exceed six inches (6") and each layer shall be spaded and tamped until the concrete is thoroughly compacted. Surfaces of non-extruded sidewalks shall be finished by double screeding, which shall include working the concrete with a jitterbug until the coarse aggregate is forced down into the body of the concrete and a layer of mortar is thus forced to the top for floating, and troweling.

The top and face of the finished curb shall be true and straight, and the top surface of curbs shall be of uniform width, free from humps, sags, or other irregularities. Grade tolerance of the gutter flow line, lip of gutter, back of curb, and back of sidewalk shall not exceed plus or minus 0.05-foot in any twenty-five foot (25') length from the elevations shown on the plans. When a straightedge 10 feet long is placed on the top of a finished surface, the surface shall not vary more than .02 feet except at grade changes or curves. Contractor shall water test the gutter at the time of construction, and no more than .02 feet of water shall remain shortly after water supply is stopped.

Partial concrete pours shall terminate at an expansion joint or deep-score line. The end of such a partial pour shall be vertical and square ended. If the partial pour is terminated at a deep-score line dowels shall be required.

24-8 CURING OF CONCRETE

Concrete shall be cured in conformance with the provisions set forth in Section 10-6 of these specifications.

24-9 DAMAGE AND REPAIRS

Any damage done to concrete curbs, gutters, sidewalks, or driveways during the progress of the work shall be repaired by Contractor to the satisfaction of the Engineer. Contractor shall protect the work from graffiti and vandalism. Patching of damaged areas shall not be allowed. Damaged or vandalized areas shall be removed and replaced to the nearest score line as directed by the Engineer at Contractor's expense.

24-10 SLOPE AND WIDTH OF SIDEWALKS

Sidewalks and planting strip between curb and sidewalk shall slope uniformly towards the street at a rate of not more than two percent (2%) and not less than one percent (1%). The transverse slope of the finished surface shall be uniform to a degree such that no depressions greater than 0.01-foot are present when tested with a straightedge laid in a direction transverse to the centerline and extending across the width of the sidewalk.

Unless otherwise shown on the Plans or by the Special Provisions, sidewalks shall be four feet six inches (4'-6") wide and three and five eights inches (3⅝") thick.

24-11 DOWEL REINFORCEMENT

Dowel reinforcement shall be installed to join existing concrete to new concrete as directed by the Engineer. A typical dowel installation consists of a No. 4 bar snugly fit or epoxied four to six inches, and spaced between 18 and 24 inches apart, in the existing concrete. The dowels shall conform to Section 21 of these Specifications.

24-12 CURB RAMPS AND DRIVEWAYS

Curb ramps for the physically handicapped and driveways shall be constructed to the dimensions, lines, grades as shown on the plans, and to the draiwngs shown in Section 38.

24-13 CURBS & GUTTER RECONSTRUCTION TO ACCOMMODATE DRIVEWAYS

Where curbs are removed for the purpose of constructing a driveway, the entire curb and gutter shall be removed to the nearest score line and the gutter rebuilt as directed by the Engineer.

24-14 PAYMENT

On unit price proposals, unit prices will be required as set forth in this paragraph. The price bid on each of the following items shall include full

compensation for furnishing all material, labor, and equipment necessary to construct the completed work as shown on the Plans.

1. Concrete Curb and Gutter

Payment for concrete curb and gutter will be at the price bid per lineal foot which will include full compensation for finishing the subgrade, dampening the subgrade, including furnishing the water; furnishing, placing, and later removing necessary forms and form work; furnishing and finishing concrete; curing concrete; furnishing and placing expansion joint material; furnishing and placing dowel reinforcement; and doing such other work as may be necessary to construct the curb and gutter complete in place as shown on the Plans.

If curbs and gutters of more than one type are specified on one job, then separate unit prices will be bid for each type specified.

2. Sidewalks

Payment for sidewalk will be at the price bid per square foot which will include full compensation for finishing the subgrade; dampening the subgrade, including furnishing the water; furnishing, placing, and later removing necessary forms and form work; furnishing concrete; furnishing and placing expansion joint material; finishing the sidewalk surfacing; curing the sidewalk, furnishing and placing dowel reinforcement; and doing such other work as may be necessary to construct the sidewalk as shown on the Plans.

If sidewalk thickness varies on a job, then separate unit prices will be for each thickness specified.

3. Curb Ramps and Driveways

There will be no separate payment for curb ramps and driveways and the cost thereof shall be included in the price bid for sidewalk and/or curb and gutter, unless otherwise indicated in the Special Provisions.

4. Removal of Existing Curb, Gutter, and Sidewalk

Payment for Removal of Existing Curb, Gutter and Sidewalk will be included in the payment for “Clearing” or “Clearing and Grubbing” per Section 13. If there is no item for “Clearing” or “Clearing and Grubbing”, payment for removal of curb, gutter and sidewalk will be at the price bid per lineal foot and will include full compensation for sawcutting, removal of curb, gutter and sidewalk and disposal at an appropriate location and all other effort associated with this item.

Section 25

SANITARY SEWER AND STORM DRAIN MANHOLES

25-1 STANDARD MANHOLES

City standard manholes shall conform to this Section 25, and to the drawings shown in Section 38 of these Specifications. Unless otherwise shown on the Plans or called for in the Special Provisions, the standard manholes shall be used on City work.

25-2 MANHOLE CASTINGS

Castings for manhole heads and manhole covers shall conform to Section 10-25 of these Specifications. Dimensions of manhole heads and covers shall be as shown in Section 38 of these Specifications.

25-3 CONSTRUCTION OF MANHOLES (NEW OR RECONSTRUCTED)

Sanitary sewer and storm drain manholes shall be watertight structures constructed by placing precast concrete sections on a poured or precast concrete base.

1. Precast Concrete Sections

Precast concrete sections shall conform to ASTM C 76 for Class III pipe, or C478 for precast reinforced concrete manhole sections. Manhole barrels, pre-cast bases, cones, flat top lids, and grade rings shall conform to the requirements of ASTM C 478. Lifting holes shall be sealed with plastic sealing compound conforming to Section 10-37 on the side facing the soil and grouted smooth on the interior with an non-metallic, non-shrink grout in conformance with Section 10-58.

2. Cone sections

Shall be constructed of concentric cones except in the following cases: eccentric cones, reduced height cone sections, or flat top lids, in accordance with the following guidelines:

a. Eccentric Cone, Type 3A – Manholes 8-foot deep and greater

b. Eccentric Cone, Type 4 – Manholes for sewer mains 21-inch and larger; storm mains 27-inch diameter and larger

c. Reduced Height Cone – Manholes for pipe depths of 30 inches to 42 inches above crown of largest connecting pipe

d. Flat Top Lid – Manholes for pipe depths of cover of 18 inches to 30 inches above the crown of the largest connecting pipe

3. Concrete Bases, General

Concrete manhole bases may be either cast in place or pre-cast of a type and manufacture as approved by the Engineer. Unless otherwise approved by the Engineer, a minimum of twelve-inches (12") of Type A clean crushed rock conforming to Section 10-14 of these Specifications shall be placed and compacted below the base to provide a firm foundation. If subgrade cannot be compacted using usual construction methods, it will be considered unsuitable material and handled in accordance with Section 14-8 of these Specifications.

Stubs in the base shall match inlet pipe sizes and shall align true with all inlet and outlet pipes (within a tolerance of ± 4 degrees). Reducers will not be permitted. All inlet pipes that enter the manhole at the bases shall be channelized through the manhole with smooth uniform bends toward the direction of flow. In all cases, positive slope for all inlet pipes shall be maintained through the manhole. Two flexible joints shall be provided outside manhole barrel for each pipe connecting to manhole base. Flexible joints may consist of standard bell and spigot connections or flexible connectors as manufactured by Fernco, or equal, and shall be one pipe diameter apart and a minimum of 24-inches apart. Connection to base shall be grouted in place and made watertight.

Manhole bench shall slope upwards from the spring-line of the pipe to the projected level of the crown of the pipe at the manhole wall, or 12 inches above the spring-line, whichever is less. All holes, cracks, and seams shall be grouted flush with the manhole interior using nonshrink nonmetallic grout in accordance with Section 10-6. All internal surfaces shall be constructed with a smooth and uniform finish.

4. Cast-in-place Bases

Cast in place concrete bases shall be Class "A" concrete as set forth in Section 10-5 of these Specifications. Portland Cement shall be Type II, as set forth in Section 10-1 of these Specifications.

5. Sanitary sewer manhole flowlines

Flowlines for main pipe and intersecting mains shall be constructed of vitrified clay pipe liners except if manhole base is placed over the main which is "laid through", in which case flowline material shall be same as the host pipe. Where multiple pipes are joined, the host pipe for purposes of this specification is defined as the downstream pipe. If inlet and outlet pipes are of

different sizes, new flowline pipe size shall match larger pipe size. If host pipe is PVC, Contractor shall apply an epoxy grout bonding agent to ensure pipe flowline adheres to concrete base. If host pipe is not utilized as the flowline, new flowline shall match inlet and outlet pipe elevations and shall extend to inside face of manhole. For host pipes up to 36-inches in diameter, all inlet pipes shall be channelized through the manhole base using clay pipe bends, grouted smooth to prevent the accumulation of debris.

The preformed plastic sealing compound shall conform to Section 10-37 of these Specifications.

Manholes not constructed in streets shall have three (3), six inch (6”) adjusting rings placed between the top of the cone and the bottom of the manhole head. Top of head to be six inches (6”) above the ground surface.

Manholes constructed in streets shall have the top of the cone within twelve inches (12”) to eighteen inches (18”) of final street grade.

6. Precast Bases

Precast concrete bases and their details shall have the prior approval of the Engineer and shall conform to ASTM C 478 and the Standard Drawings. Precast bases shall incorporate a 0.05-foot fall across the base.

Openings in the base that are not connected to a pipe shall be sealed with a watertight plug such as a “Gripper” mechanical wing nut plug by Cherne, or equal, and grouted smooth.

7. Joining Precast Manhole Sections

Preformed plastic sealing compound, in conformance with Section 10-37 of these Specifications, shall be used for joining all precast manhole sections. Prior to application of preformed plastic sealing compound, all joint surfaces shall be thoroughly cleaned. The sealing compound shall be protected from dirt during placing. Ends of the compound shall be joined end-to-end and not joined by overlapping. Sufficient compound shall be used to cause a visual “squeeze-out” of compound material when adjacent sections are seated. Squeeze-out on the inside of the manhole shall be neatly trimmed flush with the inside surface.

All surface irregularities in the interior manhole surface shall be grouted smooth. In areas of high groundwater, the external joint of each barrel section and of the barrel/cone connection shall be sealed with an external rubber sealing sleeve as manufactured by Infi-Shield Inc. or equal. The seal shall be made of neoprene and EPDM rubber and have a minimum thickness of 60 mils. Material shall conform to specifications of ASTM C 923, ASTM C 443, and ASTM

F 477.

Rubber seal shall be attached to manhole using a non hardening butyl rubber mastic applied to the top and bottom of sleeve in accordance with manufacturer's instructions. Seal shall overlap joint a minimum of 3-inches and shall be continuous around the perimeter of the barrel section and overlapped a minimum of 6-inches. "High groundwater" will be considered a location where the groundwater reaches the level of the manhole barrel during a typical rainy season.

8. Manhole Chimneys

For manholes constructed in streets, the height of the manhole chimney shall be between six and three-quarters inches (6-¾") and eighteen inches (18") and in accordance with these guidelines. In general, manhole precast components shall be selected to produce the minimum practical chimney height. In newly constructed streets, chimney height shall be between six and three-quarters inches (6-¾") and thirteen inches (13"). On streets with average cross slopes greater than 3% or streets receiving overlays, chimney height shall be between twelve and eighteen inches.

9. Chimney Collars

There shall be a minimum of eight inches (8") of concrete placed around the head after it is set to the final street grade. The concrete shall extend from two inches (2") below the top of the manhole cone to a point two inches (2") below the pavement grade. After the concrete has hardened, the remaining two-inch (2") space will be filled with asphaltic concrete carefully raked and compacted by approved powered tampers.

10. Concrete Collars (unimproved areas)

For manholes not constructed in streets, three (3), six inch(6") adjusting rings shall be placed between the top of the cone and the bottom of the manhole head. Top of head shall be a minimum of six inches (6") above the ground surface. A concrete collar shall be constructed around head a minimum of six inches (6") wide, from top of cone to top of head.

11. Manhole Location Signs

For manholes not constructed in streets a manhole location sign shall be installed in accordance with these specifications and drawings in Section 38. The manhole location sign shall be placed as shown on the plans or as directed by the Engineer. The use of concrete for mount stabilization will not be allowed. Sign posts shall be driven a minimum of three feet into the undisturbed or compacted soil. If a stable mount cannot be achieved at

minimum sign post mounting heights, greater driven depths must be used in conjunction with longer channel posts. All signs shall be mounted on the wide, or open, side of the channel post. Bolts shall protrude beyond the lock nut by at least a full thread after assembly, and care shall be exercised when tightening the bolts so as not to create a "Dimple" in the aluminum sign.

12. Manhole Connections

Connections to an existing manhole shall be made using a "Core-Bore" technique or other method approved by the Engineer. All connections to sanitary sewer manholes shall be made using a resilient connector conforming to ASTM C 923, as made by Kor-N-Seal, A-LOK, or approved equal, and shall be watertight. For connections not part of the base, the annular space between the resilient connector and the manhole wall shall be filled with a flexible material approved by the manufacturer.

13. Manhole Testing

In areas where ground water is expected, including but not limited to Pocket Area, Willow Creek, North Natomas and areas close to the rivers, the following shall apply: All sanitary sewer manholes shall be tested and shall meet the requirements of ASTM C 1244 prior to acceptance. Manholes shall be tested prior to backfill. If the manhole fails the test at this time, the manhole shall be repaired by Contractor and retested. This procedure shall be repeated until the manhole passes the required test. The Engineer may also require the manholes to be tested using this method after backfilling if he has reason to suspect that the manhole has been disturbed during the backfilling operation, or at other times during construction of the improvements being installed as part of the development.

In order to prepare the manhole for this test, all lift holes shall be plugged and all pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn in to the manhole.

The test procedure shall be as follows:

a. The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.

b. A vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 inches of mercury.

c. The manhole shall pass if the time for the vacuum to drop from 10

inches of mercury meets or exceeds the values indicated in Table 1 of ASTM C 1244.

The vacuum gauge used for this test shall be supplied by Contractor, and shall have maximum scale division of 0.1 psi, and shall have an accuracy of 0.04 psi. Accuracy and calibration of the gauge shall be certified by a reliable testing firm at six month intervals, or when requested by the Engineer. In addition, the Engineer may compare Contractor's gauge with a City owned gauge at any time. During testing, the vacuum gauge shall be located such that it is readily visible.

Surface restoration shall be in accordance with the section of the General Requirements entitled "Pavement Cutting and Surface Restoration" and shall be paid for under this item of the contract. Pavement cutting shall be perpendicular and parallel to the centerline of the road.

25-4 ADJUSTING MANHOLE HEADS

Existing manholes in streets shall be adjusted to grade when shown on the Plans or called for in the Special Provisions.

Manhole heads shall be raised by wiring the frame to two 2" X 4"'s of sufficient length to span the excavation. The space between the old manhole and the bottom of the head will then be filled with a cement mortar, conforming to Section 10-37 of these Specifications, poured against a suitable form on the inside of the structure. Concrete will then be poured around the head to a point two inches (2") below the top of the head. Concrete shall be Class "A" concrete, conforming to Section 10-5 of these Specifications. After the concrete has hardened, the remaining two-inch (2") space will be filled with asphaltic concrete carefully raked and compacted by approved powered tampers.

When adjusting a manhole head will result in less than six and three-quarters inches (6¾"), or more than eighteen inches (18") between the top of the cone and final street grade, the cone shall be removed and forty-eight inch or sixty inch (48" or 60") diameter manhole barrels shall be added or removed so that the top of the cone is within six and three-quarters to eighteen inches (6¾" to 18") of final street grade.

Manhole heads that need to be lowered shall be removed as directed by the Engineer to a depth that will allow the manhole to be reconstructed with the proper cone and to the lines and elevation shown on the Plans. Manholes that require lowering shall be indicated on the Plans or Special Provisions as manholes to reconstruct. Manholes that require raising shall be indicated on the Plans or Special Provisions as manholes to raise.

When manholes are required to be adjusted in a street that is open to traffic, all work involved in adjusting shall be fully completed during the work day so as to permit full use by traffic at 4 p.m. of the same day. Should Contractor be unable to fully complete a manhole by the above time, a temporary asphaltic cutback surface shall be placed in any depression so as to provide a smooth traveling surface until the manhole can be fully completed. The use of barricades around incomplete manholes during night hours in not permitted.

25-5 FLUSHER BRANCHES

Flusher branches are no longer permitted for new construction.

25-6 PAYMENT FOR MANHOLES

On unit price Proposals, payment for manholes shall be at the unit price bid per manhole. This price shall include full compensation for all necessary excavation, form work, pre-cast and cast-in-place concrete, furnishing all other material and doing all work necessary to construct the manholes complete in place to the dimensions shown on the Plans or in these Specifications. If shown in the list of bid quantities, the Proposal may require separate unit prices on standard manholes of various depths but if only a single item is shown for standard manholes, then manholes of all depths will be included and shall be paid for at the price bid.

Special manholes, that is, those which may be shown on the Plans which are separately detailed and do not conform to standard manhole details shall be paid for under a separate item or items of the Proposal. The price bid per special manhole shall include full compensation for doing all work and furnishing all material necessary to construct the special manhole as shown on the Plans.

Payment for raising or reconstructing manholes shall be at a unit price bid, which shall include full compensation for doing all work and furnishing all material necessary to raise or reconstruct the manholes as shown on Plans or Special Provisions. On overlay projects, raising of cones will be considered as Extra Work and shall be paid for according to the terms and conditions of Section 4-6 of these Specifications.

Section 26

LAYING SEWER AND DRAIN PIPE

26-1 EXCAVATION

Trench excavation for all sewer and drain pipe shall conform to standard drawing T- 80 and the following requirements

Table 26-1.1 – Minimum and Maximum Trench Width (TW) @ Top of Drainage Pipe		
Pipe Inside Diameter (inches)	**(Min. Trench Width) Pipe Outside Diameter Plus (inches)**	**(Max. Trench Width) Pipe Outside Diameter Plus (inches)**
33 or less	12	16
36 or greater	12	24

Table 26-1.2 – Minimum and Maximum Trench Width (TW) @ Top of Sewer Pipe		
Pipe Inside Diameter (inches)	**(Min. Trench Width) Pipe Outside Diameter Plus (inches)**	**(Max. Trench Width) Pipe Outside Diameter Plus (inches)**
Flexible Pipes		
15 or less	12	24
18 or greater	12	36
Vitrified Clay Pipe		
All Pipe Sizes	24	No Limit

Contractor shall substitute stronger pipe or increased bedding and backfill requirements, subject to approval of the Engineer, **at no extra cost**, if the specified trench width is exceeded by the fault of Contractor. If field conditions do not allow for a trench within the above limitations, at no fault of Contractor, as determined by the Engineer, alternative bedding and backfill requirements shall be incorporated as directed by the Engineer and added cost will be reimbursed as extra work.

At a minimum, the depth of excavation shall be three inches (3") below the outside diameter of the barrel or one inch (1") below the outside diameter of the bell, whichever is deeper.

No tunnels shall be allowed, except when, in the opinion of the Engineer, it is impossible or impracticable to prevent tunneling.

Contractor shall comply with the requirements set forth in paragraph 6-8 "TRENCH SAFETY PLANS", Section 6.

Trenches shall be excavated only as far in advance of pipe laying as can be backfilled in the same day. The maximum total length of open trench shall be five hundred feet (500'). Under no condition shall more than fifty feet (50') of trench remain open overnight. A trench in an existing roadway which is not to be regraded is defined as open until backfilled and paved with temporary surfacing, ready for traffic. Other trenches are defined as being open until backfilled to subgrade or the original ground line. Temporary surfacing is defined in 26-11, "Repaving Trenches".

Contractor, at his/her option, may elect to cut existing sewer services that are encountered or tunnel under them. All sewer services cut by trench excavation shall be replaced before nightfall of the same day in accordance with Standard Drawing S-230, Section 38 of the Standard Specifications. No additional compensation will be paid Contractor for any sewer services purposely or accidentally cut and repaired

26-2 DEWATERING

Contractor shall be responsible for the control, removal, and disposal of any groundwater that may be encountered in the course of excavating and backfilling trenches or placing pipe. Whenever water or over-saturated soil conditions exist which may interfere with proper installation, trenches shall be dewatered to a level twelve inches (12") below the trench bottom before placement of any pipe or material. Unless approved in writing by the Engineer, groundwater and/or water from trench dewatering shall be free of sediment and other construction materials before entering the City storm drain system. A dewatering plan, including a water de-sedimentation plan, shall be submitted

to the Engineer for approval prior to any pumping or discharge of water to the City storm drain system.

For projects located within the combined system the procedures outlined in paragraph 16-1, “Ground Water Discharges” shall be followed.

26-3 HEALTH AND SAFETY

Contractor is warned that existing sanitary sewers and appurtenances have been exposed to sewage and industrial wastes. These facilities shall therefore be considered contaminated with disease-causing organisms. Personnel in contact with contaminated facilities, debris, wastewater, or similar items shall be advised by Contractor of the necessary precautions that must be taken to prevent infection. It is Contractor's responsibility to urge his personnel to observe a strict regime of proper hygienic precautions, including any inoculations recommended by the local public health officer.

Because of the danger of solvents, gasoline, and other hazardous material in the existing sewers or drains, these areas shall be considered hazardous to open flame, sparks, or unventilated occupancy. Contractor shall be aware of these dangers and shall take the necessary measures to assure his personnel observe proper safety precautions when working in these facilities.

Contractor shall not allow any wastewater to discharge from sanitary sewage collection systems onto adjacent lands or waters. In case of accidental discharge, Contractor at his/her expense shall be responsible for containment, immediate cleanup and disposal to the full satisfaction of the Engineer. Where containment is not possible, Contractor at his/her expense shall provide adequate disinfection as directed by the Engineer or jurisdictional agency. If, in the opinion of the Engineer, Contractor fails to adequately follow the above guidelines, the City will make arrangements to have the work done by others, and have the cost deducted from amounts owing to Contractor.

26-4 PIPE MATERIALS/TYPES

Sewer and drain pipe shall conform to Sections 10, 26, and 38. The type, class and size of pipe are generally shown on the Plans and/or in the list of quantities contained within the Proposal.

1. Continuous types

Only one type of pipe shall be used between manholes with the exception of changing from Class III to Class IV RCP as long as the pipes are completely compatible with no modifications and both classes of pipe come from the same manufacturer and are of the same manufacturing process.

Prior to the start of work, Contractor shall submit a plan showing types of pipe and locations to the Engineer. Any deviation in the plan thereafter shall not be allowed unless approved in advance by the Engineer.

2. Acceptable Sewer and Combined Sewer Pipe Types

Sewer pipe types shall be as shown on the Plans or as noted in the Special Provisions and shall be of one of the following types unless otherwise noted: Vitreous Clay Pipe (VCP), Closed Profile Polyvinyl Chloride (CPPVC), Polyvinyl chloride (PVC), Centrifugally Cast Fiberglass-reinforced Polyester Resin (CCFPR), or HDPE Solid Wall Fusion Jointed.

3. Acceptable Drainage Pipe Types

Drainage pipe types shall be as shown on the Plans or as noted in the Special Provisions and shall be of one of the following types unless otherwise noted : Reinforced Concrete Pipe (RCP) Class III or Class IV, Closed Profile Polyvinyl Chloride (CPPVC), Polyvinyl Chloride (PVC), Centrifugally Cast Fiberglass-reinforced Polyester Resin (CCFPR), or HDPE Solid Wall Fusion Jointed.

26-5 LAYING PIPE

Laying sewer and drain pipe shall conform to Sections 10, 14, 26, and 38. Pipe shall be placed in accordance with the Plans, Special Provisions, manufacturer's recommendations, and as directed by the Engineer.

1. Saw-cutting over existing pipelines

Prior to saw-cutting, Contractor shall mark the exact location of the existing pipeline on the pavement using a ferreting device or equivalent.

2. Manhole connections

All connections to the manholes not cast as part of the manhole base shall be made by use of a coring machine. The annular space between the outside of the pipe and the manhole shall be sealed by using a flexible annular space filler such as "Kor n' Seal Cavity O-Ring" by NPC Inc. or approved equal.

3. Bedding

Bedding shall be Type A clean crushed rock and shall be placed in accordance with these Standard Specifications and the pipe manufacturer's recommendations. The bedding material shall provide uniform support of the

full length of the pipe to a width of at least fifty percent (50%) of the pipe internal diameter. Initial backfill shall be brought to uniformity on each side of the pipe to prevent distortion or displacement. Consolidation under pipe haunches shall be accomplished by shovel slicing or rodding to assure all voids are filled. Remaining initial backfill shall be placed in lifts and then consolidated with vibratory equipment to insure proper compaction. Ponding and jetting methods of achieving compaction will not be allowed.

4. Special foundation treatment

Whenever the bottom of the trench is soft or rocky, or, in the opinion of the Engineer, otherwise unsuitable as a foundation for pipe bedding, the unsuitable material shall be removed to a minimum depth of six inches (6") and replaced with Type D clean crushed rock, "pit run" or cobbles or any combination thereof. Pit run shall have a minimum sand content of 25 and shall be compacted to 90% relative compaction. Cobbles shall be a maximum of 12" and a minimum of 4".

As an alternate to, or in addition to, the bedding materials specified above, the Engineer may direct Contractor to furnish and place geotextile fabric below the bedding materials. The geotextile material shall be a high modulus woven fabric, and shall be inert to commonly encountered chemicals, rot-proof, and resistant to ultraviolet light, insects and rodents. The geotextile fabric shall have a minimum grab tensil strength of two hundred pounds (200 lbs.) in any direction as measured in accordance with ASTM D 4632, a Mullen burst strength of at least four hundred pounds per square inch (400 psi) per square inch per ASTM D 3786, and an Equivalent Opening Size no larger than the U.S. Standard Sieve Number 50 as determined by ASTM D 4751. Geotextile fabric shall be Mirafi 600X or equal. Each roll of fabric shall be handled and placed in accordance with the manufacturer's recommendations. Furnishing and placing of geotextile fabric will be paid for as extra work as defined in 4-6, "Extra Work, Force Account".

If material more than twelve inches (12") below the typical trench bottom is ordered removed by the Engineer, the excavation below that point and the imported material required to backfill the trench to that elevation will be paid as extra work as provided in Section 4 unless otherwise specified in the Special Provisions. Before excavation of the pipe trench in fill areas of roadway embankments, the fill area or embankment shall be completed to a height above the pipe invert grade line of not less than twice the internal pipe diameter or to final fill or embankment subgrade, whichever is lower, but in no case less than twelve inches (12") above the top of the pipe. Such embankment shall be compacted to a minimum relative compaction of ninety percent (90%) for a distance on each side of the pipe equal to a least two (2) pipe diameters. The remainder of the embankment shall be compacted to the minimum relative compaction specified elsewhere in these Specifications for the type of

construction being done, or as specified in the Special Provisions or on the Plans.

5. Trench backfill

a. Initial backfill

Initial Backfill shall be provided by Contractor and shall be placed in accordance with these Standard Specifications and the pipe manufacturer's recommendations. Initial backfill shall be the material between the top of the bedding material and six inches (6") above the top of the bell or barrel if the pipe does not have a bell. Unless otherwise indicated in the Special Provisions, initial backfill shall be granular material consisting of imported Type A, or Type B clean crushed rock, conforming to the requirements of 10-17, "Clean Crushed Rock" of these Standard Specifications.

Initial backfill shall be placed immediately after pipe joints have been completed, inspected and passed by the Engineer. The material shall be carefully placed so as not to disturb or damage the pipe, and shall be brought up evenly on both sides. Initial backfill material shall be placed in layers not exceeding eight inches (8") in depth before compaction at or near optimum moisture content. Contractor shall place initial backfill–by shovel slicing, tamping, and/or vibratory compaction in order to produce firmly compacted material under the haunches of the pipe. Compaction shall be by mechanical pneumatic or vibratory compaction equipment approved by the Engineer. Care shall be used to avoid dislodging the pipe. No wedging or blocking of the pipe will be permitted. Ponding and jetting methods of achieving compaction shall not be allowed.

When the bedding material for the pipe consists of crushed rock, sand shall not be used as initial backfill material.

b. Trench backfill

Unless otherwise approved by Engineer, trench backfill shall be provided, and placed to grade by Contractor, in accordance with these Standard Specifications and the pipe manufacturer's recommendations. Trench backfill shall be the material between the initial backfill and the top of trench or subgrade. The material for trench backfill may be of job excavated, native material provided that such material is free of organic materials or other unsuitable materials as determined by the Engineer that may cause voids or depressions to develop during or after placement of the backfill. Rocks, stones and solid earth chunks exceeding three inches (3") in greatest dimension shall be removed from

the trench backfill material.

Trench backfill material shall be placed in layers not exceeding eight inches (8”) in depth before compaction at or near optimum moisture content. Until the total backfill above the top of the pipe exceeds three feet (3’), machine-placed backfill material shall not be allowed to “freefall” more than two feet (2’).

Unless otherwise shown on the Plans or specified in the Special Provisions, compaction of all backfill material shall be by mechanical pneumatic or vibratory compaction equipment. Minimum relative compaction of the trench backfill material shall be ninety percent (90%) when tested according to ASTM D 1557, except that the top six inches (6”) below the subgrade shall be compacted to a relative compaction of ninety-five percent (95%). Trenches in easements outside the street rights-of-way may be compacted to ninety percent (90%) relative compaction throughout the depth. Compaction testing will be performed by the Engineer and the cost thereof will be borne by the City, except that retests of areas which fail to meet the required compaction shall be charged to Contractor and deducted from any payment due Contractor for work performed under the terms of the Proposal.

Ponding and jetting methods of achieving compaction shall not be allowed.

Upon written request by Contractor, and upon approval of the Engineer, the trench may completely backfilled to the bottom of the AC pavement with slurry cement or Control Density Fill backfill provided in conformance with 10-16, “Controlled Density Fill”. For pipes and conduits two inches (2”) and smaller, bedding, initial backfill, and trench backfill shall be slurry cement backfilled, placed to within one and one-half inches (1½”) of finished grade.

c. Unsuitable material/import

If the portion of existing, native material removed in the excavation of trenches to be used for backfill is determined by the Engineer to be unsuitable for backfill not due to any action or negligence of Contractor nor because native material is inadequately protected from inclement weather, Contractor shall remove unsuitable material and import and place suitable backfill material.

The cost for this item shall be paid separately and it includes all associated costs including hauling away unsuitable material, disposal, and transportation and material cost for import material, except that

the cost of placing and compacting import material is not included in this item but is included in the item for placing pipe. The quantity of "Unsuitable Material/Import" and the cost thereof shall not include that native material which is removed from the trench in the area wherein the pipe bedding, initial backfill, aggregate base course, asphalt concrete or the pipe itself is placed. Such material, whether unsuitable or not, and its replacement material of whatever kind shall be included in the cost of the pipe.

The quantity of unsuitable material/import shown on the Proposal is for bidding purposes only. The unit price indicated will not be adjusted because the actual quantity varies from the quantity shown on the Proposal. The cost for replacing unsuitable material rendered unsuitable due to any act or omission of Contractor or due to inclement weather shall be borne by Contractor and there will be no compensation therefore.

Trench import material shall be placed in accordance with “Trench Backfill” herein.

d. Unstable trench

Contractor may assume that trench side walls may be maintained, without shoring, at a slope of three-quarter vertical to one horizontal (3/4:1). When trench side slopes are not able to be maintained at this slope due to unstable materials or excessively high ground water or both, as determined by the Engineer, and not based on improper or insufficient dewatering nor because of inadequate shoring and not due to any action or negligence of Contractor, the trench shall be considered an unstable trench. When such unstable trenches are encountered, as defined herein, additional effort and materials will be paid for as extra work, as described in Section 4, unless otherwise directed in the Special Provisions.

In areas of trench determined to be unstable, flexible pipe may be used in sizes up to nominal 24-inch diameter. Larger sizes up to and including 42-inch diameter may only be used if submitted with an engineered design for trench details for normal installation and for unstable trench conditions, stamped and signed by an engineer registered in the State of California and with prior written approval by the Engineer. Additional trench width shall also be provided in accordance with manufacturer’s recommendations for installation in unstable conditions.

When placing flexible pipes in unstable trench locations, Contractor shall perform that work necessary to create a stable trench. All work shall conform to pipe manufacturer's recommendations, to ASTM D 2321, and the special provisions. At a minimum, vertical, stable trench walls shall be maintained to 12 inches above the top of the pipe and additional trench width shall be excavated, in accordance with pipe manufacturer's recommendations, to a point 12 inches above the top of the pipe, and replaced with Type A clean crushed rock. Initial backfill shall be brought to uniformity on each side of the pipe to prevent distortion or displacement. Consolidation under pipe haunches shall be accomplished by shovel slicing or rodding to assure all voids are filled. Remaining initial backfill shall be placed in lifts and then consolidated with vibratory equipment to insure proper compaction.

e. Precast manhole bases

Where pre-cast manhole bases are allowed, Contractor shall install a flexible joint (bell and spigot or flexible coupling) a horizontal distance of 18-inches to 24-inches from the wall of the manhole.

f. Existing pipe

Existing pipe shall be removed at such places as shown on the Plans or as designated by the Engineer in accordance with Section 13 and the Special Provisions. All removed pipes or portions thereof shall be disposed of by Contractor.

g. Pipe laying, grade and alignment:

After the trench for pipe has been brought to the proper line and grade, the pipe shall be laid in the following manner:

Pipe laying shall proceed upgrade with the bell or groove end of the pipe placed upstream. Each section of pipe shall be laid true to line and grade and in such a manner as to form a watertight, concentric joint with the adjoining pipe. The interior of the pipe shall be cleared of all dirt and debris as the work progresses. Pipe shall not be laid when the condition of the trench or the weather is unsuitable, in the opinion of the Engineer, because of water or mud which may interfere with proper jointing. All open ends of pipe and fittings shall be adequately and securely closed whenever the work is discontinued.

Circular reinforced concrete pipe with elliptical reinforcement shall be placed with the minor axis of the reinforcement in a vertical position.

The pipe shall be laid in strict conformity to the prescribed line and grade–and each pipe length checked to the top grade line. Three (3) consecutive points on the same grade of slope shall be used at all times to detect any variation from a straight grade. In case any discrepancy exists, the work shall be stopped and the discrepancy immediately reported to the Engineer. In addition, when requested by the Engineer, a string line shall be used in the bottom of the trench to insure a straight grade and alignment of the pipe.

At the option of Contractor, grade and alignment controlled by a laser beam system which complies with OSHA requirements may be used. The laser system shall have good visibility when used with suitable target material. The laser system must be of the self-leveling type so that the laser beam is automatically compensated for minute grade disturbances.

The laser system must also have an early warning system that instantly warns the pipe layer when the laser is off grade. The laser system is to be provided by Contractor and shall have a minimum accuracy of ±0.01 foot per one hundred feet (100') on line; and a minimum visible range of one thousand feet (1000').

Grade tolerance of the flow line of pipe shall not exceed plus or minus 0.05 feet. In addition, the total variation plus and minus from flow line grade shall not exceed 0.05 feet in any twenty-five foot (25') length. Both joint surfaces shall be cleaned before the joints are made. Care shall be used to prevent chipping or cracking of either end of the pipe during installation.

h. Moveable trench support:

When using movable trench support, care should be exercised not to disturb the pipe location, jointing or its embedment. Removal of any trench protection below the top of the pipe and within two and one-half (2½) pipe diameters of each side of the pipe shall be prohibited after the pipe embedment has been placed and compacted. Movable trench supports shall only be used in either wide trench construction where supports extend below the top of the pipe or on a shelf above the pipe with the pipe installed in a narrow, vertical wall subditch. Any voids left in the trench wall or embedment material by support removal shall be carefully filled with bedding material which shall be adequately compacted. Removal of bracing between sheeting shall only be done where backfilling proceeds and bracing is removed in a manner that does not relax trench support. When advancing trench boxes or shield, there

shall be no longitudinal pipe movement or disjointing.

i. Protecting existing sewers and drains:

Mortar or brick plugs shall be installed and maintained in existing manholes as directed by the Engineer in order to prevent surface water, ground water, and debris from entering existing sewer or drain systems during construction. Inflatable plugs will not be permitted. Care shall be exercised in installing plugs to avoid interrupting service. Plugs shall be removed upon completion of testing as described in 26-10.

j. Installation procedures for HDPE solid wall pipe:

i. Handling:

Pipe, fittings and accessories shall be carefully inspected before and after installation and those found defective shall be rejected. Pipe and fittings shall be free from fins and burrs. Before being placed in position, pipe, fittings, and accessories shall be cleaned, and shall be maintained in a clean condition. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe, fittings or any other material be dropped or dumped into trenches.

ii. Joint welding:

Sections of polyethylene pipe shall be joined into continuous lengths on the job site above ground. The joining method shall be the thermal butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. Fusion equipment used in the joining procedure shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, fusion temperature, alignment, and fusion pressure.

Butt fusion shall conform to ASTM D 2657 and pipe manufacturer's criteria for the type of joining. Butt fusion joining shall be 100% efficient and shall provide a joint strength equal to or better than the tensile strength of the adjacent pipe.

Fusion equipment shall be operated only by technicians who have been certified by the pipe manufacturer, and who have a minimum of two (2) years of experience fusion welding pipelines of the diameters used in this project. The technician's experience shall be documented in the HDPE pipeline submittal.

iii. Installation of pipe:

All pipe shall be carefully placed and supported at the proper lines and grades and all pipe flanges shall be set level, plumb, and aligned. All flanged fittings shall be true and perpendicular to the axis of the pipe. All bolt holes in flanges shall straddle vertical centerline of pipes. Piping shall be installed without springing or forcing the pipe in a manner which would set up stresses in the pipe, valves, or connected equipment.

26-6 SEWER AND DRAIN SERVICES

Sewer services shall be installed at the points shown on the Plans. All sewer services shall be installed perpendicular to the main unless otherwise shown on the plans or approved by the Engineer. All services, where not connected shall be closed with a stopper or plug of proper size. Where services are carried from the main line to the property line, stoppers shall be placed in the ends of the pipe. Before backfilling, a 2" X 2" redwood post shall be placed with its lower end at the end of the pipe, and its upper end extended vertically twelve inches (12") above the street grade. Where grade of sewer permits, the flow line of a sewer service at the property line shall be four feet (4') below the street grade.

In addition, where curb and gutter exists, or is to be constructed concurrently with sewer facilities, the location of each sewer service shall be permanently indicated by inscribing the letter "S" two inches (2") in height in the curb directly above the line when the service is perpendicular to the street centerline. Otherwise, the "S" mark for skewed or angling services shall be placed at a right angle to the end of the service. When sewer services are installed in an existing street, the curb mark shall be placed at the time the service is installed to assure proper location.

In new subdivisions when the sewer services are installed before the curb is constructed, it shall be Contractor's responsibility to establish the exact location of each sewer service and to furnish this information to the Engineer. In all alley improvements where a main is being replaced, all services to that main will be replaced and a clean-out installed as indicated on the Plans or specified in the Special Provisions.

26-7 DRAIN AND DITCH BOX LEADS

RCP or PVC ditch box leads and fittings shall be constructed to the details on the Plans, the Special Provisions and shall conform to Sections 10 and 14. Where noted on the plans, C900 class 100 PVC pipe shall be used.

All connections of drain leads to the maintenance holes not cast as part of the maintenance hole base shall be made by use of a coring machine. The annular space between the outside of the pipe and the maintenance hole shall be sealed by using a flexible annular space filler such as "Kor n' Seal Cavity O-Ring" by NPC Inc. or approved equal.

26-8 PIPE JOINTS

All pipes shall have elastomeric gasket joints providing a water tight seal. Joints in pipe shall conform to section 10-19of these Specifications.

26-9 PROTECTIVE COVERING

Whenever sewer or drain pipe is laid in trenches at such an elevation that the top of the pipe bell is less than eighteen inches (18”) below sub-grade of the street, the pipe must be covered with a protective covering as shown in Section 38, Drawing S-250, of these Specifications. The concrete used in making the covering shall conform to Portland Cement concrete Class “A”, as denoted in these Specifications. As an alternate, C900, C905, or ductile iron pipe with controlled density fill placed as shown in Section 38, Drawing S-250 may be used, as approved by the Engineer.

26-10 TESTING OF PIPE

After laying, backfilling, and compacting pipes, <u>and before placing any road base or asphalt,</u> sewer or drain lines and force mains shall be inspected and tested for obstructions and leakage, unless otherwise specified, as follows.

1. Test for obstructions

All lines or mains shall be cleaned by balling, and any obstructions or irregularities shall be removed or repaired by Contractor. All testing, cleaning and repairing shall be done to the satisfaction of the Engineer. Water used in cleaning shall not be permitted to enter existing sewer systems. Contractor shall provide all necessary labor, materials, tools and equipment for the tests and shall dispose of all waste, including water at their own expense.

2. Test for leakage

All or any section of constructed pipe, including sewer and drain lines and force mains which the Engineer may select, shall be tested by Contractor by either of the methods described in (3) and (4). An exception to this requirement is HDPE solid wall pipe where only a hydrostatic test for leakage is required as recommended by the manufacturer. For sections of pipe between

manholes, no leakage is acceptable for solid wall HDPE.

3. Air test for leakage

The length of line tested at any one time shall be limited to the length between adjacent manholes. The test section shall be pressurized to 3.5 psi and shall be held above 3.0 psi for not less than five (5) minutes. Air shall be added if necessary to keep the pressure above 3.0 psi. At the end of this five (5) minute saturation period, note the pressure (must be 3.0 psi minimum) and begin the timed period. If the pressure drops 0.5 psi in less than the time given in the following table, the section of pipe shall not have passed the test.

Table 2610.1 - Minimum Time for Prescribed Pressure Drop

Pipe Diameter (inches)	Time Span (seconds)
4	122
6	184
8	245
10	306
12	367
15	460

For larger diameter pipe use the following formula: Minimum time in seconds = 370 X pipe diameter in feet. If the time for the pressure to drop 0.5 psi is less than the time given in the table, the leakage shall be repaired and the line retested until found satisfactory to the Engineer.

When the prevailing ground water is above the pipe being tested, air pressure shall be increased 0.43 psi for each foot the water table is above the invert of the pipe.

House sewer services shall be considered part of the lateral to which they are connected and no adjustment of test time shall be allowed to compensate for the smaller diameter of the house services.

The pressure gauge used shall be supplied by Contractor, shall have minimum divisions of 0.10 psi, and shall have an accuracy of 0.04 psi. Accuracy and calibration of the gauge shall be certified by a reliable testing firm at six-month intervals, or when requested by the Engineer.

When the pipes are air tested, all manholes shall be tested by filling with water to the top of the manhole dome. If any appreciable loss of water, as determined by the Engineer, is found, the manhole shall be considered defective and suitable repairs shall be made.

4. Hydrostatic test for leakage

A section of line shall be prepared for testing by plugging the upper side of the downstream manhole and all openings in the upstream manhole except the downstream opening. Where grades are slight, two or more sections between manholes may be tested at once. Where grades are steep and excessive heads would result by testing from one manhole to another, test tees, the same size as the main, shall be installed at intermediate points so the maximum head on any section under test shall not exceed twelve feet (12').

A section of line prepared as above shall be tested by filling with water to an elevation five feet (5') above the top of pipe at the upstream end of the test section, or five feet (5') above the existing ground water elevation, whichever is greater. The water shall be introduced into the test section at least four (4) hours in advance of the official test period to allow the pipe and joint material to become saturated with water. The water level shall then again be brought to the five foot (5') mark. At the beginning of the test, the elevation of the water in the upper manhole shall be carefully measured from a point on the manhole rim or test tee. After a period of four (4) hours, or less, with the approval of the Engineer, the water elevation shall be measured from the same point on the manhole rim and the loss of water during the test period calculated. If this calculation is difficult, enough water shall be measured into the upper manhole to restore the water to the level existing at the beginning of the test, and the amount added taken as the total leakage.

The allowable leakage in the test section shall not exceed five hundred (500) gallons per mile per day per inch diameter of pipe tested at the five foot (5') test head, unless otherwise specified. If it is necessary or desirable to increase the test head above five feet (5'), the allowable leakage will be increased at the daily rate of eighty (80) gallons for each foot of increase in head.

Test sections showing leakage in excess of that allowed shall be repaired or reconstructed as necessary to reduce the leakage to that specified above. Water used in testing will not be permitted to enter existing sewer systems.

5. Testing for deflection

For all flexible sewer and drain pipes and fittings, the minimum pipe stiffness ($F/\Delta y$) at 5% deflection shall be 46 PSI in accordance with ASTM D

2412, "External Loading Properties of Plastic Pipe by Parallel-Plate Loading." A deflection test shall be made by Contractor upon completion and acceptance by the Engineer of all backfill operations and prior to the placement of the finished surface, if any. Deflection testing shall be conducted no sooner than 96 hours following completion and acceptance of all backfill operations, unless otherwise approved by the Engineer.

The deflection testing shall be witnessed by the Engineer and shall be conducted by Contractor's forces and performed at the expense of Contractor. One-hundred percent (100%) of all flexible sewer and drain pipe mainline installed shall be deflection tested for excessive deflection using a pre-sized, rigid mandrel or "Go-No-Go" device 5% smaller than the average inside diameter of the pipe as approved by the Engineer. Mandrel tests may be performed by the City after a 6 month period of time at which time a maximum deflection of 7½% from the base internal diameter, as specified in ASTM D 3034 and ASTM D 2680 for PVC or ABS gravity sewer pipe, respectively will be allowed. The mandrel used shall be the PHOS PVC Sewer Pipe Deflection Gauge or other deflection gauge approved by the Engineer.

The mandrel shall be drawn through the pipe using only the force that can be exerted by one individual on the end of a rope, using no mechanical advantage. Under no conditions shall the mandrel device be attached to the cleaning ball.

Pipe which does not pass all specified mandrel tests shall be replaced at Contractor's expense. Re-rounding or other attempts to reduce deflection beyond the allowable shall not be acceptable. All re-tests for deflection shall be made at the expense of Contractor.

6. Closed Circuit T.V. inspection

a. Capital Improvement Projects

Sewer and drainage pipe for Capital Improvement Projects (CIPs) shall be inspected by the City's Field Services Division utilizing a Closed Circuit T.V. camera (CCTV). Request for T.V. inspection shall be submitted to the Engineer no less than three working days prior to the need for the inspection. Pipe shall be thoroughly cleaned of all debris using sewer ball or other approved method within 48 hours of requested T.V. inspection. T.V. inspections shall be made prior to final paving and after manhole channels have been completed. Cost of T.V. inspection will be borne by City unless pipe is not properly cleaned and/or manhole channels are not completed prior to requested T.V. inspection, wherein cost of subsequent T.V. inspection shall be

borne by Contractor.

b. Development Projects

Sewer and Drainage pipe shall be CCTV inspected by Contractor on all development projects. The Developer shall be responsible for all cost for this inspection and shall comply with Section 26-12 Procedures for T.V. Inspection of Piping Systems.

26-11 REPAVING TRENCHES

Certain construction projects may require the cutting of existing pavements, the laying of pipe, backfilling and then repaving of the cut pavement. When the trench is in an existing paved area, the pavement shall be sawed or scored and broken ahead of the trenching operations. Before sawcutting the pavement, Contractor shall use a ferreting device or equivalent to determine the exact location of the existing pipes and mark them on the pavement. The proper tools and equipment shall be used in marking and breaking so that the pavement will be cut accurately to a neat and parallel line six inches (6") wider on each side than the trench width required. All cuts in Portland Cement concrete pavements shall be sawcut with approved equipment.

Where the edge of the trench is within two (2) feet of existing curb and gutter or pavement edge, the asphalt concrete pavement between the trench and the curb or pavement edge shall be removed and replaced.

Contractor shall restore all surfaces which have been removed or damaged by Contractor in kind, using the same material as existing, unless otherwise noted on the Plans or in the Special Provisions. The repaving is to be done in such a manner to, as closely as possible, replace the cut pavement with a similar type and an equal or greater structural section. In any case, where a trench is cut in existing pavement, or as directed by the Engineer, a temporary asphaltic plant mix cut back surface not less than two inches (2") in thickness shall be placed immediately after the top backfill has been completed and compacted and maintained at a level surface until removal. Temporary surfacing material shall be removed just prior to placing the permanent surfacing material. Payment for temporary paving shall be included in the price bid per foot of pipe placed, unless otherwise set forth in the Special Provisions.

1. Asphalt concrete replacement

The structural section shall be no less than four inches (4") of asphaltic concrete over twelve inches (12") of Class 2 aggregate base. Asphalt concrete

shall be Type B, medium, and its placement shall conform to the requirements of Section 22 of these Standard Specifications. Class 2 aggregate base and its placement shall conform to the requirements of Sections 10-7 and 17.

2. Portland cement concrete replacement

Restoration of existing portland cement concrete pavement shall consist of at least six (6) inches of portland cement concrete and shall conform to the requirements of Sections 10 and 19. Concrete surfaces to be replaced shall be colorized, as necessary, to match existing adjacent concrete color by the addition of Lamp Black coloring agent. Contractor shall submit concrete mix design for approval including a proposed proportion of coloring agent appropriate to the shade of adjacent concrete. Where entire alley requires replacement, concrete shall not include coloring agent, unless directed by the Engineer.

3. Unpaved surfaces

Unless otherwise provided on the Plans or in the Special Provisions, pipeline trenches in unpaved portions of street rights-of-way shall have the top twelve inches (12") filled with aggregate base Class 2, conforming to Section 10-7 of these Specifications and compacted to ninety-five percent (95%) relative compaction as determined by ASTM D 1557.

26-12 PROCEDURES FOR TV INSPECTIONS OF PIPING SYSTEMS

.

1. Standards

Minimum City standards are to be used by Contractor in video recording newly installed mains for City acceptance. Any deviation from these standards shall be approved by the Construction Inspector. If a conflict exists between this section and other sections of the City of Sacramento Standard Specifications or the Contract Documents the more stringent shall apply. The TV inspection will generate a record DVD and a computer generated report.

2. Equipment

a. Camera

The camera shall record in color. The footage read-out shall appear on screen away from the central focus of the main. A gauging tool, e.g. ¾" cylinder (size of cylinder shall be indicated on the tape label) shall precede the camera for measuring sags and offsets. Focal distance shall be adjustable through a range of from 6 inches to infinity.

The camera shall be tractor driven with a rotating camera head suitable sized for each pipe diameter to be investigated.

b. Recorder

The recorder shall record in DVD format. The submitted DVD(s) shall be 16X DVD-R or +R.

c. Video Quality

The DVD shall be of quality to result in a high-resolution video.

d. Lighting

There shall be sufficient lighting to produce a clear and sharp image of the entire inside periphery of the pipe for all conditions encountered during the work. Lighting is to be adjusted according to the size of pipe. In an eight-inch diameter pipe with joints at five-foot intervals, the lighting shall allow the camera to reveal not less than three consecutive joints, or up to ten feet of unobstructed pipe shall be visible in the monitor picture.

e. Locator

A locating device or other acceptable locating method shall be used to locate points of deficiencies on the ground, in green paint, or green flag.

f. Audio

The following is to be voice recorded during actual televising but will not replace the required computer generated report:

i. Date of inspection

ii. Verbal confirmation of upstream and downstream manhole numbers

iii. Verbal description of pipe size, type and pipe joint length

iv. Verbal description and location of each defect

v. Verbal description and location of each service connection

3. Procedure

a. Timing

The Contractor shall notify the Construction Inspector two working days prior to televising the mains to allow the Inspector the option of being on-site at time of televising.

The job is ready for color television inspection, only after compaction of street sub-grade and prior to placement of road base. The following items must be complete:

i. All underground facilities, utility piping, conduits, and access structures are installed, backfilled, and trench backfill compacted.

ii. Final air test has been completed.

b. Schematic

The manholes shall be numbered on a plan to be provided to the Inspector and the televised segments tied to the assigned manhole numbers. The length of televised run is measured from centerline of manhole to centerline of manhole and approximate tape location shall be indicated on the report. Maximum allowable tolerance for the TV counter shall not exceed 1 foot in 1,000 feet for location accuracy.

c. TV Run

The main shall be flush cleaned prior to running the TV camera. Water shall be present in the line to indicate sags in the main. The camera is to be placed in the main with the footage counter at zero (0) at the centerline of the manhole. The camera is to travel at a maximum speed of 45 feet per minute with slow downs at joints and inspect service connections with a rotating camera head. The picture shall be clear and bright enough to allow a photograph of a section to be made. The footage counter shall appear on screen at all times, and show the upstream and downstream manhole line segments being televised. All service laterals shall be televised and recorded from point of service cleanout or manhole to City connection on City main or manhole tap.

d. Recording

The following items are to be recorded on the first 15 seconds of the recording:

i. Location and/or subdivision name

ii. Date

iii. City job number

iv. Company name, Operator's name, and Evaluator's name

A label shall be affixed to both the DVD and jacket with the above information, start-end footage, and size of gauging tool.

Each televised segment shall be preceded by the following:

i. location (MH #__ to MH #)

ii. main size, type of pipe

iii. main slope and flow direction

iv. length of run (measured on street)

iv. number of pipes entering MH and sizes

vi. number of service connections

The DVD shall given to the Engineer and shall become the property of the City of Sacramento upon completion of the televised inspection.

4. Acceptance Criteria

Maximum acceptable sag for sewer pipes is ¾ inch, unless otherwise specified in the Special Provisions of the Project Plans. All other criteria as set by the City Standard Specification and/or special conditions shall apply for both sewer and drain pipes. Within two working days from receipt of the tape and report, the Inspector shall review the tape and either approve the main(s) or call for repairs. The Contractor is to be notified in writing of any deficiencies revealed by the television inspection that will require repair. If the Contractor is to make repairs and wishes to review the tape with the Inspector, he/she shall contact the Inspector to set a time for viewing. Upon completion of repairs, the main is to be re-televised. Road base is to be placed, only after approval by the Inspector.

5. Report

A **legible** computer generated report shall accompany the DVD. The format shall follow the form below. The initial reading and end reading shall indicate manhole number, type, size of head, length of neck, size of inlets and outlets and depth of manhole. At each service connection the footage shall be marked and location (based on clock) indicated. If there are any sags or offsets, the footage shall be indicated and comment made. Any unusual sighting shall also be noted.

REQUEST FOR TV INSPECTION

Project Name_____

Contractor Name_____

Contractor Representative_____

Date Requested _____Project Number _____

Project Inspector _____ Phone _____ DOU ☐ DOT ☐

DEPARTMENT

To be completed by Contractor and Inspector						To be completed by City O&M			
Type of Pipe	Location of Pipe (MH to MH or Street to Street)	Pipe Size (Inches)	Ball and flush(yes or no)	Checked by Inspector (Initial)		Date Inspected	Inspected by (Name)	Passed Inspection (yes or no)	Comments

Instructions:

1. Contractor shall complete the form and submit to Project Inspector.
2. Project Inspector will sign form when it has been properly completed and Contractor has balled and flushed the pipe.
3. Project Inspector will submit form to the Field Services Division of DOU.
4. Field Services will perform T.V. Inspection.
5. Field Services will complete the form. Inspection comments will be included on this form or on an attached sheet.

26-13 PAYMENT FOR SEWER AND DRAIN PIPE

Payment for sewer and drain pipe will be at a price bid per lineal foot which will include full compensation for pavement cutting and removal, excavation, trenching, dewatering, removal and disposal of existing pipe, bedding, furnishing and laying of pipe, initial backfill, trench backfill, manhole connections, temporary paving, final paving and all other work necessary to construct the sewer or drain pipe complete in place as shown on the Plans.

Measurement of such lineal footage shall be the total distance along the centerline of the pipe from the centerline of manhole to centerline of manhole and shall include the straight run of all tees where used.

Payment for clean crushed rock or bedding material provided for use shall be considered as included in the price paid for laying pipe, unless otherwise indicated in the Special Provisions.

Payment for concrete or control density fill used as protective covering shall be paid for at a separate price per lineal foot for protective covering in place, unless otherwise set forth in the Special Provisions.

Where tee fittings are placed in a main sewer or drain line in connection with sewer or drain services, payment for the fittings shall be considered as included in the price per lineal foot for the main sewer or drain pipe and no deduction or addition will be made to the length of main line laid.

Placing of sewer and drain services will be paid for at the contract unit price bid per service, which price shall include full compensation for furnishing and placing all service pipe from the tee or the fitting in the main sewer or drain line to the property line, and furnishing and placing other necessary bends and stoppers to construct the service complete in place.

The cost for the testing of pipe shall be included in the price bid for the pipe in place.

The cost of removing and replacing pavement over trenches shall be included in the price bid for the pipe in place, unless otherwise set forth in the Special Provisions.

Manholes and drain inlets are paid for as a separate item in accordance with Section 25-6 of these Specifications.

Section 27

WATER DISTRIBUTION SYSTEMS

27-1 GENERAL

All water pipe, fittings, valves, fire hydrants, blow-offs, air release valves and other appurtenances shall be installed in accordance with the requirements of the project Plans and Special Provisions, these Standard Specifications, the American Water Works Association (AWWA), ANSI-61, the City's Cross Connection Control Policy, and the manufacturer's recommendations. Materials shall be as specified in Section 10 "Construction Materials" of these Standard Specifications.

During construction, **Contractor shall not operate any valves in the City's distribution system** and must request that City Utilities Department Personnel operate them. Contractor shall request the Engineer to notify the City Utility Department Personnel as specified in Section 27-11 of these Standard Specifications.

If shown on the Plans or specified in the Special Provisions, Contractor shall pay all fees for taps, tie-in connections, and meters in advance at the Department of Utilities Customer Service Office, 1395 35th Avenue. Fees shall be paid after the "Notice to Proceed" has been issued, and prior to the work being performed by the Department of Utilities. For current fee information, contact Customer Service at 264-5371.

27-2 WATER PIPE

1. General - All water pipes shall be designed to withstand the external earth load and the AASHTO H-20 vehicle live load. The pipe shall also be designed to withstand an internal working pressure of one hundred and fifty pounds per square inch (150 psi).

2. Water Services - Pipe used for water services two inches (2") in diameter or less shall be copper or polyethylene tubing as specified in Section 10 of these Standard Specifications. Pipe used for water services four inches (4") in diameter or large shall be the same as specified for distribution mains.

Polyethylene services shall be a single piece of tubing (no joints allowed including butt welds) and shall have a locating wire attached with ten (10) mil tape at three foot (3') spacing. The minimum allowable radius shall be thirty (30) times the tubing diameter.

3. Distribution Mains (4" to 12") - Unless otherwise specified on the Plans or Special Provisions, water mains four inches (4") through twelve inches (12")

diameter in water distribution systems shall be made of ductile iron pipe (DIP), or polyvinyl chloride pipe (PVC) meeting the applicable requirements of Section 10 of these Standard Specifications.

4. Transmission Mains (greater than 12") - Water mains greater than twelve inches (12") in diameter shall be ductile iron pipe (DIP), concrete cylinder pipe (CCP) or welded steel pipe (WSP) meeting the applicable requirements of Section 10 of these Standard Specifications.

27-3 TRENCHING FOR WATER PIPE

Trenches for water pipe including water transmission mains, water distribution mains, fire hydrants branch leads, and water services shall be as specified herein unless otherwise indicated on the Plans or in the Special Provisions.

Prior to cutting pavement Contractor shall notify Underground Service Alert (USA) per Section 6-19 of these Standard Specifications and shall bring to the Engineer's attention any possible conflicts.

Existing pavement to be removed shall be saw cut the full depth to provide a neat straight pavement break along both sides of the pipe trench as shown on Standard Drawing W-701. Contractor shall perform the pavement cutting operation by saw cutting.

Trenches for water main pipe shall be excavated to the lines and grades indicated on the Plans and as detailed by Standard Drawing W-701 in Section 38 of these Standard Specifications. Contractor shall furnish, install, and maintain a trench shoring system in compliance with Section 6-8 of these Standard Specifications.

Water distribution mains constructed in fully improved streets with curb, gutter, and sidewalk shall be installed with a minimum of thirty-six inches (36") of cover and a maximum of fifty-four inches (54") of cover measured from the top of the pipe to pavement surface.

Water distribution mains in unimproved areas or in existing streets lacking curb, gutter, and sidewalk shall be installed with a minimum cover of fifty-four inches (54") and a maximum cover of sixty inches (60") measured from the top of the pipe to the existing ground or pavement surface.

In order to avoid conflicts with other utilities, particularly at street intersections, it may be necessary to deviate from the above-specified minimum and maximum cover requirements. At locations where the crossing of water mains with other underground utilities results in grade conflicts,

adjustment to the vertical alignment of the water main may be required. Adjustments over or under the conflicting utility line shall be made as detailed in Standard Drawing W-106 in Section 38 of these Standard Specifications. The cost to make these adjustments shall be included in the bid price to install the pipe when the conflicts are shown on the Plans.

In designing the distribution system, it was intended that ten feet (10') be the minimum horizontal distance between parallel water and sanitary sewer lines and services, and that the water main be at least twelve inches (12") higher. No field changes shall be made that conflict with the requirement without prior approval of the Engineer. When crossing a sanitary sewer force main, the water main shall be a minimum of three feet (3’) above the sewer line and no fittings within ten feet (10') of the crossing.

The bottom of the excavated trench shall be cleared of rocks and clay lumps larger than two inches (2") in size. All grade stakes, wood, cut and abandoned pipe, or other material shall be removed from the trench. The bottom of the trench shall be smoothed and compacted to provide uniform support of the pipe between the joints. The bottom of the trench shall be compacted to a minimum of ninety percent (90%) of maximum dry density as determined by ASTM Test Designation D698.

Whenever the bottom of the trench is soft or rocky, or, in the opinion of the Engineer, otherwise unsuitable as a foundation for pipe bedding, the unsuitable material shall be removed per Section 14-8 of these Standard Specifications.

Unsuitable material encountered during excavation of the trench shall be excavated and disposed of as directed by the Engineer. Contractor shall excavate unsuitable material and the resulting space shall be filled per Section 14-8 of these Standard Specifications.

At the end of each working day, the maximum amount of trench open on any portion of the project shall not exceed the length of open trench necessary for placing pipe the next working day. This open trench shall be bridged. Open trench exceeding the length necessary for placing the pipe the next day shall be backfilled, compacted, and temporarily paved. Within the traveled way in a direction crossing traffic flow, the open trench shall either be bridged or shall be backfilled, compacted, and temporarily repaved. Temporary paving shall be installed in accordance with the requirements of Section 14-4 of these Standard Specifications.

Temporary bridges placed over excavated trenches at street intersections, pedestrian crosswalks, driveways, and private roadways shall be

provided by Contractor for the safe passage of pedestrian and vehicular traffic in accordance with Section 6-10 of these Standard Specifications.

Footbridges adequate for pedestrians shall have a minimum width of five feet (5'). The footbridges shall be designed and constructed to withstand a minimum uniform load of one hundred and fifty pounds per square foot (150 psf). Handrails and support posts shall be made with dressed lumber.

Bridges for vehicle traffic shall be a minimum of twelve feet (12') in width, skid resistant and structurally able to withstand an AASHTO H-20 vehicle load. Temporary bridges shall be installed over the trenches at all intersections whenever excavation is in excess of one-half the street width. Bridges shall also be provided at residential and commercial driveways for the safe access of vehicle traffic onto public streets.

All temporary bridges over excavated trenches shall remain in place for public safety and convenience during the duration of the work. At Contractor's risk, the bridges may be temporarily removed or relocated to accommodate the work as approved by the Engineer.

All cut and abandoned pipes within the area of the trench, including existing water mains, that are not removed in accordance with Section 13 of these Standard Specifications shall be sealed by plugging or capping the exposed ends of the pipe.

In plugging pipes with concrete, the concrete plug shall extend at least two feet (2') into the pipe from the exposed end. Concrete used for the plug shall be Class "C" or Class "D" and shall meet the applicable requirements of these Standard Specifications. Steel pipes may be sealed by welding a quarter inch (¼") thick steel plate to the end of the pipe.

Contractor shall be responsible for the control, removal, and disposal of any groundwater that may be encountered in the course of excavating and backfilling trenches or placing pipe. Whenever water or over-saturated soil conditions exist which may interfere with proper installation, trenches shall be dewatered before placement of any pipe or material. Unless approved in writing by the Engineer, groundwater and/or water from trench dewatering shall be free of sediment and other construction materials before entering the City storm drain system. A dewatering plan, including a water de-sedimentation plan, shall comply with Section 16-1 of these Standard Specifications and be approved by the Engineer prior to any discharge of water to the City's storm drain system.

27-4 LAYING WATER PIPES

1. General

Contractor shall take all appropriate measures to prevent any type of foreign material or animals from entering the pipe while the water pipe is being placed. Contractor shall clean the inside of the pipe as directed by the Engineer.

Pipe for water mains shall not be placed during inclement weather or when the conditions in the trench will interfere with proper jointing of the pipe as determined by the Engineer. Whenever the work of placing the water main is discontinued and at the end of each workday, all open ends of water main pipe, fittings and valves at the pipe end shall be sealed. The seal shall be water tight and shall be easily installed and removed. The trench shall be temporarily backfilled to completely cover the seal.

All metallic pipe and fittings shall be shall be wrapped with eight (8) mil polyethylene material in accordance with AWWA Standard C105/A21.5. Polyethylene shall be installed in accordance with the requirements of Section 27-17 “Corrosion Monitoring” in these Standard Specifications.

Pipe for the project shall not be stockpiled within public street right-of-way along the alignment of the water transmission main in excess of an amount representing a five (5) day supply at current rates of pipe laying, and shall never exceed a maximum length of five hundred feet (500') unless otherwise indicated in the Special Provisions. Stockpiling of pipe on the opposite side of the street from construction shall not be allowed without the approval of the Engineer.

Each section of pipe and each fitting shall be thoroughly cleaned before it is installed. All pipes, valves, fittings, and appurtenances shall be lowered into the trench in such a manner as to prevent any damage, particularly to the pipe lining and coating. Under no circumstance shall pipe or appurtenances be dropped into the trench.

The pipe shall be laid true and uniform to line and grade, with no visible change in alignment at any joint unless a curved alignment is shown on the Plans, in which case the maximum deflection at any joint shall not exceed two-thirds (⅔) the manufacturer’s recommendation for the type of pipe and joint being used.

All pipe jointing, including the deflection at joints in curved alignments, shall be in accord with accepted best practice and as detailed herein and in the manufacturer’s installation manual. Both joint surfaces shall be clean before

joints are made. Materials used to join the pipe shall only be that furnished with the pipe or recommended by the manufacturer.

When field cutting pipe, the cut ends shall be cut square and all burrs removed from the pipe interior. The beveling of the pipe ends shall be as specified by the manufacturer. Guide marks for jointing the pipe, after cutting, shall be made on the pipe in accordance with the manufacturer's recommendations.

Contractor shall prevent undue pipe deflection and/or unit loading during pipe handling. Damage to the pipe lining or coating shall be repaired by Contractor in accordance with the manufacture's recommendations as directed by the Engineer

2. Rubber Gasket Joints

The joining of lengths of pipe with rubber gasket joints shall be performed in the following sequence and in accordance with the pipe manufacturer's recommendations:

a. The spigot groove, inside bell sealing surface and rubber O-ring gasket shall be thoroughly cleaned.

b. The above-cleaned surfaces shall be thoroughly lubricated with a soft, vegetable soap compound.

c. The gasket shall be uniformly stretched while placing it in the spigot groove to assure a consistent volume of rubber distributed uniformly around the circumference.

d. The pipe shall be joined by a firm horizontal push without binding.

e. A feeler gauge shall be inserted between the bell and spigot to check the position of the rubber gasket around its periphery. If the gasket is in an improper position, it shall be removed, inspected, reassembled, and rechecked.

3. Field Welding of Pipe Joints

Field welding of pipe joints for welded steel pipe and concrete cylinder pipe shall be performed in accordance with the requirements of AWWA C206, AWSD 7.0 "Field Welding of Steel Water Pipe Joints" and Standard Drawings W-904 and W-903 in Section 38 of these Standard Specifications.

All welding, whether done in the shop or in the field, shall be performed by experienced and skilled operators familiar with the methods and materials to be used. Welding operators and welding procedures for all manual welding of joints and fittings shall be qualified in accordance with the standard qualifications procedure of Section IX of the ASME Boiler and Pressure Vessel Code. Welder operators shall be certified for three position welding in accordance with AWWA, ASME or other similar three position root bend test method of qualification.

All shop and field welding shall be performed by the submerged or shielded electric arc method unless specified in the Special Provisions. The minimum number of passes for welded joints shall be as follows:

Steel Cylinder Thickness (inches)	**Minimum Number of Passes for Welds**
Less than 0.25	2
Equal to or greater than 0.25	3

Welds shall be full circumferential and shall be done in passes no more than one-quarter inch (¼") in thickness. Welding electrodes shall comply with the requirements of American Welding Society A5.1 or A5.5. Size and type of electrodes and the magnitude of the voltages and currents used shall be consistent with methods, materials, and loads to be resisted.

Artificial cooling of the weld area during welding or quenching the completed weld is not permitted. The Engineer will have the option of requesting welding sample coupons for testing. The tests shall show the weld strength to be at least equal to the strength of the plates being welded to be acceptable.

Particular attention shall be given to the alignment of edges to be joined to allow complete penetration and fusion throughout the full depth of the weld. Welds shall contain no undercuts or valleys in the center or at the edges of the weld. Each weld pass shall be thoroughly cleaned of dirt, slag, and flux before each succeeding weld bead is applied.

Completed field welds of pipe joints shall be cleaned of dirt, slag and flux, and then visually inspected. Subject to the approval of the Engineer, all porosity and cracks, trapped flux, or other defects in the welds, discovered during inspection, shall be completely chipped out in a manner that shall allow proper and complete repair by re-welding. Under no circumstances shall caulking of defective welds be permitted.

4. Cement Mortar Joint Finish

Following satisfactory testing of the welds, the interior of all joints shall be cement mortar lined and the exterior of the joints shall be cement mortar coated in accordance with AWWA C205 for welded steel pipe and AWWA C303 for concrete cylinder pipe.

The application of cement mortar to the joints on the exterior of the pipe shall be made after the pipe is adequately bedded. Interior joints shall be mortared after initial backfill is in place or after pipe is secured in or on a structure.

To minimize annular shrinkage cracks due to temperature change, exterior joints shall be poured when the pipe is cool. Water jetting to cool the pipe shall be done when the joint mortar is still in a plastic state and is protected from washing by canvas or impervious joint wrapping.

Cracks occurring in interior or exterior joint mortar shall not exceed four hundredths of an inch (0.04”). Where cracks exceed this limit, they shall be removed to the metal to a width of at least three eights inch (⅜”) and new mortar set in.

a. Exterior Joints

After cleaning, a sail cloth band with three eighths inch (⅜”) wide steel box strapping attached to the two long ends shall be placed around the pipe outside and centered over the joint with the band, opening for grout on the pipe top. The strapping band shall fit snugly around the pipe.

The cement mortar shall consist of one (1) part Portland Cement to two (2) parts sand mixed to a consistency of thick fluid cream. After the joint is moistened, the cement mortar shall be poured into the joint recess on one side, rodded, if necessary, until it appears on the opposite side, then the remainder shall be poured. Portland Cement shall meet the requirements of Section 10 of these Standard Specifications.

The cement mortar shall completely fill the outside joint exposed metal annular space. Upon completion, the joint cover shall be placed over the opening and the mortar allowed to set.

b. Interior Joints

The cement mortar shall consist of one (1) part Portland Cement and one and one-half (1½) parts sand, dry mixed and wetted with

sufficient water to permit caulking and troweling without crumbling or sloughing. Sufficient time shall be allowed for curing prior to use. Portland Cement shall meet the requirements of Section 10 of these Standard Specifications.

For pipe less than twenty-two inches (22”) in diameter cement mortar shall be placed in the inside recess prior to joining the pipe. After each new length of pipe has been placed in final position, a ball shall be pulled through the joint in order to smooth the mortar at the joint. This procedure is not necessary if a hand hole is used to mortar the joint.

For pipes greater than or equal to twenty-two inches (22”) in diameter, cement mortar shall be placed in the inside of recess while working inside the pipe. Foreign substances which adhere to the steel joint rings shall be removed, the surface cleaned, and stiff cement mortar packed into each joint. The mortar shall be finished with a steel trowel to match the lining in the adjoining pipes. Excess mortar and other construction debris shall be removed from the pipe interior.

Closure assemblies shall be cement-mortar lines to a mortar thickness at least equal to the adjoining standard pipe sections. The steel shall be cleaned with wire brushes and a cement and water wash coat applied prior to applying the cement mortar. Where more than a 4-inch joint strip of mortar is required, welded wire mesh reinforcement having a 2-inch by 4-inch pattern of No. 13 gage shall be placed over the exposed steel. The mesh shall be installed so that the wires on the 2-inch spacing run circumferentially around the pipe. The wires on the 4-inch spacing shall be crimped to support the mesh 3/8 inch from the metal surface. The interior mortar shall have a steel-troweled finish to match adjoining mortar lined pipe sections.

5. Cleanup-Up Behind Pipe Laying Operations

Contractor shall maintain cleanup operations in pace with pipe laying. Concurrently with or immediately after placing a temporary bituminous surface within paved areas, or the placing of backfill in unpaved locations, all areas affected by Contractor’s operations shall be restored to their original conditions (except for final repaved surfacing) and left in a neat and orderly condition.

Paved areas shall be swept with a power broom and then flushed with water.

Excavations at locations of valves, blow-offs, air relief valves, and tie-in connections shall not be left open without the Engineer's written permission.

Replacement of removed improvements or repairs to damaged or disturbed real property or improvements shall be performed concurrently with the cleanup work.

Failure to perform the above work in pace with the forward trenching progress shall be sufficient cause for the Engineer to order Contractor to stop trenching until the Engineer has determined that the work has been caught up.

27-5 PLACING LOCATING WIRE WITH DISTRIBUTION MAINS

All runs of distribution mains (4" to 12") including metal and plastic shall have a locating wire taped to the top of the pipe to facilitate location after installation, as shown on Standard Drawing W-102 in Section 38 of these Standard Specifications. The locating wire shall be a No. 10 gauge copper wire insulated with high molecular weight polyethylene (HMWPE), blue in color, and suitable for direct burial.

27-6 THRUST BLOCKING AND RESTRAINED JOINTS

1. Distribution Main (4"-12")

All plugs, caps, tees, or bends with a deflection greater than eleven and a quarter degrees (11¼°) shall be provided with concrete thrust blocks installed as detailed on Standard Drawing W-103. Nuts or bolt heads of bolted connections shall not be covered by concrete or form materials. The thrust block shall extend from the fitting to undisturbed soil.

Deadman thrust assemblies shall not be allowed without prior approval from the Engineer.

Mechanically restrained joints may be used in lieu of concrete thrust blocks when approved by the Engineer and shall be the type recommended by the manufacturer of the pipe.

2. Transmission Mains (Greater than 12")

Contractor shall submit to the Engineer for approval, calculations for minimum lengths of restrained pipe where there is unbalanced hydraulic thrust, such as at abrupt changes in horizontal and/or vertical alignment, at tees, valves and caps. Thrust restraint calculations shall be based on an internal test pressure of two hundred and twenty-five pounds per square inch (225 psi). Any demarcations of restrained joint requirements on the Plans

indicate only possible segments for restrained pipe joints. Contractor is responsible for verifying the necessity of and minimum lengths for restrained joints. Concrete thrust blocking is not allowed.

Joints shall be restrained when deflection of the pipe at the joint exceeds two-thirds (⅔) manufacturer's recommendation. Transmission mains constructed of welded steel pipe or concrete cylinder pipe shall be restrained by field welding the joints. Ductile iron pipe shall be restrained with Field Lok Gaskets, TR Flex, or an approved equal.

Thrust restraints for fittings, elbows, reducers, in-line valves, appurtenances, etc., shall be provided by means of restrained pipe joints, utilizing pipe skin friction for horizontal restraint, and dead load for vertical restraint (uplift). In-line valves shall be considered as a dead end main for thrust restraint calculations. Thrust forces shall be calculated using the internal diameter of the pipeline. Skin friction shall be calculated with allowance for pipe dead and live load. Earth load above the pipe when backfilling prior to testing, and a friction coefficient incorporating the properties of the actual backfill materials shall be used.

The friction coefficient shall not exceed 0.25 for C200 and C303 unless a geotechnical evaluation is submitted. In no case shall the friction coefficient exceed 0.30. For polyethylene encased ductile iron pipe, only skin friction between the encasement and the pipe shall be considered with no allowance for soil cohesion or the internal friction angle of the soil. The skin friction for polyethylene wrapped ductile iron pipe shall be reduced thirty percent (30%) to a maximum of 0.17 unless Contractor submits a geotechnical evaluation.

27-7 APPURTENANCES

1. General

Appurtenances shall comply with the material requirements of Section 10 of these Standard Specifications and shall be installed per the manufacture's recommendations.

Gate valves and butterfly valves, as well as fire hydrants, installed in water transmission and distribution systems constructed north of the American River, shall be opened left (counter clockwise) in accordance with Standard Drawing W-309 of these Standard Specifications. Valves and hydrants installed in water systems constructed south of the American River shall be opened right (clockwise).

Appurtenances shall be installed at elevations and locations as shown on the Plans. The joints between the main pipe and side fittings shall be

restrained in compliance with the Plans, Special Provisions, and these Standard Specifications. The trench bottom shall be graded uniformly to provide a level base for the fittings and minimize torsional strain when the backfill is placed.

On transmission mains, insulated flanged joints shall be provided at every butterfly valve, gate valve, flanged outlet, at each tie-in connection, at fire hydrant connections, at air release valves, at blow-off connections, at intervals of two thousand five hundred feet (2,500') along the water main pipe, and/or as otherwise indicated on the Plans. Insulated joints shall be installed in accordance with the requirements of Section 27-17, "Corrosion Monitoring", and Standard Drawings W-902 and W-905 in Section 38 of these Standard Specifications.

Polyethylene material with a minimum thickness of eight (8) mil shall be placed around the exterior of the appurtenances in accordance with AWWA Standard C105/A21.5. Polyethylene shall be installed in accordance with the requirements of Section 27-17, "Corrosion Monitoring".

2. Fire Hydrants

In no case shall a fire hydrant be installed within three feet (3') of a building or any other structure that would limit access. All hydrants shall be set plumb and installed and located in accordance with Standard Drawing W-201 in Section 38 of these Standard Specifications.

Only ductile iron or polyvinyl chloride pipe shall be used as branch leads that connect fire hydrants to water mains.

Where the Plans indicate that existing fire hydrants are to be removed and salvaged, the salvaged hydrants shall be removed intact and delivered undamaged to the Corporation Yard as directed by the Engineer.

Fire hydrants placed at street intersections shall be installed at the beginning or end of round corners (curb returns) and not be positioned along the arc of the round corner.

Only one six inch (6') or twelve inch (12') fire hydrant extension kit per hydrant shall be allowed. Contractor shall meet the bury depth requirements by use of forty five degree (45°) fittings.

3. Gate Valves

All gate valves shall be restrained in both directions.

Value operating nut extensions are required in accordance with Standard Drawing W-308 in Section 38 of these Standard Specifications when valve nut is in excess of thirty inches (30") below finished grade.

Contractor shall carefully place valve into position, avoiding contact or impact with other equipment, or trench walls. The pipe ends shall be prepared in accordance with the manufacture's instructions. The water main shall be properly supported to avoid line stress on valve. The pipe/valve joint shall not be deflected nor shall the valve be used as a jack to pull the pipe into alignment.

4. Backflow Prevention Assemblies and Swing Check Valves

The City maintains a backflow prevention and cross-connection control program in accordance with the requirements of Title 17 of the California Administrative Code. Backflow prevention assemblies shall be installed in accordance with the appropriate Standard Drawings in Section 38 of these Standard Specifications (Drawing Numbers W-501 thru W-511 and W-601 thru W-607). The backflow prevention assembly must be installed such that the device is readily accessible for testing and maintenance, and shall be located as close as practical to the point of service delivery (meter).

The City of Sacramento Department of Utilities maintains a list of approved assemblies. Only assemblies that appear on this list are acceptable for installation. Assemblies shall be shipped from the manufacturers in the fully assembled configuration. This includes bypass arrangements and shutoff valves. Assemblies received for installation not completely assembled are not approved. Field conversions of double check assemblies to a detector assembly, or vice versa, are not permitted.

The City of Sacramento's requirements for designing, constructing, installing, and maintaining backflow prevention assemblies is found in the Cross Connection Control Policy of Department of Utilities. Copies of the "Cross Connection Control Policy" are available from the Department of Utilities Customer Service at 1395 35th Avenue. Following acceptance of the installation, the device must be performance tested at the owner's expense by a certified tester selected from the City approved list.

All assemblies shall be installed to provide protection from vandalism and freezing. Cages must be installed so that adequate clearance is available for maintenance and testing or it should be completely removable and allow for any discharge from the relief valve to fully drain from the protective cage or cover.

As a minimum, backflow prevention assemblies shall be sized equivalent to the diameter of the service connection. The installation of backflow prevention assemblies shall be aboveground.

5. Blow-Offs

a. Distribution Mains

Standard two inch (2") and four inch (4") blow-offs shall conform to and be installed in accordance with Standard Drawing W-301 in Section 38 of these Standard Specifications.

b. Transmission Mains

Blow-offs shall be six inches (6") in size and shall conform to and be installed in accordance with Standard Drawings W-804 or W-805 in Section 38 of these Standard Specifications.

6. Butterfly Valves

Butterfly valves shall conform to and be installed in accordance with Standard Drawing W-801 in Section 38 of these Standard Specifications.

Value operating nut extensions are required in accordance with Standard Drawing W-308 in Section 38 of these Standard Specifications when valve nut is in excess of thirty inches (30") below finished grade.

Contractor shall carefully place valve into position, avoiding contact or impact with other equipment, or trench walls. The pipe ends shall be prepared in accordance with the manufacture's instructions. The water main shall be properly supported to avoid line stress on valve. The pipe/valve joint shall not be deflected nor shall the valve be used as a jack to pull the pipe into alignment.

7. Combination Air Vacuum and Release Valves

Combination air vacuum and release valves shall be two inches (2") or four inches (4") in size, as indicated on the Plans. Installation of air vacuum and release valves shall conform to and be installed in accordance with Standard Drawings W-802 and W-803 in Section 38 of these Standard Specifications.

8. Flexible Couplings and Flanged Coupling Adaptors

a. Transmission Mains

The flexible couplings shall be installed with provision for thrust restraint ties attached to the water main pipe. The thrust restraint ties on the pipe shall be welded lugs, lugs cast integrally with the pipe, or friction collars. Anchor studs placed perpendicular to the long axis of the pipe are unacceptable. Resistance to hydraulic thrust shall be adequate to sustain a force developed by a test pressure of two hundred and twenty-five pounds per square inch (225 psi).

Flanged coupling adapters shall be provided with thrust ties attached to the pipe with welding lugs, cast-in-place lugs, or friction collars. Lugs shall have a minimum thickness equal to that of adjacent flange and shall have holes the same size as those on the flange. Anchor studs placed perpendicular to the longitudinal axis of the pipe are unacceptable.

Contractor shall ensure that the pipe is in proper alignment. Contractor shall clean all dirt, rust, oil or loose scale from pipe ends for a distance of two inch (2") greater than the length of the flanged coupling. Contractor shall check area where gaskets will seat on pipe and flange faces to make sure there are no dents, projections, gouges, etc. that will interfere with the gasket seals. Welds must be ground flush. Bolt tightening should be done evenly, alternating to diametrically opposite positions to bring bolts to recommended tightness.

b. Distribution Mains:

Flexible couplings shall be installed with provisions for thrust restraint.

9. Mechanical Joints

Contractor shall thoroughly clean socket and plain end of all rust or foreign material. The socket, gasket and plain end shall be lubricated with soapy water or an approved pipe lubricant meeting requirements of AWWA C111. The bolts shall be tighten to draw gland toward the pipe flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the joint using torque-measuring wrenches.

10. Valve Boxes

Valve boxes shall be furnished and installed in accordance with Standard

Drawings W-303, W-304, and W-306 in Section 38 of these Standard Specifications.

11. Access Manholes

Installation of access manholes shall conform to and be installed in accordance with Section 25 and Standard Drawing W-702 in Section 38 of these Standard Specifications

27-8 PIPE BEDDING AND BACKFILLING OF TRENCHES

Pipe bedding and initial backfill for water mains, fire hydrant branch leads, and water services shall be furnished and placed according to the requirements contained herein and as detailed on Standard Drawing W-701 in Section 38 of these Standard Specifications. The pipe bedding and initial backfill material shall consist of sand meeting the requirements as given in Section 10-13 of these Standard Specifications unless otherwise specified in the Special Provisions.

Bedding material shall be placed and compacted along the bottom of the trench to provide uniform support for the water main pipe at every point between the joints. Support of the pipe by wedging or blocking shall not be permitted. At the location of each joint, holes of adequate size shall be provided in the bottom and sides of the trench to permit easy joint preparation, pipe assembly, and visual inspection of the entire joint.

Initial backfill shall be placed immediately after pipe joints have been completed, inspected, and passed by the Engineer. Trench backfill shall be earth material, unless otherwise specified in the Special Provisions, placed and compacted above the granular bedding and initial backfill material to the level of the subgrade in paved areas or to the top of the trench in unpaved areas. Backfill shall be provided by Contractor and shall be placed in accordance with Section 14-3 of these Standard Specifications and the pipe manufacturer's recommendations.

Imported granular material may be used to backfill pipe trenches in place of job excavated native material. The imported granular material placed above the initial backfill shall be uniformly graded Class 2 aggregate base, meeting the requirements of Section 10-7 of these Standard Specifications. Compaction and placement requirements for imported granular material shall be the same as required for compaction of job excavated native material.

Full depth select or imported backfill will be required under the following circumstances:

1. At locations where over excavation is required, i.e., butterfly valves, blow-offs, system tie-in connections, insulated joints, etc.

2. At locations where pipes for sewage or drainage cross above the water transmission main pipe.

3. In areas where the trench section is of unusual configuration.

4. Jacking and receiving pits for the boring and jacking of pipe casings.

Full depth select backfill shall be placed in layers not exceeding eight inches (8”) in depth and shall extend to the level of subgrade road subbase and to undisturbed earth on the sides. Compaction and placement requirements for full depth select backfill shall be the same as required for compaction of job excavated native material. Unless otherwise specified on the Plans or Special Provisions, full depth select backfill material shall consist of sand, Class 2 aggregate base or controlled density fill (CDF) meeting the requirements of Section 10 of these Standard Specifications.

27-9 REPAVING WATER PIPE TRENCHES

Repaving of trenches for water mains, fire hydrant branch leads, and water services shall be as specified in this Section of these Standard Specifications unless otherwise indicated on the Plans or in the Special Provisions

Contractor shall restore all surfaces, which have been removed or damaged by Contractor in kind, using the same material as existing, unless otherwise noted on the Plans or in the Special Provisions. The repaving is to be done in such a manner to, as closely as possible, replace the cut pavement with a similar type and an equal or greater structural section.

Upon completion of trench backfill, existing pavement as well as any curbs, gutters and sidewalks that have been cut or damaged as a result of the construction activities shall be replaced. The replacement of pavement, curb, gutter or other improvements shall match that of the original as close as practical unless otherwise indicated on the Plans. Segments of pavement that were damaged during construction shall be cut to a neat straight line. To form the required “T” trench, the existing pavement shall be ground or saw cut an additional six inches (6”) outside the excavated area prior to paving. The minimum pavement section within public street right-of-way shall be four inches (4") of asphaltic concrete over twelve inches (12") of Class 2 aggregate base unless otherwise noted on the Plans or in the Special Provisions.

Aggregate base for repair and/or replacement of existing pavement shall meet the requirements for Class 2 aggregate base as contained in Section 10 of these Standard Specifications. Aggregate base shall be placed and compacted in accordance with Section 14 of these Standard Specifications, except that it shall be compacted to a relative compaction of not less than ninety-five percent (95%) as measured by tests specified in Section 14 of these Standard Specifications.

Asphaltic concrete pavement and its placement shall conform to the requirements of Section 22 of these Standard Specifications.

Restoration of existing concrete pavement shall consist of at least six inches (6") of concrete and shall conform to the requirements of Section 19. Concrete surfaces to be replaced shall be colorized, as necessary, to match existing adjacent concrete color by the addition of Lamp Black coloring agent. Contractor shall submit concrete mix design for approval including a proposed proportion of coloring agent appropriate to the shade of adjacent concrete. Where entire alley requires replacement, concrete shall not include coloring agent, unless directed by the Engineer.

Concrete used in the repair and/or replacement of curb, gutter, or sidewalk shall be Class “C” as specified in Section 10 of these Standard Specifications. Concrete used in the replacement of existing concrete vee gutter or pavement shall be Class “A” concrete in accordance with Section 10 of these Standard Specifications. Placement of concrete shall conform to the requirements of Section 24 of these Standard Specifications.

Where less than two feet (2') of existing pavement is left between the edge of the trench and the lip of concrete gutter or pavement edge, the narrow strip of existing pavement shall be removed and the area repaved along with the area overlying the trench. All existing asphaltic concrete or concrete pavement adjacent to the pipe trench that has been loosened, cracked, or damaged as a result of Contractor's operations shall be removed and replaced.

Unless otherwise provided on the Plans or in the Special Provisions, pipeline trenches in unpaved portions of street rights-of-way shall have the top twelve inches (12") filled with aggregate base Class 2, conforming to Section 10 of these Specifications and compacted to ninety-five percent (95%) relative compaction as determined by ASTM Designation D1557.

All pavement debris and other excavated material not destined to be used for backfill shall be removed and disposed of outside the limits of the project at Contractor's expense.

27-10 WATER SERVICES

Materials for services shall meet the requirements specified in Section 10 and shall be installed in accordance with the Standard Drawings. All new and reconnected services shall be metered.

The location of water services extending beneath curbs, gutters and sidewalks shall be denoted by imprinting a two inch (2") size Gothic letter "W" on the upper face of the curb, unless otherwise directed by the Engineer.

Service saddles for one inch (1"), one and a half inch (1½") and two inch (2") services shall be installed in accordance with Standard Drawing W-403 in Section 38 of these Standard Specifications. Three inch (3") services are not allowed. A three inch (3") meter shall be installed on a four inch (4") tap. Tapping sleeves for services four inch (4") and larger shall have a stainless steel sleeve and stainless steel flange.

Gate valves for water services four inches (4") and larger in diameter shall be installed at the main with a flanged connection and shall include a valve box and riser. Boxes and risers shall be as specified in and installed in accordance with Standard Drawing W-303 in Section 38 of these Standard Specifications.

No hydrant branch lead, services or fitting (tee, ell, etc.) shall be tapped to accommodate any service.

27-11 WATER TAPS TO NEW AND EXISTING MAINS

Prior to scheduling taps on new or existing water mains, Contractor shall provide the Engineer a copy of a bacteriological report showing that all piping including on-site fire services, private fire hydrants, and domestic services meet the requirements of these Standard Specifications.

Water taps on new mains prior to being accepted by the City shall be made by Contractor. Water taps on existing City mains shall only be made by City crews at Contractor's expense.

For any given project, a maximum of two (2) water main shutdowns, water main tie-in connections (tap or "cut-in"), or combination thereof directly involving work by the City crews, shall be scheduled per day. Such work performed by City crews will be between 9:00 am and 3:00 pm. Modification to this procedure may be requested by Contractor and will be considered on a case-by-case basis with the final determination to be made by the Engineer.

Contractor shall notify the Engineer that a shutdown is required and the City will schedule the shutdown within five (5) working days of notification. The Engineer will notify Contractor of the time of shutdown at least two (2) working days prior to the shutdown. Contractor shall excavate around the water main, per Standard Drawing W-404, twenty-four (24) hours prior to the City tapping the water main.

Any change made to the vertical and horizontal alignment of water services shall be made behind the sidewalk and outside the City right-of-way. Within the City right-of-way the water services shall be installed perpendicular to the main.

27-12 DISINFECTION OF WATER MAINS

1. General

The intent of this section is to present procedures essential for the disinfection of newly constructed water mains and appurtenances. No new mains shall be connected to existing mains until they have been disinfected in accordance with this section, and pressure tested in accordance with Section 27-13 in these Standard Specifications. All disinfection and testing shall be made in the presence of the Engineer. The basic procedure consists of the following:

a. Preventing contaminating materials from entering the water mains during construction.

b. Disinfecting any residual contamination that may remain.

c. Determining the bacteriological quality by laboratory testing after disinfection.

Contractor shall furnish all hoses, pumps, gauges, connections, valves, other necessary apparatus, and personnel required for disinfecting, flushing, and disposal of chlorinated water.

Precautions shall be taken to protect pipe interiors, fittings, and valves against contamination during the construction of the water system.

Chlorination and testing of the pipeline shall be in accordance with AWWA C 651 with the following exception: the first bacteria sample after flushing the main is not required. Water distribution mains up to and including twelve inches (12") in diameter shall be disinfected using the Tablet Method or Continuous-feed Method described in AWWA C 651. Water transmission mains

eighteen inches (18”) in diameter and greater shall be disinfected using the Continuous-feed Method described in AWWA C 651.

Disinfecting the pipeline may be performed concurrently with the hydrostatic testing in accordance with Section 27-13. In the event repairs are necessary, as indicated by the hydrostatic test, additional disinfecting may be required as directed by the Engineer.

2. Tablet Method

The Tablet Method shall employ the use of a sufficient number of calcium hypochlorite tablets as a disinfectant to yield an average chlorine dose of approximately twenty-five milligrams per liter (25 mg/l). The five-gram (5g) calcium hypochlorite tablets shall contain at least sixty-five percent (65%) available chlorine by weight. These tablets shall meet the requirements of AWWA B 300, standard for hypochlorites.

Because preliminary flushing cannot be performed when tablets are used, cleanliness must be exercised during construction of the water main.

The calcium hypochlorite tablets shall be placed in each section of pipe and also in hydrants, hydrant branches and other appurtenances. They shall be attached by an adhesive at the top of the pipe to prevent washing to the pipe end. If the tablets are fastened before the pipe section is placed in the trench, their position shall be marked on the section to assist in keeping the tablet’s position at the top of the pipe.

Number of 5 Gram Calcium Hypochlorite Tablets*					
Pipe Diameter (Inches)	**Length of pipe section (feet)**				
	13 or less	18	20	30	40
4	1	1	1	1	1
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
*Based on 3.25 grams of available grams of chlorine per tablet. Any portion of tablet rounded to next highest number.					

The adhesive shall be Permatex No. 1, or approved equal. There shall be no adhesive on the tablet except on the broad side next to the surface to which

the tablet is attached. The number of calcium hypochlorite tablets required for main disinfections shown by the table above.

3. Continuous Feed Method

The continuous feed method consists of completely filling the main to remove all air pockets, flushing the completed main to remove particulates, and filling the main with chlorinated potable water so that after a twenty four (24) hour holding period in the main there will be a free chlorine residual of not less than ten milligrams per liter (10mg/l) at all locations in the main.

Prior to being chlorinated the main shall be filled to eliminate air pockets and shall be flushed to remove particulates. The Flushing velocity in the main shall be not less than two and a half feet per second (2.5fps) unless otherwise directed by the Engineer.

A chlorine-water solution shall be applied by means of a solution feed chlorinating device. Care shall be taken to prevent the highly chlorinated water in the pipeline being treated from flowing back into the pipeline supplying the water. At a point not more than ten feet (10') downstream from the beginning of a new main, the concentrated chlorine solution shall be pumped into the main at a uniform feed rate until the desired chlorine residual (at least 25mg/l) is measured in the flushed water at the terminal outlet. Chlorine application shall not cease until the entire main is filled with chlorinated water. If at any time the application of chlorine is interrupted, the flow of water shall be stopped until chlorine application is resumed.

4. Pipeline Filling

Before filling the pipeline, Contractor shall:

a. Remove any and all residual water from the entire pipeline to be tested.

b. Open all air vents.

c. Furnish a double check valve assembly to make a single supply connection for testing. Installation of the double check valve assembly shall be in accordance with Standard Drawing W-107 in Section 38 of these Standard Specifications. A double check valve assembly hook-up to the City water system must be approved by the Engineer prior to water use. The double check valve assembly shall be approved by a certified tester. The certification tags shall be displayed on the double check valve assembly after approval.

Each section of the pipe to be disinfected shall be slowly filled with water at a velocity of less than one foot per second (1fps), and all air shall be expelled from the pipe. The release of the air can be accomplished by opening fire hydrants and service line cocks at the high points of the system and blow-offs at all dead ends. If required, Contractor shall provide a corporation stop at high points to provide air vents and insure that all air is released. The valve controlling the admission of water into the section of pipe to be disinfected should be opened wide before shutting the hydrants or blow-offs. After the system has been filled with water and all the air expelled, all the valves controlling the section to be tested shall be closed.

5. <u>Disinfection, Flushing and Testing</u>

The disinfection, flushing and testing sequence shall be as follows:

a. Chlorination and testing of the pipeline shall be in accordance with AWWA Standard C651 with the following exception: the first bacteria sample after flushing the main is not required.

b. The heavily chlorinated water shall be retained in the main for at least twenty-four (24) hours, during which time all valves and hydrants shall be operated to ensure disinfection of the appurtenances. At the end of the twenty-four (24) hour period, the main shall have a residual of not less than ten milligrams per liter (10 mg/L) of free chlorine or the disinfection procedure shall be repeated using the continuous-feed or other method described in AWWA C651 as directed by the Engineer.

c. Contractor shall flush the main until the chlorine residual is less than one part per million (1.0 ppm) or matches distribution system chlorine residual level and turbidity is less than one nephelometric turbidity unit (1.0 NTU). The chlorinated water shall be flushed from the system at its extremities and at each appurtenance, using potable water from a source designated by the Engineer. The minimum water velocity during flushing shall be two and a half feet per second (2.5 fps) or as directed by the Engineer. Temporary inlets/outlets shall be sized to provide adequate velocity to flush the main. The minimum inlet/outlet size shall be two inches (2”) in diameter.

d. Samples will be collected at locations along the pipeline identified by the Engineer. Contractor shall notify the Engineer at least twenty-four (24) hours in advance of the time that the bacteriological samples are to be drawn for testing. Contractor

shall furnish and install temporary sampling devices in accordance with Standard Drawing W-302 in Section 38 of these Standard Specifications at the locations indicated by the Engineer spaced no greater than twelve hundred feet (1200') apart.

e. Twenty-four (24) hours after flushing the chlorinated water from the main the Engineer will collect samples for testing.

f. Bacteriological examination of the samples shall meet the following criteria:

i. Total Coliform absent

ii. Total Plate Count less than five hundred (500) colony forming units per milliliter

Re-disinfection, if required due to test failure, shall be performed by Contractor at Contractor's expense. Cost to retest the water will be at Contractor's expense.

The water shall meet State and Federal drinking water standards; Title 22, California Administrative Code and the Safe Drinking Water Act of 1974, as amended.

6. Disposal of Chlorinated Water

After disinfection of the system and prior to coliform bacteria and turbidity testing, chlorinated water shall be disposed of such that water does not flood, inundate or damage property. Contractor shall dechlorinate the water by use of apparatus that injects or mixes EPA approved chemicals with the water to neutralize the chlorine before it is released to the ground, streams, or storm sewer systems. Residual chlorine levels shall be reduced and maintained to a maximum of one hundredth of a milligram per liter (0.01 mg/l). Contractor shall test the discharge at fifteen minute (15) intervals to insure that acceptable levels of neutralization are maintained. Discharge shall be stopped if chlorine levels exceed one hundredth of a milligram per liter (0.01 mg/l).

Declorinating aparatus shall be the de-chlorinator by Romac Industries or approved equal. All procedures shall be in accordance with manufacturer's recommendations and as approved by the Engineer.

27-13 PRESSURE TESTING WATER MAIN INSTALLATIONS

Following disinfection, Contractor may use the chlorinated water to perform a hydrostatic pressure test of the system. Prior to making final tie-in connections, the entire system shall be pressure tested by Contractor independent of the existing system or systems to be connected.

Contractor shall furnish all hoses, pumps, pressure gauges, leakage measuring devices, connections, relief valves, temporary pressure heads, other necessary apparatus, and personnel required for hydrostatic pressure and leakage testing. Pressure gauges shall register pressure in pounds per square inch gauge (psig). The range of the gauge shall be from zero to two hundred and seventy-five pounds per square inch gauge (0-275 psig). The gauge readings shall have a five (5) psig incremental tick marks. The gauge shall be calibrated within forty-five (45) days of the hydrostatic test and the calibration tag affixed to the gauge.

In no case shall there be placement of permanent pavement prior to successful completion of the test. Joints and fittings must be backfilled to the springline of the pipe and the pipe between joints backfilled to a depth necessary to hold the line securely during the test, but in no case less than eighteen inches (18") above pipe. Thrust blocks shall have been in place for at least thirty-six (36) hours if high-early-strength concrete was used or at least seven (7) days if standard concrete was utilized.

A hydrostatic pressure of one hundred and fifty pounds per square inch gauge (150 psig) shall be maintained for a duration of two (2) hours. Should the pressure after one (1) hour be less than at the beginning of the test, the volume lost shall be determined by measuring the total amount of additional water supplied to the pipeline to re-establish the test pressure of one hundred and fifty pounds per square inch gauge (150 psig). Contractor shall provide the necessary pump and clean calibrated container for measurement of make-up water required to replace leakage.

Each test section shall not exceed the maximum allowable leakage as determined using the following formula. Leakage exceeding this amount shall be cause for rejection.

$$L = SDT/12{,}500$$

where:

L = The minimum acceptable leakage in gallons
S = The length of the test section in feet
D = The diameter of the pipe in inches
T = The test time period in hours

No leakage is allowed for welded steel pipe with welded joints.

Contractor shall determine the cause of unacceptable leakage results, take corrective measures, and conduct subsequent tests until the pipeline meets the allowable leakage criteria. Contractor shall perform any excavation required to locate and repair leaks or other defects that may develop during the test, including removing backfill that has been already placed. The Engineer shall witness the test and Contractor shall provide the Engineer a forty-eight (48) hour notice prior to the test.

Contractor at his expense shall repair any leaks detected by visual inspection regardless whether test results are acceptable.

Contractor shall take all necessary precautions to prevent joints from drawing while the pipelines and their appurtenances are being tested. Any damage to the pipes and their appurtenances, or any other structures, resulting from or caused by these tests, shall be repaired by Contractor at Contractor's expense.

27-14 "CUT-IN" CONNECTION TO EXISTING WATER MAINS

Connection of new water mains to existing mains shall be made only after the newly constructed water mains have been successfully disinfected and pressure tested including onsite fire systems and domestic services.

Contractor shall furnish and install all pipe, fittings and valve boxes necessary to complete the "cut-in" as shown on Standard Drawing W-105 in Section 38 of these Standard Specifications.

City crews shall perform all shutdowns of existing water mains. See Section 27-11 for water main shut down procedure.

Contractor shall expose the existing water main at the "cut-in" locations per Standard Drawing W-404 and shall have all material necessary to complete work onsite at least one day prior to the scheduled "cut-in" to the satisfaction of the Engineer. Contractor shall have all necessary manpower and equipment ready at the time of the scheduled "cut-in" necessary to be able to complete the "cut-in" within four (4) hours of the shutdown to the satisfaction of the Engineer. Failure to comply with above-specified requirements shall result in the cancellation of the scheduled shutdown.

New pipe, fittings and valves required for connection but not included in the hydrostatic pressure testing and disinfection procedures shall be

disinfected prior to connection in accordance with AWWA Standard C651 relating to "Connections Equal To or Less Than One Pipe Length".

In the connection of new water mains to existing mains, any offset in horizontal or vertical alignment between the exposed ends of new and existing water main pipes that is six inches (6") or greater shall be taken up by the use of elbow fittings. Ninety degree (90°) elbows shall be used only with the Engineer's approval. Deflection of the pipe joints or the use of flexible couplings shall not be permitted.

27-15 SETTING, ADJUSTING AND LOCATING VALVE BOXES

For all new water valves installed, Contractor shall furnish and install valve boxes, covers, drop caps, and steel risers in accordance with Standard Drawings W-303 and W-304 in Section 38 of these Standard Specifications. Unless otherwise shown on the Plans, or specified in the Special Provisions, in construction areas involving elevation changes or where existing valve boxes or risers are disturbed, or as indicated on the Plans, Contractor shall furnish and adjust to final grade all existing valve boxes in accordance with Standard Drawings W-303, W-304 and W-306 in Section 38 of these Standard Specifications. All non-steel risers shall be replaced with steel risers in accordance with Standard Drawings W-303 and W-306 in Section 38 of these Standard Specifications. When approved by the Engineer, Contractor may reuse existing valve boxes that meet these Standards Specifications and are in an undamaged condition.

All water valve boxes removed for subsequent reinstallation to allow reconstruction of existing streets shall be temporarily replaced with a protective metal container. The temporary container shall cover the riser over the valve and will assist in keeping the location of the valve visible during street reconstruction activities, the risers at each valve shall be kept free of debris and the valve operating nut left exposed.

Prior to construction Contractor shall furnish locations or swing ties to all existing valves within the streets to be resurfaced. A copy of the valve location measurements shall be provided for the Engineer prior to any street construction or resurfacing.

27-16 ADJUSTING AIR RELEASE VALVES

Contractor shall install new or adjust existing air valve box or manhole head and cover in accordance with Standard Drawing W-802 in Section 38 of these Standard Specifications.

All precast concrete sections used to construct the vaults or manholes for air release valves shall be set in Portland Cement mortar or preformed plastic sealing compound. The preformed plastic sealing compound and the mixing of the mortar shall meet the requirements specified in Section 10-37 of these Standard Specifications.

The interior and exterior surfaces of the joints of the precast concrete sections shall be coated with Portland Cement mortar. The precast sections shall be cleaned and moistened immediately prior to setting the sections in the mortar. A moistened brush shall be used to apply and smooth the mortar to the interior and exterior joint surfaces of the precast concrete sections.

27-17 CORROSION MONITORING

1. General

Contractor shall furnish and install the corrosion monitoring system components as indicated on the Plans and these Standard Specifications. Material shall be as specified in Section 10 and this section of these Standard Specifications. All corrosion monitoring equipment shall be supplied by a manufacturer regularly engaged in the production of such equipment. Equipment shall not be installed without prior review and approval by the Engineer.

Contractor shall install each system component in a workmanlike manner and in strict conformance with the latest edition of the following standards.

NEC	-	NATIONAL ELECTRICAL CODE
NEMA	-	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
ASTM	-	AMERICAN SOCIETY FOR TESTING AND MATERIALS
IEEE	-	INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS
ANSI	-	AMERICAN NATIONAL STANDARD INSTITUTE
IPCEA	-	INSULATED POWER CABLE ENGINEERS ASSOCIATION
OSHA	-	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
NACE	-	NATIONAL ASSOCIATION OF CORROSION ENGINEERS
UL	-	UNDERWRITERS LABORATORIES

All electrical equipment and materials and the design, construction and installation thereof shall comply with all applicable provisions of the National Electric Code (NEC) and applicable local codes and regulations.

Corrosion Specialist shall refer to a California registered Corrosion Engineer or NACE certified Corrosion Protection Specialist.

The system shall be complete and in a satisfactory operating condition at the time of acceptance of the work.

2. Equipment Locations

The locations of corrosion monitoring equipment, devices, outlets and appurtenances as indicated on the Plans are approximate only. Exact locations shall be determined by the Engineer.

Contractor shall verify in the field, all data and final locations of work done under other sections of these Standard Specifications required for placing of the electrical work.

3. Test Stations/Traffic Valve Boxes

Test stations shall be provided where shown on the Plans, and shall conform to the Standard Drawing W-1002 in Section 38 of these Standard Specifications. Test stations for insulated joints shall conform to the Standard Drawing W-1001 in Section 38 of these Standard Specifications. Test stations for anodes shall conform to the Standard Drawing W-1013 in Section 38 of these Standard Specifications. Test station junction boxes shall conform to the Standard Drawing W-1004 in Section 38 of these Standard Specifications.

Attachment of wire identification tags, split bolts and shunts shall be made as stated in these Standard Specifications.

4. Test Boards

Panel boards for test stations shall be made of phenolic plastic one-quarter inch (¼") thick and sized as shown on Standard Drawings W-1005, W-1006, and W-1014 in Section 38 of these Standard Specifications. Solderless copper lugs and capacitors shall be installed on the panel boards as shown on the Details. Shunts for the anode junction boxes shall be one-hundredth (0.01) ohm, six (6) ampere, manganin wire type, as indicated. Shunts shall be as manufactured by Holloway or equal.

5. Wire

Conductors shall consist of solid or stranded copper of the gage as shown on the Standard Drawings in Section 38 of these Standard Specifications. Wire sizes shall be based on American Wire Gage (AWG). Copper wire shall be in conformance with ASTM Designations B3 and B8.

Wires buried in the ground shall be laid straight, without kinks and shall have a minimum cover of twenty-four inches (24"). The bottom of the finished

trench shall be free from stones, roots or other materials that may damage the wire during or after installation.

Each wire run shall be continuous in length and free of joints or splices. Care shall be taken during installation to avoid punctures, cuts or other damage to the wire insulation. Damage to insulation will require replacement of the entire length of wire.

At least eighteen inches (18”) of slack shall be left for each conductor at each test station housing. Slack in the wire shall be sufficient to allow removal of wire extension for testing. Wire shall not be bent into a radius of less than eight (8) times the diameter of the wire.

The wire attached to the anodes shall be (AWG) stranded, single conductor, copper and insulated for six hundred (600) volts. Wire size shall be minimum No. 12 AWG THWN and conform to the requirements of ASTM D 2220 and NEMA WC-5. Connection of wire to the anode shall have a pulling strength, which shall exceed the tensile strength of the wire. Any damage to the wire insulation or anode shall require complete replacement of the wire and anode.

The anode manufacturer shall conduct and report resistance tests performed on each anode wire connection to assure the finished connection does not exceed four-thousandths (0.004) ohms. These resistance tests shall be performed with a Kelvin bridge circuit or equal. All anode wire connections that have a resistance value of greater than four-thousandths (0.004) ohms shall require replacement by the anode supplier prior to shipment. An accurate record of tests shall be submitted by the anode supplier to the Engineer.

Anode wires shall be of one continuous length without splices from the anode connection to the respective Junction Box. Anode wires with the attached anode shall be shipped to the job site with the wire wound on a reel. The minimum core diameter of the reel shall be five and a half inches (5½”).

Wire identifiers shall be installed in conformance with Standard Drawing W-1015 in Section 38 of these Standard Specifications. Wire identifiers for anodes shall be the wrap around type with a high resistance to oils, solvents and mild acids. Marker shall fully encircle wire with imprinted alphanumeric characters for pipe identification. Wire identifiers shall be placed on the wires prior to backfill, using nylon straps.

Red caution tape three inches (3”) in width shall be installed above buried wire and conduits at a maximum depth of eighteen inches (18”) below grade over the wire and conduit location.

6. Exothermic Welds

Exothermic welds shall be provided for cable to structure connections in strict accordance with the manufacturer's recommendations. Connections shall be made in accordance with Standard Drawing W-1011 in Section 38 of these Standard Specifications.

The shape and charge of the exothermic weld shall be chosen based on the following parameters:

Pipe material
Pipe size
Wire material
Number of strands to be welded
Orientation of weld (vertical or horizontal)

Type of exothermic weld to be used shall be submitted to the Engineer for approval.

Exothermic weld connections shall be installed in the manner and at the locations shown on the plans. Coating materials shall be removed from the surface over an area of sufficient size to make the connection. The steel surface shall be cleaned to white metal by grinding or filing prior to welding the conductor. The use of resin impregnated grinding wheels will not be allowed. The conductor shall be welded to the pipe by the exothermic welding process with a copper sleeve fitted over the conductor. Only enough insulation shall be removed such that the copper conductor can be placed in the welding mold. After the weld has cooled, all slag shall be removed and the metallurgical bond shall be tested for adherence to the pipe or casing. All defective welds shall be removed and replaced. Connections to the piping shall not be buried prior to inspection and approval by the Engineer.

Exothermic welds shall be tested by Contractor for adherence to the pipe or casing and for electrical continuity between the pipe or casing and wires. A twenty-two ounce (22oz.) hammer shall be used for adherence testing by striking a blow to the weld. Care shall be taken to avoid hitting the wires.

7. Field Repair of Coatings

After installation of coated items, contractor shall repair damaged shop-applied coatings and coat field welds with the coating manufacturer's recommended repair material. Contractor shall furnish all materials, clean surfaces and repair any damage to protective coatings and linings damaged as a result of the welding. This shall be done in accordance with these specifications.

For ductile iron or dielectrically coated steel, the coating shall be a bitumastic coating as listed in these specifications. All surfaces must be clean and dry and free of oil, dirt, loose particles and all other foreign materials prior to application of the coating. Exothermic welds shall be coated and then covered with a plastic weld cap.

For cement mortar lined and coated pipe or concrete cylinder pipe, the coating shall match the exterior mortar.

For epoxy-coated appurtenances, Contractor shall use an epoxy-coating touch-up kit. Prior to coating, surfaces shall be cleaned and ground to bare metal. Apply one or two coats as required to obtain a dry film thickness of eight (8) mils minimum using brush or spray. Brush shall be used for touch-up work of less than three square feet (3 sf). Field repairs shall comply with the recommendations of the coating manufacturer.

8. Bitumastic Coating

Bitumastic coating shall be TC Mastic, as manufactured by Tapecoat Company, Bitumastic 505 as manufactured by Koppers Company, Inc. or approved equal.

Contractor shall furnish all materials, clean surfaces and repair any damage to protective coatings and linings damaged as a result of the welding. This shall be done in accordance with these specifications.

9. Weld Caps

Weld caps shall be Royston Handy Cap, as manufactured by Royston Laboratories, Incorporated Thermit Weld Cap, as manufactured by Phillips Petroleum Company, or an approved equal.

10. Insulating Flange Kits

Insulating flange kits shall be installed to effectively isolate metallic piping from foreign metallic structures. Flange insulators shall be installed as shown on Standard Drawings W-902 and W-905 in Section 38 of these Standard Specifications.

Insulating flange gaskets shall include full-faced gaskets, insulating washers and sleeves, and steel washers. The complete assembly shall have a pressure rating equal to that of the flanges between which it is installed. Gaskets shall be neoprene faced phenolic, 1/8-inch thick having a high dielectric constant. Insulating sleeves shall be fabric reinforced resin, 1/32-

inch thick. Insulating washers shall consist of two sets of 1/8-inch thick neoprene faced phenolic, having a high dielectric constant.

The central gasket shall have a minimum electrical resistance of eighteen thousand megohms (18,000mΩ) for flanged joints larger than twelve inches (12”) in diameter and sixteen thousand megohms (16,000mΩ) for flanged joints twelve inches (12”) in diameter and smaller, be temperature rated to one hundred and fifty degrees Fahrenheit (150°F), and possess a water absorbency of no more than five (5) percent when tested in accordance with ASTM D 229.

Steel washers shall be cadmium plated and fit well within the bolt facing on the flange. Insulating washers shall fit within the bolt facing the flange over the outside diameter of the sleeve.

Bolts and nuts used for insulated flanged joints shall conform to ASTM A 307, Grade B, and ASTM A 563, Grade C3, respectively.

Insulating flange kits shall be installed to effectively isolate metallic piping from foreign metallic structures. Contractor shall test the performance of these insulating flange kits prior to backfill. An electric resistance test of at least fifty thousand ohms (50,000Ω) shall be performed on all insulated joints after each joint installation has been completed. If the results of the test for electrical resistance are less than fifty thousand ohms (50,000Ω), the joint shall be inspected for damage, repaired, as needed, and retested.

11. Joint Bonds

Bond cables or clips shall be provided across flexible couplings on steel pipe, cement mortar coated steel cylinder pipe joints, and ductile iron pipe joints as necessary to ensure electrical continuity. Joint bonds shall be installed as shown on Standard Drawings W-1008, W-1009, W-1011, and W-1012 in Section 38 of these Standard Specifications. Bond wires shall have minimal slack in the wire at each weld but otherwise be as short as possible.

After installation, all joint bonds shall be tested for effectiveness. The testing shall be performed prior to backfill of the pipe and shall be verified upon completion of backfilling operations. Prior to backfilling, current shall be circulated through the pipe and the measured resistance shall be compared to the theoretical resistance of the pipe and bond cables. The resistance measured shall not exceed one hundred and twenty percent (120%) of the theoretical resistance.

12. Polyethylene Encasement

Polyethylene encasement shall completely encase and cover all metal surfaces to form a continuous and all-encompassing layer of polyethylene between the iron and the surrounding earth or backfill material. Polyethylene encasement material shall conform to AWWA C 105.

Pipe: All ductile-iron pipe shall be encased with polyethylene sleeves in accordance with Method A described in AWWA C 105, or with polyethylene wrap in accordance with Method C described in AWWA C 105.

Fittings: Fittings such as tees, bends, reducers, and flanged outlets shall be encased with polyethylene wrap in accordance with AWWA C 105.

Valves: Valves shall have only the stem and operating nut exposed and the wrap shall be attached so that valve operation will not disturb the wrapping or break the seal.

Polyethylene sleeves shall be secured with polyethylene or vinyl adhesive tape or plastic tie straps at the ends and quarter points along the sleeve in a manner that will hold the sleeve securely in place during backfill. Polyethylene wrap shall be secured with polyethylene or vinyl adhesive tape in a manner that will hold the wrap securely in place during backfill.

13. Magnesium Anodes

Magnesium anodes shall be "High Potential" magnesium anodes of the following composition, percent by weight:

Aluminum	0.01% max
Manganese	0.50 - 1.30%
Copper	0.02% max
Nickel	0.001%max
Iron	0.03% max
Other	0.05% each or 0.30% max total
Magnesium	Remainder

The anodes shall be prepackaged in a cloth bag containing backfill of the following composition; seventy-five percent (75%) gypsum, twenty percent (20%) bentonite and five percent (5%) sodium sulfate. The magnesium anodes shall be of the size indicated and placed where indicated. Cable for the anodes shall be black, No. 12 AWG THWN, stranded, and of sufficient length to extend to the junction box without splicing.

Anodes shall be cast with a galvanized steel core strap. One end of the anode shall be recessed to provide access to the rod for connection of the lead wire. The lead wire shall be silver brazed to the rod, making a mechanically secure connection. The connection shall be insulated to a six hundred volt (600v) rating by filling the recess with asphaltic concrete. The asphaltic concrete material shall be extended over the lead wire insulation by not less than one half inch (½"). Contractor shall repair all damaged lead wire insulation as directed by the Engineer and at no additional cost to the City.

Prepackaged anodes shall be installed at the locations indicated. Plastic or paper wrap shall be removed from the anode prior to lowering the anode into the hole. Anodes shall not be suspended by the lead wires. When compacted soil is required and has been placed to the top of the anode and prior to the filling of the hole with soil, a minimum of 10 gallons of water shall be poured into the hole to saturate the anode backfill and surrounding soil.

Backfilling with native soil shall proceed in six inch (6") lifts, compacting the soil around the anode during each lift until the backfill has reached grade. Damage to the canvas bag, anode to wire connection, copper wire or wire insulation will require replacement of entire assembly.

Anodes shall not be backfilled prior to inspection and approval of the Engineer.

14. System Check-Out

Upon completion of the installation, Contractor shall provide testing of the system by a qualified Corrosion Specialist, approved by the Engineer, to ensure compliance with the Plans and these Standard Specifications. The testing by the Corrosion Specialist shall be in addition to, and not a substitution for, any required testing of individual items at the manufacturer's plant or in the field by Contractor.

a. Testing

The following test results shall be submitted to the Engineer:

i. Continuity test report

ii. Insulator test results

iii. Initial pipe-to-soil potential survey

The assembled flange shall be tested with a Gas Electronics Model 601 Insulator Checker or equivalent instrument that is specifically

designed for the testing of insulating flanges. The testing shall be done in accordance with NACE RP0286-97. If a short is indicated, each bolt shall be tested to verify the integrity of each insulating sleeve before the flange is disassembled. Contractor shall provide assistance in finding any and all shorts or shorted bolts.

Contractor shall locate and repair any defects that may become apparent during testing. All efforts by Contractor to test and repair defects, including excavation and replacement of backfill that has been already placed, will be at Contractor's expense. The system will not be considered free from defects until the Corrosion Specialist retests and confirms that all defects have been eliminated.

b. Written Report:

The Corrosion Engineer retained by Contractor shall prepare a final report that contains the following:

i. Verification that all test stations have been installed properly.

ii. Verification that all insulating flanges have been tested with an approved test instrument and that all have passed.

iii. Field continuity test data, calculations of actual (measured) pipe resistance from the data and calculations of the theoretical resistance for each section of pipe tested. The report shall include a statement that each section of pipe that contains a bonded or mechanical joint was tested and that the resistance of each section tested was less than or equal to one hundred and twenty percent (120%) of the theoretical resistance.

iv. Verification that all casings are isolated from the pipe.

v. Tabulation of all pipe-to-soil potential survey data.

vi. Other information that the Corrosion Engineer believes is pertinent with respect to the corrosion status or long-term performance of the pipeline or structure installed.

27-18 PAYMENT FOR FURNISHING AND INSTALLING WATER DISTRIBUTION SYSTEMS

Unless unit bid prices are required by the Special Provisions, payment for the item "Water Distribution System to construct" shall be made at the lump

sum price. Such payment shall be full compensation for furnishing all labor, material, tools, and equipment and doing all work involved in cutting, trenching, laying, blocking, making connections, disinfecting, testing, backfilling, and paving or repaving, as required herein, on the Plans or in the Special Provisions.

Section 28

DRIVEWAY CULVERT AND SIDEWALK FRENCH DRAINS

28-1 DRIVEWAY CULVERT

Driveway culvert shall be reinforced concrete pipe (RCP), high density polyethylene (HDPE) with smooth bore, corrugated metal pipe (CMP), or field assembled metal plate as called for on the plans. Material shall conform to Section 10 and the following:

1. Pipe Materials

RCP shall be ASTM C 76, Class III. CMP and field assembled plate shall be minimum of 12 gage, galvanized or aluminized pipe. HDPE shall be smooth interior, shall conform to ASTM F 894 and referenced standards contained therein or AASHTO M 294 with HDPE belled ends; resin utilized in manufacture of M294 polyethylene pipe shall conform to ASTM D 1248 and ASTM D 3350. HDPE pipe shall have a minimum Ring Stiffness Constant (RSC) of 63 and/or a minimum SDR rating of 26. Joints shall be rubber gasket material conforming to ASTM F 477, or shall be fused, and shall be capable of the same water tightness as PVC (ASTM 3212).

2. Installation

Installation of RCP shall be in accordance with Section 26. Installation of HDPE shall conform to ASTM D 2321 and additional requirements contained therein or ASTM F 714, ASTM D 3261, ASTM D 3350, and ASTM 1248. CMP shall be placed in accordance with Section 66 of the State Specifications. Field assembled plate culvert shall be placed in accordance with Section 67 of the State Specifications.

28-2 SIDEWALK FRENCH DRAINS

Sidewalk French drains shall be placed in new construction when directed by the Engineer or when shown on the plans and shall conform to applicable portions of Section 26 and the following:

1. Pavement Cutting

Pavement cutting shall conform to Sections13-3, and 38 (STD DWG T-8). The thickness of existing AC to be cut and AB is variable. There shall be no additional payment due to the varying thickness of AC and AB. Existing street surface to be removed shall be saw cut in a neat line and shall be disposed of away from the project site in a location and manner satisfactory to the

Engineer. Pavement removal shall not precede trenching by more than seven (7) calendar days unless approved by the Engineer.

2. Placement of French Drains

In new construction, French drains are normally placed underneath, and in alignment with the gutter in accordance Standard Drawing T-40.

3. Trench Excavation

Trenches shall be graded to the lines and sections as shown on the Plans or where directed by the Engineer and shall be in accordance with the provisions of Section 14.

Care shall be exercised to prevent excavation below the grade for the bottom of the trench, and areas excavated below grade shall be filled with suitable material and thoroughly compacted by Contractor at his/her expense.

Excavated material shall become the property of Contractor and shall be disposed of away from the site.

4. Crushed Rock

Contractor shall place Type C Crushed Rock conforming to Section 10 and in accordance with Standard Drawing T-40.

5. Perforated Pipe

All French drains shall be four inches (4") in diameter unless otherwise indicated. Perforated pipe shall be polyvinyl chloride (PVC) pipe with perforations throughout the length of the pipe and conforming to the applicable portions of AASHTO M 252. Alternatively, pipe may be perforated corrugated polyethylene tubing conforming to the applicable portions of AASHTO M 252 or M 294.

6. Filter Fabric

Filter fabric shall conform to Sections 68-1.03, 88-1.01, and 88-1.03 of the State Specifications.

7. Drain Inlet Penetrations

Cast in place drain inlets shall be core bored and french drain lead pipes connected to manholes using "Kor n' Seal Cavity O-Ring" by NPC Inc., or

approved equal. Connecting French drains to pre-cast drain inlets shall be per Section 30, “Drain Inlets.”

28-3 PAYMENT

Payment for pipe culvert will be at the price bid per lineal foot and will include full compensation for furnishing and laying the pipe, excavation, backfill, compaction, special foundation treatment, dewatering, incidentals and all other work necessary to place pipe culvert.

Payment for sidewalk French drains will be at the price bid per lineal foot and will be considered full compensation for constructing the French drains, connections to drain inlets or manholes, clean crushed rock, filter fabric, all labor, materials, tools, equipment and all incidentals and work necessary to complete this item in place. Steel under sidewalk drains and replacement of existing asphalt pavement shall be paid for separately.

Section 29

MOVING OR CHANGING UTILITIES AND WATER SERVICES

29-1 UTILITIES AND FRANCHISES

If it is required to move a public utility or franchise, the owner will be notified by the Engineer to move such, and Contractor shall protect the facility from damage and not interfere with such facilities until after it is moved.

The City and owners of public utilities and franchises reserve the right to enter upon the street for the purpose of making necessary repairs or making changes in their facilities made necessary by the work.

29-2 PROVISION FOR UTILITY CONNECTION

The City reserves the right to construct or reconstruct any sewer, water, drain, electric or any other facility, to grant permits to lay gas, electric, or communication lines, conduits, and other facilities, and to make connections thereto, at any time during the work.

29-3 COOPERATION OF CONTRACTOR DURING RELOCATIONS AND UTILITY CONNECTIONS

Contractor shall not interfere with or place any impediment in the way of any person or persons authorized by the City to perform such relocations and utility connections.

The City of Sacramento reserves the right to suspend the work on any part of an improvement at any time during the construction of the same, for the purposes stated above.

Section 30

DRAIN INLETS, GUTTER DRAINS AND DITCH BOXES

30-1 DRAIN INLETS

Drain inlets shall conform to Sections 10 and Standard Drawings S-10, S-20, S-21, S30, S-40, and S-65 of Section 38 of these Standard Specifications. Drain inlets shall be pre-cast or cast in place or a combination of the two. Hand forming of concrete will not be allowed. For cast in place drain inlets, maximum wall thickness shall be 8 inches. Concrete shall be Type A or B in Accordance with Section 10 of these Specification.

30-2 DRAIN INLET GRATE AND HOOD

The grate shall conform to drawings included in Section 38 of these Specifications. Joints and connections between grate frame, hood and vertical walls of drain inlet shall be smooth and continuous, with a slight broom finish or equivalent. If steel, surfaces shall be covered with an asphaltic paint.

30-3 GUTTER DRAINS

Gutter drains shall conform to Standard Drawings S-42, S-45, S-50, S-55, and S-60 of Section 38 of these Standard Specifications.

30-4 WATER QUALITY MARKING

All drain inlet and gutter drain installations shall include a permanent storm water quality marking conforming to Section 38 of these Specifications.

30-5 PAYMENT

Payment for drain inlets, gutter drains or ditch boxes will be at the price bid per each and will be considered full compensation for excavation, material and labor necessary to construct this item in place.

Section 31

CONSTRUCTION OF CHAIN LINK FENCE

31-1 MATERIAL IN FENCE

Chain link fence shall conform to Section 10-38 of these Specifications.

31-2 CONSTRUCTING FENCE

Chain link fence shall be constructed in accordance with Standard Drawing T-90 of Section 38 of the Standard Specifications, with 72-inch high fabric topped with three strands of equally spaced barbed wire attached to 45-degree post top mounted breakaway arms for a total fence height of seven (7) feet, unless otherwise specified or shown on the Plans.

The line of the fence shall be cleared of all obstructions and surface irregularities and the bottom of the fence shall be to uniform grade as may be established by the Engineer. The posts shall be spaced not more than ten feet (10') apart and at points specifically shown on the Plans.

Terminal posts, gate posts, and line posts shall be set thirty-six inches (36") in concrete footings. Concrete shall be Class "C" as set forth in these Specifications. Concrete footings for terminal, gate and line posts shall be allowed to cure for not less than seven (7) days before wire fabric is placed. Set posts to within six (6) inches from the bottom of the concrete footing. Set top of footing at post two (2) inches above finish grade. Slope top of footing for water runoff.

Stretcher bar and truss bands shall be spread and slipped on end, corner, pull, brace, and gate posts before installation of top rails. Extension joints shall be provided for rails at intervals of one hundred feet (100'). Bottom tension wire shall be seven (7) gauge galvanized coil spring steel.

The placing of the rails, braces, and the wire fabric shall be accomplished in such a manner that the finished fence shall be taut, true, and of precise workmanship throughout. The fabric shall be stretched so that no slack sections remain at any point. The fabric shall be securely tied to posts and rails in a manner so that the fabric will remain tight and immovable. Position fabric three (3) inches above finish grade. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

Install gates using fabric to match fence. Install three (3) hinges per leaf. Install latch, catches, foot bolts and sockets, retainer and locking clamp. Provide concrete center rest and drop bolt retainers at center of double gate

openings. Install center brace rail on all gate leaves. Gates shall be so set that they are true and will swing freely in the direction indicated on the Plans.

Provide standard commercial grade locking latches for use with padlocks on all gates, and provide 3/8”diameter U-bolts welded (1/4” fillet weld) to gate posts and gate frame for backup chain and lock.

31-3 VINYL SLATS

When shown on the Plans or specified in the Special Provisions, chain link fence shall be constructed with vinyl slats. The slats shall be inserted vertically into each mesh of the wire fabric. The slats shall be fastened in position by the weaving machine which shall produce a bow knuckle at both ends of the slats. No staples in the slats are permitted. The slats shall be of redwood color, unless otherwise directed.

31-4 PAYMENT FOR FENCING

Payment for chain link fencing and chain link fencing with vinyl slats shall be at the price bid per lineal foot, unless otherwise stated in the Special Provisions. Gates shall be paid for separately at the price bid per each gate of a specified size, unless otherwise stated in the Special Provisions. Payment shall include full compensation for furnishing all fencing material, labor, equipment, concrete, or other materials and constructing the fence or gates at the location shown on the Plans or as otherwise directed.

Section 32

TRAFFIC SIGNS, MARKINGS, AND BARRICADES

32-1 TRAFFIC SIGNS

1. General

Signs shall conform to Section 56, "Signs", of the State Specifications, and these Specifications.

2. Overhead Sign Structures

Overhead sign structures shall conform to Section 56-1, "Overhead Sign Structures", of the State Specifications and these Specifications.

3. Roadside Signs

Roadside signs shall conform to Section 56-2, "Roadside Signs", of the State Specification, and these Specifications. Unless otherwise shown or specified in the Contract, all signs and pipe posts shall be furnished and installed by Contractor.

City Specialty Signs shall conform to Standard Drawings of Section 38 of these Standard Specifications.

City Specialty Signs may be purchased from the Signs and Markings operation of the Streets Division.

Construction signs shall conform to the provisions of the U.S. Department of Transportation, Federal Highway Administration, "Manual on Uniform Traffic Control Devices" and the California Suppilment.

4. Material

Sign panel fastening hardware shall conform to Section 56-2.02D, "Sign Panel Fastening Hardware", of the State Specifications, and these Specifications. Lag screws, bolts, metal washers, and nuts may be cadmium-plated steel instead of commercial quality galvanized steel. All street name signs shall be fastened with stainless steel hardware and strapping.

Wood posts and laminated wood box posts as referenced in Section 56-2.02B "Wood Posts" and Section 56-2.02C "Laminated Wood Box Posts" of the State Specifications shall not be allowed.

5. Construction

Construction shall conform to Section 56-2.03, "Construction", of the State Specifications and these Specifications. Wood Posts and Laminated Wood Box Posts shall not be allowed.

6. Installation

Installation shall conform to Section 56-2.04 "Sign Panel Installation", of the State Specifications and these Specifications. Socket-Mounted Stanchions: Socket-mountings shall conform to Standard Drawing T-260. Socket mounting is used on median signs and on signs installed in asphalt, or as specified on plans.

32-2 THERMOPLASTIC PAVEMENT MARKINGS

Thermoplastic traffic stripes and markings, both white and yellow, shall be placed as shown on the Plans, and in conformance with Sections 84-1 and 84-2 of the State Standard Specifications. All striping details shall be in conformance with the State Standard Plans (latest edition). Removal of Thermoplastic shall be per State Specification 15-2.02B.

1. Material

Thermoplastic shall be Alkyd type for extrusion application and shall produce an adherent reflectorized strip capable of resisting deformation by traffic.

The thermoplastic material shall be 100 percent solids. The binder shall consist of synthetic alkyd resins and shall be homogeneously incorporated with all the necessary prime pigments, fillers, and glass beads to produce a traffic coating to meet the requirements as specified herein. The characteristics of finished thermoplastic are shown on Table 32-2.01

	White	Yellow
Glass Beads, AASHTO M-247, Type I, percent by weight, min. (Cal. Test Method 423)	30	30
Titanium Dioxode (TiO2), percent by weight, min. (AASHTO T250-77)	10	
Lead Chromate, Medium Heat Stability, percent by weight, min.		2.5
Specific Gravity, max. (Cal. Test Method 423)	2.15	2.15

	White	Yellow
Binder, percent by weight, min. (Cal. Test Method 423)	18	18
Ring & Ball Softening Point, ¤F (ASTM E28)	200 – 240	200 – 240
Tests on Material after 4 hours heat with stirring at 425¤ + 2¤F, which includes 1 hour for meltdown and temperature stabilization:		
Bond Strength to Concrete, 0.125-inch thick film drawdown at 425¤F test at 75¤F + 2¤F, psi, min. (Cal. Test Method 423)	180	180
Brookfield Thermosel Viscosity, Spindle SC4-27, 20 RPM at 425¤F, Poise (Cal. Test Method 423)	30 – 45	30 – 45
Impact Resistance, Falling Ball Method, 0.125-inch thick film drawdown at 425¤ F on concrete. Test at 75¤F + 2¤F inch-lbs., (ASTM D 2794)	10	10
Daylight Luminous Reflectance, min. (ASTM E97)	75	40
Yellowness Index, max., (ASTM E313)	15	
Hardness, Shore A-2 Durometer with 2 kilogram weight at 115¤F (Cal. Test 423)	60 – 80	60 – 80
Low Temperature Stress Cracking, Resistance at 25¤F (AASHTO)	No Crack	No Crack
Color Match, Federal Std. No. 595a, Color No. 33538		Passes

Table 32-2.01

2. Application

The thermoplastic material shall be applied by extrusion methods in a single uniform layer. Stencils shall be used when applying thermoplastic material for pavement markings. Stencils may be new or used, if in good condition. If stencils are bent or damaged, they shall be replaced at the request of the Engineer.

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. Surface must be dry before application. Contractor may use artificial method to dry the pavement surface.

Unless otherwise specified in the Special Provisions, the thermoplastic material for traffic stripes shall be applied at a minimum thickness of 0.075-inch. Thermoplastic Material for pavement markings shall be applied at a minimum thickness of 0.125-inch. Glass beads shall be applied immediately to the surface of the molten thermoplastic material, at a rate of not less than 8 lbs. per 100 sq. ft. The amount of glass beads applied shall be measured by stabbing the glass beads tank with a calibrated rod.

Contractor shall apply all traffic stripes and markings on new asphalt surface in accordance with the manufacturer's recommendations.

3. Tolerances and Appearance

The completed traffic stripes and markings shall have clean and well-defined edges without deformations, and shall be free of tears or other disfigurements. Improperly placed, defective, or disfigured traffic stripes and markings shall be immediately removed from the pavement surface by methods approved by the Engineer. All such removal work shall be at Contractor's expense.

Completed traffic stripes shall be uniform, shall be straight on tangent alignment, and shall be on a true arc on curved alignment. On tangent alignment, when a 100' string line is stretched taught and placed directly on the outer edge of the completed traffic stripe, the distance between the string and the edge of the traffic stripe shall not exceed three-fourths of one inch (3/4") when measured anywhere along any 100' interval of the tangent alignment. On curved alignment, the outer edge of the traffic stripe shall not deviate more than three-fourths of one inch (3/4") from the true arc. The lengths of the gaps and individual stripes that form broken traffic stripes shall not deviate more than 2" from the lengths required to produce a uniformly repeating, broken-stripe pattern.

4. Time Limitations

All permanent marking must be placed no earlier than three (3), and no less than seven (7), days from the placement of slurry seal. Partial removal of roadway markings shall be replaced within two (2) weeks. Contractor may contact City Signs and Markings to replace markings at cost.

32-3 PAINTED PAVEMENT MARKINGS

1. General Requirements

Painted pavement markings shall not be used unless directed by the Engineer. If directed, painted pavement markings shall be placed in conformance with the State Standard Plans (latest edition) and Sections 84 of the State Specifications except as modified herein.

2. Materials

Section 84-3.02 materials of the State Standard Specifications shall be amended to read as follows:

The paint thickness shall be 12 to 14 mils wet. Thinning of paint will not be allowed, except when placed for temporary markings that will be replaced within two (2) weeks.

3. Certificate of Compliance

When requested, Contractor shall provide the Engineer with a manufacturer's certificate of compliance which certifies that the paint comply with the specifications contained herein. Contractor shall also provide the Material Safety Data Sheet (MSDS) on all material.

4. Time Limitations

All permanent marking must be placed within three (3) days of final paving. Partial removal of roadway markings shall be replaced within two (2) weeks. Contractor may contact City Signs and Markings to replace markings at cost.

5. Quality

The completed markings shall have clean and well-defined edges without deformations, and shall be free of tears or other disfigurements. Improperly placed, defective, or disfigured markings shall be immediately removed from the pavement surface by methods approved by the Engineer. All such removal work shall be at Contractor's expense.

32-4 RAISED REFLECTIVE PAVEMENT MARKERS

1. General Requirements

Raised reflective pavement markers shall conform to Section 85 of the State Specifications except as noted herein.

2. Materials

Raised reflective pavement markers shall be #290 manufactured by 3M Company or approved equivalent and shall be placed in conformance with Section 85 of the State Standard Specifications.

3. Placement

Blue raised reflective pavement markers shall be placed in the street, 6" - 12" off of centerline and perpendicular to the fire hydrant. Markers shall be blue with two reflective faces.

Green raised reflective pavement markers shall be placed in the street, 6" - 12" off of centerline and perpendicular to the "backyard" manhole. Markers shall be green with two reflective faces. Contractor shall be responsible for locating, inventorying and replacing all green raised reflective markers. Contractor shall provide to the Engineer an inventory list of all green raised reflective markers before starting construction.

32-5 TEMPORARY PAVEMENT MARKINGS

1. General Requirements

Temporary pavement markers shall be furnished, placed, maintained, and later removed as specified in the Special Provisions, and as directed by the Engineer.

2. Materials

The following markers are approved for use on City of Sacramento street resurfacing projects:

Temporary Overlay marker (Types Y and W) manufactured by Davidson Plastics Company, 18726 East Valley Highway, Kent, Washington 98032, telephone (206) 251-8140.

Safe-Hit Temporary Pavement Marker, manufactured by Safe-Hit Corporation, 1930 West Winton Avenue, Building #11, Hayward, CA 95545, telephone (415) 783-6550.

Swareflex Pavement Marker (Models 3553, 3554, Cat Eyes Nos. 3002 and 3004), manufactured by Swareco and distributed by Servtech Plastics Inc., 1711 South California Street, Monrovia, CA 91016, telephone (818) 359-9248.

Stimsonite Construction Zone Marker (Model 66), manufactured by Amerace Corporation, Signal Products Division, 7542 North Natchez Avenue, Niles, IL 60648, telephone (312) 647-7717.

Flex-O-Lite Raised Construction Marker (RCM), manufactured by Flex-O-Lite, Lukens Company, P.O. Box 4366, St. Louis, MO 63123-0166, telephone (800) 325-9525.

3M Scotch-Lane A200 Pavement Marking System (reflective raised pavement marker on reflective traffic line tape), manufactured by 3M Company, Highway Safety Products, 1010 Hurley Way, Suite 300, Sacramento, CA 95825, telephone (916) 924-9605.

MV Plastics Chip Seal Marker (1280/1281 Series with Reflexite Polycarbonate, PC 1000, reflector unit), manufactured by MV Plastics, Inc., 533 W. Collines Avenue, Orange, CA 92667, telephone (714) 532-1522.

3. Placement

Temporary reflective raised pavement markers shall be placed in accordance with the manufacturer's instructions. Temporary reflective raised pavement markers shall be cemented to the surfacing with the adhesive recommended by the manufacturer, except epoxy adhesive shall not be used.

At the direction of the Engineer, Temporary pavement striping may be required.

After paving and or planing, temporary pavement markers shall be placed on all existing striped streets that are opened to public traffic prior to final striping in accordance with the striping diagrams. Temporary pavement markers that are damaged from any cause during the progress of the work shall be repaired or replaced by Contractor at his expense.

When no longer required for the work as determined by the Engineer, temporary pavement markers shall be removed in accordance with the provisions in Section 15-2, "Miscellaneous Highway Facilities," of the State Standard Specifications, except as otherwise provided herein. If the temporary

pavement markers to be removed are on surfacing that is to be removed, the temporary pavement markers may be removed and disposed of in conjunction with the removal of the surfacing, providing such pavement markers do not interfere with the required traffic lane delineation, as determined by the Engineer.

The 14-day waiting period for placing pavement markers on new asphalt concrete surfacing shall not apply to temporary pavement markers.

32-6 TEMPORARY STREET SIGNS

Temporary street signs shall conform to this Section 32-1 and Section 38 of these Specifications. The signs shall be placed as shown on the Plans. Their exact location and orientation shall be designated by the Engineer.

The dimensions of the materials shall be as shown in Section 38. The post shall be either redwood or Douglas Fir. Douglas Fir shall be treated with a wood preservative in conformance with Section 58 of the State Specifications. The signboard shall be exterior plywood. Paint shall be a quality latex base for exterior wood.

The sign shall have black letters on a white background. Gothic letters similar to those in Section 38 shall be used. The lettering shall be four inches (4”) in height with a stroke width of no less than one-half inch (½”) or more than three-fourths inch (¾”). Numeral suffixes, i.e., st, nd, rd, and th, shall be two inches (2”) in height with a stroke width of no less than one-fourth inch (¼”) or more than three-eighths inch (⅜”). The back of the sign-board and the post shall also be painted white.

Each sign-board shall be fastened to the post by bolts. The bottom of the sign shall be no less than seven feet (7’) above the ground. Payment for temporary street signs shall be the Contract price bid per each complete in place.

32-7 STREET BARRICADES

Street barricades shall conform to this Section and Section 38 of these Standard Specifications. The barricades shall be placed where shown on the Plans or designated by the Engineer.

Wood members shall be either redwood or Douglas Fir. Douglas Fir shall be treated with a wood preservative in conformance with Section 58 of the State Specifications.

A fully reflectorized sign 18 inches by 18 inches (18” X 18”) (2.25 square

feet) shall be placed on the barricade with bolts, nuts, and washers, and shall face on-coming traffic to designate dead end streets. All barricades shall be painted white in color, with two (2) applications of a quality latex base paint for exterior wood.

32-8 PAYMENT

Payment for traffic signs, including overhead sign structures and roadside signs shall be at the price bid per each and shall conform to Section 56-1.06, "Payment" of the State Specifications, and these Specifications. The price bid for each sign of the type or types designated in the Contract will include full compensation for furnishing all labor, materials, (except City furnished material), tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing roadside signs, complete in place, including the installation of sign panels, shown or specified in the Contract, specified in these Specifications, and as directed by the Engineer.

Measurement for overhead and roadside sign structures shall conform to Section 56-1.10, "Measurement" of the State Specifications, and these Specifications. Signs will be measured by the unit from actual count, complete in place, of the type or types of signs designated in the Contract.

Payment for thermoplastic pavement markings will be at the unit price bid per lineal foot for striping as measured by the lineal foot of thermoplastic material placed. No payment will be made for gaps in broken traffic stripes. Double center stripes will be paid as two (2) four-inch (4") stripes. Regular cross walks, parking Tees and L's will be measured by the lineal foot. Payment for all other thermoplastic marking will be at the price bid per square foot of thermoplastic material placed. Payment for all thermoplastic markings will be considered full compensation for furnishing all labor, material, tools, equipment and incidentals, and for doing all work involved in removing existing striping and placing stripes and markings, as specified in the Special Provisions and as directed by the Engineer. Existing striping shall be removed by grinding.

The quantities of thermoplastic traffic stripes or thermoplastic pavement markings may be adjusted, deleted, or omitted as directed by the Engineer to meet the existing requirements. No adjustment to the unit price bid will be made because of a change in quantity from the Engineer's estimate.

Payment for bike legends will be at the unit price bid per square foot and will include full compensation for furnishing all labor, material, tools, equipment and incidentals, and for doing all work involved in removing existing and painting new pavement markings, as specified in the Special Provisions and as directed by the Engineer.

Payment for painted pavement markings will be at the price bid per square foot bid for the actual area painted.

Payment for raised reflective pavement markers shall be at the unit price bid per each and shall include full compensation for furnishing all labor, material, tools, equipment, incidentals required to perform all work involved with placing pavement markers, including removal of existing pavement markers, as shown on the layout diagrams, as specified in these Special Provisions and as directed by the Engineer.

Payment for street barricades shall be at a unit price for each barricade constructed. This price will include full compensation for constructing street barricades complete in place as shown on the Plans.

Section 33

PNEUMATICALLY APPLIED MORTAR

33-1 GENERAL

Also known as air-blown mortar, gunite, or shotcrete, this section refers to premixed sand and cement, pneumatically applied by suitable mechanism and competent operators, and to which mixture water is added immediately previous to its expulsion from the nozzle. The pneumatically applied mortar shall be placed at the thickness shown on the Plans or called for in the Special Provisions. The resulting surface shall be uniform and free from humps or depressions.

33-2 MATERIALS

Portland Cement shall conform to the requirements of Section 10-1 and shall be Type II, unless otherwise specified in the Special Provisions.

Sand shall be clean, sharp, and free from clay, silt and loam. It shall be well graded and suitable for the purpose intended with no particles larger than three-eighths inch (⅜") in diameter.

The sand shall contain not less than three percent (3%) nor more than six percent (6%) moisture by weight.

Material quality assurance shall be in accordance with pertinent provisions of ACI 506.2, except as modified herein. Product handling shall conform to ACI 506.2, and these provisions. The mix design shall conform to ACI 318 and shall obtain a twenty-eight (28) day compressive strength of 3,000 psi.

33-3 PROPORTIONS

The proportion of cement to sand shall be based on dry and loose volume and shall not be less than one part Portland Cement to four and one-half parts sand. The water content shall be maintained at a practical minimum and not in excess of three (3) gallons per sack of cement as placed. Admixtures shall conform to ASTM C 494, Type A. Calcium chloride or admixtures containing any amount of calcium chloride shall not be used.

33-4 MIXING

Before being charged into the machine the cement and sand shall be thoroughly mixed dry in an approved power batch mixer equipped with a

device for accurately measuring the quantity of sand and timing the mixing operation. The mixture shall be mixed for at least one and one half (1½) minutes during which time the mixer shall rotate at a peripheral speed of two hundred feet (200') per minute. The dry mixed materials shall be used promptly after their preparation and any material which has been mixed for more than forty-five (45) minutes shall be wasted. Rebound shall not be used on any portion of the work.

33-5 PREPARATION OF SURFACE

When gunite is to be placed on an earth slope for embankment protection, the earth surface shall be cleaned of grass, roots, and other deleterious matter. The surface shall be evenly graded to the lines, grade, and sections as indicated on the drawings. The surfaces shall be moistened thoroughly to prevent moisture from being drawn from the freshly placed lining. All surfaces on which lining is to be placed shall be free from water, mud and debris, and shall be firm enough to prevent contamination of the fresh lining by earth or other foreign material. When gunite is applied to steel or concrete structures the surface must be cleaned of all loose material and be damp, as above specified at the time of application of the material. Header board shall be placed as indicated on the Plans.

33-6 PLACING

The velocity of the material as it leaves the nozzle shall be such that minimum rebound occurs. Velocities of the material must be kept constant. The nozzle shall be held in such position and at such distance that the stream of flowing material will impinge at approximately right angles to the surface being covered and so that excessive impact will be avoided.

Pneumatic pressure at the machine shall not be less than thirty pounds per square inch (30 psi) when the length of hose does not exceed one hundred feet (100'). Pressure shall be increased five pounds per square inch (5 psi) for each additional fifty feet (50') of hose or fraction thereof. Water used for hydration at the nozzle shall be supplied at pressure of not less than fifteen pounds per square inch (15 psi) greater than the air pressure. The mortar must have uniform consistency at all times.

The mortar lining shall be applied to the surface at the thickness and to the limits indicated on the drawings. Wires shall be placed at a maximum of 10 foot intervals, both horizontal and vertical, to control finish grade and thickness. The appearance shall be neat and uniform. At regular intervals, the fresh surface shall be checked with a minimum ten (10) foot length straight-edge, and all low spots or depressions shall be filled to finish grade. Finished lining surfaces shall be plus-or-minus ½ inch from the specified grade. Lining

thickness tolerances shall be plus-or-minus ½ inch. The finished surface shall be smooth and uniformly constructed with a stiff broomed finish.

33-7 CURING AND PROTECTION

Curing shall be accomplished as set forth in Section 19-8 or Section 20-13 of these Specifications. Contractor's attention is directed to Section 7-8, "Protection of Work, Persons, and Property Against Damage", of these Specifications.

The lining shall be protected after placement in accordance with the requirements of Section 20-13.

33-8 REINFORCEMENT

Steel reinforcement shall conform to Section 10 and shall be of the type shown on the Plans or called for by the Special Provisions. Reinforcement shall be embedded in the mortar so that it will be a minimum of one inch clear from either face of the mortar unless otherwise noted.

33-9 JOINTS

Joints in Pneumatically Applied Mortar shall be neat and square, shall be constructed where shown on the plans and in accordance with the Special Provisions and the following:

1. Construction Joints

Construction joints shall be square, and shall be edged with a 1/4-inch radius edging tool. The edge shall be thoroughly wetted before the next section of lining is place. Construction joints shall be constructed whenever the operation is halted for a period exceeding thirty (30) minutes. Welded wire fabric reinforcing shall extend through the construction joint.

2. Expansion Joints

Transverse expansion joints shall be constructed at intervals of twenty (20) feet and as located on the drawings. Expansion joints shall be filled with premolded expansion joint filler material. The material shall have a minimum thickness of 3/8 inch and shall conform to ASTM D 1751. Expansion joints shall be edged with a 1/4-inch radius edging tool.

3. Contraction Joints

Transverse contraction joints shall be constructed at intervals of ten

(10) feet and shall be scored by troweling a groove 5/8 inch in depth and 1/4 inch in width. All joints shall be true to a uniform line and neat in appearance.

33-10 PAYMENT

Payment for Pneumatically Applied Mortar shall be at the price bid per square yard and shall be considered full compensation for doing all work and for furnishing all labor, material, and equipment necessary to complete this item in place. No additional compensation will be allowed for rebound.

Section 34

ELECTRICAL

34-1 GENERAL

The electrical work to be done consists of furnishing all labor, materials, transportation, tools, equipment and appurtenances required for the complete installation and testing of all electrical systems shown on the Plans, and as specified in these Standard Specifications, Special Provisions and California Administrative Code G.O. 128.

All equipment, materials and supplies shall be new and currently manufactured unless otherwise specified. All equipment shall be complete and in operation to the satisfaction of the Engineer at the time of acceptance of the work.

All incidentals parts which are not shown on the Plans or specified herein and which are necessary to complete the traffic signal and street lighting systems shall be furnished and installed as though such parts were shown on the Plans or specified herein.

34-2 RULES AND REGULATIONS

Electrical equipment furnished shall conform to the standards of the National Electrical Manufacturers Association, the Underwriters' Laboratories, Inc., or the Electronic Industries Association, wherever applicable. All material and work shall conform, where applicable, to the requirements of the National Electrical Code; Title 8, California Administrative Code, Electrical Safety Orders; Rules for Over Head Electrical Line Construction, General Order No. 95 of the Public Utilities Commission; Standards of the American Society for Testing and Materials (ASTM); American National Standards Institute (ANSI); and City of Sacramento ordinances governing such types of construction.

34-3 EQUIPMENT LIST AND DRAWINGS

Unless otherwise permitted in writing by the Engineer, Contractor shall, within twenty (20) days following notification of award of the Contract, submit to the Engineer for approval a listing of equipment and material which he proposes to furnish and install. The list shall be complete as to name of manufacturer, size and catalog number of unit, and shall be supplemented by other data, including detailed scale drawings and wiring diagrams. A minimum of five (5) copies of the above data shall be submitted to the Engineer for review and approval.

Contractor shall submit to the Engineer a statement from each vendor supplying electrical equipment, including but not limited to, traffic signal controllers, signal heads, standards, luminaires, service pedestals and all other electrical equipment indicating that the orders for the materials required for this contract have been received and accepted by said vendor. The confirmed date of delivery to Contractor shall be indicated on the statement.

Prior to acceptance of the work, Contractor shall submit to the Engineer a "Record Drawing" showing in detail all construction changes, especially location and depth of conduit and completed schematic circuit diagram. All construction changes, if any, shall be entered onto the Record Drawing by Contractor at the end of each work day and the plan shall be available for inspection by the Engineer at any time.

34-4 SCHEDULING OF WORK

Contractor shall not perform any electrical work above ground at any location until all electrical materials for that location have been received by Contractor and are on the project site. Contractor may place electrical service pedestals and underground materials such as conduit, pull boxes and foundations prior to receiving all electrical materials, upon approval of the Engineer.

34-5 MAINTENANCE OF TRAFFIC AND PUBLIC SAFETY

Contractor shall furnish all labor, materials, tools, equipment and incidentals required for the maintenance of traffic and public safety to adequately safeguard the general public and the work in accordance with the requirements of Section 6-9 of these Specifications.

34-6 PROTECTION OF EXISTING IMPROVEMENTS

Existing improvements, utility and adjacent property shall be protected from damage resulting from Contractor's operations. All trees, shrubbery, fences, walls and other improvements including existing pavements, sidewalks, street improvements and underground utilities and other improvements not to be removed under this contract shall be protected from damage by Contractor throughout the construction period.

Contractor shall notify the Traffic Signal Maintenance Section of the Department of Transportation two (2) days prior to key cutting or planing within three hundred feet (300') of any signalized intersection to enable location of buried detector or signal interconnect wiring to be identified.

All painted or other disfiguring markings on the pavement, sidewalk or

gutters shall be removed by Contractor before acceptance of the work.

Contractor shall be liable for costs or repairing damage to existing improvements.

34-7 MAINTAINING EXISTING ELECTRICAL FACILITIES

All existing electroliers shall be maintained in operation until replacement electroliers are energized, as directed by the Engineer.

All traffic signal heads and pedestrian signal heads installed but not operational shall be entirely covered with burlap and securely tied to prevent exposure of signal head face to vehicular or pedestrian traffic.

The modification of existing traffic signal intersections may require the temporary shutdown of the traffic signals. Contractor shall take all steps necessary to keep traffic signal intersection downtime to a minimum. The work shall be scheduled so that the downtime of each intersection shall be four (4) hours maximum and shall occur during the hours of 9 A.M. and 3 P.M. or as directed by the Engineer. Contractor shall notify the Engineer five (5) working days prior to a traffic signal intersection shutdown.

34-8 FOUNDATIONS

Foundations for posts, standards, pedestals and other appurtenances shall be Class "A" Portland Cement concrete conforming to Section 10-5 of these Specifications.

Foundations for standards shall be poured monolithically. The bottom of the standard shall be one to two inches above the top of the foundation. Grout shall be placed from the top of the foundation to the bottom of the standard. The exposed portion of the foundation shall be formed to present a neat appearance. Tops of foundations for posts and standards, except special foundations, shall be finished to curb or sidewalk grade as shown on the Plan or as directed by the Engineer.

When a foundation is to be abandoned in place, the top of foundation, anchor bolts and conduits shall be removed to a depth of two feet (2') below the surface of sidewalk or unimproved ground. The resulting hole shall be backfilled with material equivalent to the surrounding material.

34-9 EXCAVATING AND BACKFILLING

The excavations required for the installation of conduit, foundations and other appurtenances shall be performed in such a manner as to cause the least possible injury to the streets, sidewalks and other improvements. All lawns or

improvements disturbed in excavating shall be replaced or reconstructed with the same kind of material as found on the work or with materials of equal quality. The trenches shall not be excavated wider than necessary for the proper installation of the electrical appurtenances and foundations. Excavating shall not be performed until immediately before installation of conduit and other appliances.

The material from the excavation shall be placed in a position that will not cause damage or obstruction to vehicular and pedestrian traffic nor interfere with surface drainage.

Permission to cut or disturb the pavement in any street must be obtained from the Engineer. The removal of existing pavement and concrete walks or driveways shall be by sawing the edges of the areas to be removed to a minimum depth of one and one-half inches (1½") and digging out the old pavement or concrete. Contractor shall not cut within 24 inches of either side of a located /marked buried electrical conduit as underground is often encased or directly below pavement or concrete.

Whenever a part of a square or slab of existing concrete sidewalk or driveway is broken or damaged, the entire square or slab shall be removed and replaced to the nearest score mark or joint.

Backfill material shall be placed in six inch (6") layers. Each layer of backfill shall be moistened as directed by the Engineer and thoroughly tamped, rolled or otherwise compacted until the relative compaction is not less than ninety-five percent (95%). Compacting of backfill material by pounding or jetting will not be permitted.

As soon as the backfill is completed at each location where pavement was cut, Contractor will place the necessary temporary surfacing and later the permanent paving at the expense of Contractor. The reconstruction of the concrete walks and driveways shall be as specified in Section 24 of these Specifications. The type of concrete used and its color shall match the adjacent concrete construction. The cost of said concrete work will be at the expense of Contractor. Concrete sidewalks shall have a minimum thickness of three and one-half inches (3½") and the minimum thickness of concrete driveways shall be six inches (6").

All surplus excavated material shall be removed and disposed of within forty-eight (48) hours by Contractor. All sidewalks and gutters shall be washed down and swept clean.

34-10 CONDUITS

Conduits to be installed shall be either rigid mild steel, hot dipped galvanized conduits or Schedule 40 polyvinyl chloride conduit. The same type of conduit shall be used for the entire system.

1. Requirement for Mild Steel, Rigid Conduit

The rigid steel conduit shall be thoroughly cleaned and all burrs removed. The use of thin-wall conduit and sheradized conduit is specifically prohibited for underground installation.

Exterior and interior surfaces of all conduit and fittings shall be uniformly and adequately zinc coated by the hot-dipped galvanizing process. The interior as well as the exterior of a six inch (6”) sample cut from the center of a standard length of conduit when tested, shall not show a fixed deposit of copper after four, one-minute immersions in the standard copper sulphate solution.

The interior of the conduit shall have a continuous coating of lacquer or enamel. Each length shall bear the label of Underwriters’ Laboratories, Inc. Installation shall conform to appropriate articles of the Code.

Rigid steel conduits shall be a minimum of one and one-half inches (1½”) in diameter. It will be the privilege of Contractor, at his own expense, to use larger size conduit if desired. Where larger size conduit is used, it shall be for the entire length of the run from outlet to outlet. No reducing couplings will be permitted in any run. All conduit bends, except factory bends, shall have a radius of not less than six (6) times the inside diameter of the conduit.

Where factory bends are not used, conduit shall be bent, with approved hydraulic bender, without crimping or flattening, using the longest radius practicable. All conduit ends shall be threaded and capped until wiring is started. When caps are removed, conduit ends shall be provided with approved grounding conduit bushings.

Conduit stubs, caps, exposed threads and all standard screw joints shall be painted with zinc rich paint or an equal rust preventive paint.

2. Requirements for Schedule 40 Polyvinyl Chloride Conduit

Polyvinyl chloride conduit (PVC) shall be ninety degrees (90°) C rated and listed by the Underwriters Laboratories. Conduit shall be fabricated from polyvinyl chloride and shall conform to NEMA Standards. It shall be in conformance with Article 347 of the National Electrical Code. Conduit, fittings

and cement shall be produced by the same manufacturer, who shall have at least five (5) years experience manufacturing the product. Material shall have a minimum tensile strength of 7,000 psi at 73.4° F; flexural strength of at least 11,000 psi and a minimum compressive strength of 8,600 psi. All joints shall be solvent welded in accordance with the manufacturer's recommendations.

All PVC conduits shall be a minimum of one and one-half inches (1½") in diameter. It will be the privilege of Contractor, at his own expense, to use larger size conduit if desired. Where larger size conduit is used, it shall be for the entire length of the run from outlet to outlet. No reducing couplings will be permitted in any run. All conduit ends shall have the appropriate conduit bushing and shall be sealed in an approved manner until wiring is started. Unless otherwise specified, all PVC conduits shall contain a minimum of one No. 10 green ground conductor.

3. Requirements for Conduit Installation

The installation of conduit in lawn areas shall be done by approved boring method or by trenching. If trenching is used, Contractor shall first remove the sod before trenching. The removal of sod over jack holes or over trenches shall be done by a sod cutting machine. Removal of sod by other means will not be accepted. Each strip of sod removed shall be rolled into a neat roll without damage. All sod removed shall be replaced within forty-eight (48) hours.

The installation of conduits in paved streets shall be by approved jacking, drilling or trenching methods.

In sidewalk areas, conduit shall be laid to a depth of not less than eighteen inches (18") below the sidewalk grade. In all other areas, conduit shall be laid to a depth of not less than thirty inches (30") below the finished grade.

Conduit runs shown on the Plans to be located in the street, under street pavement, shall be installed in the street within a minimum of twelve inches (12") and a maximum of eighteen inches (18") of and parallel to the curb, by using the "Trenching Installation of Conduit in Paved Streets" method. Installation of conduits at street crossings may also be installed according to the said trenching method. All pull boxes shall be located behind curb in the sidewalk unless otherwise noted on the Plans.

When a conduit is shown on the Plans as lying in a straight line parallel to the curb line, sidewalk, or pavement edge, it shall not deviate more than six inches (6") to either side of the designated straight parallel line.

In order to determine that conduit is laid to the correct depth and in as straight a line as possible, Contractor shall cause test or pilot holes to be dug at a spacing of not over seventy-five feet (75') and no such hole shall be backfilled until approved by the Engineer or his representative.

The bending of PVC conduit shall be by a hot box bender, and in lieu of jacking or boring, PVC conduit shall be installed by the drill rod method in which a drill rod is first installed and the PVC is pulled into the cavity made by the drilling rod as the rod is removed. At locations where conduit is not installed by the said trenching method, the conduit shall be installed by the drill rod method.

Before any wire is pulled in the conduit system, all conduit shall be swabbed out to remove any foreign material that is in the conduit. The removal of foreign material from the conduit with compressed air is approved.

Conduit entering controller cabinet or service cabinet shall be sealed to prevent the entrance of gases by the use of paraffin or other sealing compound approved by the Engineer.

Five inch (5") conduit nipples shall be attached by use of a coupling to any conduit run which terminates inside any signal standard. Top of nipple shall be two inches (2") above the finished grade of the signal standard foundation.

4. Trenching Installation of Conduit in Paved Streets

Conduit shall be placed under existing pavement in a trench approximately two inches (2") wider than the outside diameter of the conduit to be installed. Trench shall not exceed six inches (6") in width. The top of the installed conduit shall be a minimum of twenty-four inches (24") below finish grade.

The outline of all areas of pavement to be removed shall be cut to a minimum depth of three inches (3") with an abrasive type saw or with a rock cutting excavator specifically designed for this purpose. Cuts shall be neat and true with no shatter outside the removal area. Contractor shall not cut with saw or rock cutting excavators within 24 inches of either side of located or marked buried electrical conduit. At these locations Contractor shall daylight or pothole to continuing a saw cut.

The trenching machine shall be shielded to prevent loose material from being thrown away from the machine. Loose material deposited on the pavement behind the cutting machine shall be removed from the pavement immediately and the pavement cleared to allow the passage of traffic. Only

those traffic lanes occupied by the cutting machine and the cleanup operation shall be closed and they shall be opened as soon as the work has moved sufficiently to clear them.

The conduit shall be placed in the bottom of the trench, anchored every four (4) feet, and the trench shall be backfilled with commercial quality concrete containing not less than 564 pounds of Portland Cement per cubic yard to be poured back flush with the pavement surface if not trench plated immediately. A red oxide in the amount of five pounds (5lbs.) per cubic yard shall be mixed uniformly throughout the backfill concrete. The concrete shall be tamped or vibrated to provide a dense material free from excessive voids and rock pockets.

The top 0.33 foot (4'') shall be backfilled by the "T" Trench Method with asphalt concrete produced from commercial quality paving asphalt and aggregates, and approved by the Engineer.

Spreading and compacting of asphalt concrete shall be performed by any method which will produce an asphalt concrete surfacing of uniform smoothness, texture, and density.

Excavation, installation of conduit and concrete backfill shall be completed within the same working day. Asphalt concrete backfill shall be completed within twenty-four (24) hours after excavation of trench.

Upon completion of all contract work, the trenches cut through existing pavement will be inspected and, if found necessary by the Engineer, they will be brought to grade with an appropriate asphaltic concrete mix. In addition to bringing the trenches to grade, the Engineer may require a twelve inch (12") wide fog seal centered over the trench pavement or between the trench pavement and the existing street pavement.

34-11 PULL BOXES

Pull boxes shall be installed in the sidewalk at the locations shown on the Plans or at locations designated by the Engineer at site of work. When pull boxes are shown on the plans or designated by the Engineer to be in the sidewalk the entire square or slab shall be replaced as specified in section 34-9 of these specifications. Contractor may, at his own expense, install such additional pull boxes as may be desired to facilitate the work.

Pull boxes shall be precast reinforced concrete boxes, unless otherwise noted. Each box shall be set in concrete with a minimum of six inches (6") of concrete on all four sides. The six inch (6") thick sides shall be a minimum of twelve inches (12") deep.

For signal systems, or combined signal and low voltage lighting systems, reinforced concrete covers shall be inscribed "Traffic Signals" and for lighting systems, reinforced concrete covers shall be inscribed "Street Lighting." ("High Voltage" where applicable). Covers shall be provided with two three-eighths inch (⅜") brass hold down bolts with brass washers and nuts. Nuts shall be recessed below the surface of the cover.

Pull boxes shall not be set in driveways, vehicular traveled lanes or in any part of a new sidewalk curb ramp area including the sidewalk ramp area of ADA compliant driveways.

Where SMUD service points are designated on the plans or specified the pull box shall be a SMUD approved # 6 box with ½'' pent head lock down bolts and SMUD inscribed on the lid.

The bottom of all concrete boxes shall be left open and at least twelve inches (12") of crushed rock shall be placed below the box for drainage as shown on Plans or as directed by the Engineer. The crushed rock shall be installed prior to the installation of the conductors.

Unless otherwise specified, all pull boxes shall be CALTRANS Standard No. 5 size. Pull box extension shall be furnished and installed where called for on the Plan. Where a pull box extension is to be installed over the ends of existing conduits, the conduit ends shall be raised or lowered so they will be a minimum of five inches (5") and a maximum of seven inches (7") below the underside of the pull box cover. No more than two (2) extensions may be used.

34-12 CONDUCTORS

Unless otherwise specified, conductors shall be single conductor, solid or stranded copper of the gauge shown on the Plans. Wire sizes shall be based on American Wire Gauge (AWG). Copper wire shall conform to the applicable portions of ASTMs B3 and B8. Contractor shall use color coded wires, using a different color for each circuit with continuous color maintained throughout each circuit. Color coding shall be as required by the Engineer or as detailed on the Plans or Special Provisions. Where permitted by the Engineer, conductor of the same color may be used on different circuits. These conductors shall be identified with approved metal tags.

Traffic signal and multiple circuit lighting conductors shall be rated for 600 volt operation. Unless otherwise specified, the insulation for the conductors shall be Type THW or Type THWN.

Detector Conductor loop

1. Loop Conductors

Each loop conductor shall be continuous, un-spliced, RHW-USE neoprene jacketed or Type USE cross-linked polyethylene insulated No. 12 stranded copper wire. Conductor insulation thickness shall be 40 mils minimum.

2. Loop Conductor installation

Loop Conductor installation shall conform to the State Standard Plans, Sheet ES-5A and State Standard Specifications, Section 86-5.01A(5) **Installation Details** and these specifications. The sealant for filling slots shall conform to the following. Only the **Hot-Melt Rubberized Asphalt Sealant method** shall be used in the City of Sacramento.

34-13 WIRING

Pulling wires shall be done with special care to avoid injury to the insulation. Hand power only shall be employed in pulling wire. Only powdered soapstone, graphite, or other inert lubricant shall be used. Wire and cable entering fixtures and boxes shall have definite drip loops arranged to prevent the carrying of water to current-carrying parts or to other conduits. Loops or bends in wires in the base of standards and pull boxes shall have a minimum radius of five (5) times its diameter, to insure the safety of the insulation. A minimum of thirty-six inches (36”) of slack in each wire shall be left in each standard base and pull box.

Wires are not to be drawn into underground conduit until standards have been delivered and ready for erection.

All connections to wires shall be made as rapidly as possible after wires are drawn in. All cut ends shall be taped immediately. Care shall be taken to avoid injury to exposed ends of wires.

Conductor splices shall be jointed by a pigtail splice using a wirenut. The use of electrical spring connector of appropriate size is approved. All splices shall be taped in a manner approved by the Engineer. All splices shall be left with ends pointed up to allow water to run off of splice.

Soldering of pressure connectors may be omitted provided the connectors are applied with a ratchet type crimping tools which will not release the connector until the crimping operation is completed. The sleeve shall be compressed on each end.

34-14 BONDING AND GROUNDING

All metal conduit systems, standards, pedestals, ballast and transformer cases, service equipment, anchor bolts, etc., shall be made mechanically and electrically secure to form a continuous system and shall be effectively grounded. Grounding shall be in accordance with all applicable codes and regulations. Bonding and grounding jumpers shall be copper wire or copper strap with a minimum cross sectional area equivalent to a No. 8 AWG.

Bonding wire or strap shall be secured to the lower section of metal standard by brass or bronze bolts three-sixteenths inch (3/16") or larger.

In conduit systems where rigid steel conduit and PVC conduits are mixed, the following requirements apply:

1. The rigid steel conduit shall have an approved grounding bushing installed at the conduit end(s).

2. The green No. 10 grounding conductors in the PVC conduit shall be attached to a grounding bushing which shall be attached to the rigid steel conduit.

34-15 PAINTING

Existing equipment to be reused shall be painted in accordance with State Standard Specifications, Section 86-2.16 "Painting"; except that all existing painted standards, pedestals, controller cabinets, and other equipment shall be painted with two (2) applications of Aluminum Paint, Finish coat as specified in Section 91-2.08 of State Standard Specifications.

34-16 ELECTRIC SERVICE

The locations of service points shown on the Plans are approximate only. Contractor shall determine the exact locations from the Sacramento Municipal Utility District. Service conduits, service conductors, service grounds, metering and transformer pads where required shall be installed in accordance with the Utility District's requirements. Service equipment and enclosure shall be furnished and installed as detailed on the Plans and/or specified in the Special Provisions.

34-17 PANELBOARDS

Panelboards shall be of the type called for on the Plans. Each circuit breaker shall be permanently marked with its trip rating. Multipole breakers shall be of the common trip with single handle. Unless otherwise specified,

each circuit breaker shall be equipped with a device for padlocking the breaker in the "on" or "off" position. Panelboards shall be equipped with copper bus bars with sizes based on a current carrying capacity of not over one thousand (1000) amperes per square inch of cross section.

Unless otherwise specified, enclosures of panel board shall be fabricated from code gauge stainless steel or powder coated steel. Enclosures shall be stainless steel.

34-18 STANDARDS

The locations of standards for traffic signals and street lights shown on the Plan are approximate only. The exact location of each standard will be determined by the Engineer prior to installation. Each standard shall be anchored to the concrete foundation by galvanized steel anchor bolts, nuts, leveling nuts and washers in accordance with the Plans and the standards shall be installed in a true vertical position.

34-19 FIELD TEST

Prior to acceptance of the work, Contractor shall cause the following tests to be made:

1. For continuity of each circuit.
2. For grounds in each circuit.
3. A megger test on each circuit.
4. A functional test in which it is demonstrated that each and every part of the system functions as specified or intended herein.
5. Contractor shall supply the temporary power source necessary to facilitate the functional test as specified above.

34-20 TRAFFIC SIGNAL CONTROLLER AND INTERSECTION TURN ON

Prior to the initial traffic signal intersection turn on, Contractor shall perform the following functional tests in the presence of the Engineer:

1. All vehicular and pedestrian indications shall individually be turned on momentarily and proper operation and phasing shall be checked.

2. The controller shall be turned on with the vehicle and pedestrian indications turned off, all pedestrian pushbuttons and inductive loop detectors shall be checked for proper operation and phasing.

3. All vehicular and pedestrian signal heads shall be properly adjusted and covered.

If any system component or circuit does not operate properly, it shall be repaired and retested prior to traffic signal intersection turn on. After the successful completion of all tests, Contractor shall request through the Engineer, a time and date for turn on.

Traffic signal intersection turn on may occur only between the hours of 9 A.M. and 3 P.M. on Tuesday, Wednesday or Thursday on a week with no scheduled holidays. Contractor shall give the Engineer at least five (5) working days notice prior to the traffic signal intersection turn on.

The intersection turn-on date shall be subject to the approval of the Engineer. Contractor shall arrange to have a City signal technician and a technician from the controller manufacture, or his representative, qualified to work on the controller present at the time of traffic signal intersection turn-on.

In addition, Contractor shall provide sufficient personnel and equipment for the timely completion of the traffic signal intersection turn on. If, in the opinion of the Engineer, Contractor has not provided sufficient personnel and equipment, the Engineer, at his discretion, may postpone the traffic signal turn on until such time as sufficient personnel and equipment are provided. Contractor shall arrange to have a City signal technician and a qualified technician by the controller manufacture at the turn on.

34-21 TRAFFIC SIGNAL CONTROLLER FUNCTIONAL TEST

A functional test shall be made on the new controller after installation. Contractor shall schedule the test upon the approval of the Engineer.

Prior to the functional test, Contractor shall first determine that all equipment as shown on the Plans or called for under these specifications are installed and operable.

The functional test shall not begin on a Monday or a Friday or on the day preceding a legal holiday. The test shall be made between 9 A.M. and 2 P.M. by Contractor in conjunction with the service engineer of the controller manufacturer in the presence of the Engineer and representatives of the City Traffic Engineer and Traffic Signal Maintenance Section of the Transportation Department.

Included as a part of the functional test is the continuous satisfactory operation of the signal system for a minimum of five (5) working days. During the five (5) day test period, Contractor and the authorized service engineer of the controller manufacturer shall be available a the job site within four (4)

hours after notification to correct any malfunction which might develop in the signal system or the controller.

34-22 INSPECTION

In order to facilitate inspection by the Engineer, Contractor must observe the following procedure:

1. An electrical inspection permit must be obtained by Contractor before work is started. No fee will be required.

2. Prior to final electrical inspection, Contractor must ascertain that:

- **a.** All standards are tightly secured.
- **b.** All standards are true.
- **c.** All standards are grounded with copper ground wire or strap with brass bolts and washers.
- **d.** All conduit studs are bonded.
- **e.** All exposed threads are painted.
- **f.** All splices are taped and insulated in accordance with these Specifications.
- **g.** Circuits are tagged with metal tags where required.

3. Concrete pull box covers shall be protected during construction. Damaged covers must be replaced with new covers by Contractor.

4. The final coat of paint of standards, pedestals, service can, and other appliances shall be applied after the electrical system has been finally inspected and after all corrections to the electrical system have been made.

34-23 SALVAGE

All salvageable material and equipment removed from present installation which is not to be re-installed shall be delivered in good condition to the City Corporation Yard at 5730 24th Street, Sacramento, California or the City Corporate Center North 918 Del Paso Road, Sacramento, California as directed by the Engineer. Contractor is responsible to provide machinery and manpower to unload and load all salvaged equipment and materials. Loading, unloading, pick-up and delivery of these items shall be included in the price bid for various items and no additional compensation will be allowed therefore.

Contractor shall remove all signal heads, mounting brackets, luminaires, mast arms and appurtenances from all salvaged traffic signal and street lighting standards prior to delivery to the City Corporation Yard.

Contractor shall provide for the safe transfer with no damage to the salvaged equipment. Any equipment broken or lost by Contractor shall be replaced with equipment of equal quality at the expense of Contractor.

34-24 CITY FURNISHED EQUIPMENT

Contractor shall pick-up all City furnished equipment at either the Corporate Center South, at 5730 24th Street, building 11, or 918 Del Paso Road, Sacramento, California and deliver these items to the job site. Contractor is responsible for providing machinery and manpower to load and unload all City furnished equipment. Loading, unloading, pick-up and delivery of these items shall be considered included in the price bid for various items and no additional compensation will be allowed therefore.

Contractor shall be responsible for all damages that occur in the connection with the care and protection of all materials and equipment until the completion and final acceptance of the work by the city.

Contractor's responsibility for City furnished equipment shall be in accordance with section 6-1.02 "STATE FURNISHED MATERIALS" of the State Standard Specifications.

34-25 PAYMENT

Payment for Electrical or for any electrical items will be in accordance with the Contract Documents.

Section 35

LANDSCAPE PLANTING

35-1 GENERAL

Landscape planting shall consist of preparing and planting the areas shown on the Plans or specified in this Section and the Special Provisions.

Unless otherwise provided, walls, curbs, planter boxes, walks, irrigation systems and similar improvements required by the Plans and Specification shall be constructed following the rough grading and before landscaping.

All work on the irrigation system, including hydrostatic and coverage tests, preliminary operational tests of automatic control system, and the back fill of trenches, and other excavations shall be performed before planting.

35-2 CERTIFICATE OF COMPLIANCE MATERIALS

A Certificate of Compliance must be furnished to the Engineer or Landscape Architect with each lot of material delivered to the work site and the lot so certified must be clearly identified in the certificate.

All materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve Contractor of responsibility for incorporating material in the work which conforms to the requirements of the Plans and Specifications and any material not conforming to such requirements will be subject to rejection whether in place or not.

35-3 MEASUREMENT OF QUANTITIES

Measurement of Quantities shall be determined by the Engineer or Landscape Architect based on delivery tags presented at time of delivery unless otherwise indicated in the Contract Documents. Contractor shall give twenty-four (24) hours notice of all delivery dates and times. Materials delivered at such times that the Engineer or Landscape Architect is not present will not be counted.

35-4 MATERIALS

Materials shall conform to the provisions of Section 10 of these Specifications.

35-5 PREPARING PLANTING AREAS

The work involved in preparing planting areas shall be so conducted that existing flow lines will be maintained. Material displaced by Contractor's operations which interferes with drainage shall be removed and disposed of as directed by the Engineer or Landscape Architect.

Contractor shall perform a laboratory soil analysis to determine what amendments and method of application are required to support trees, shrubs and groundcovers, seeds and sod identified on the landscaping plan. Contractor shall submit this soil fertility analysis upon completion of rough grading for approval. For native soil, samples of area to be landscaped shall be taken at the locations shown on the plans, directed by the Engineer, Landscape Architect or specified in the Special Provisions. For imported soil, one sample for every 100 cubic yards shall be taken. A laboratory soil analysis is not required for non-irrigated native grass areas.

The samples shall be place in a sturdy container, properly identified, labeled, numbered and dated and delivered to a soils laboratory. Results of the analysis shall be provided to the Engineer or Landscape Architect and Contractor. The recommended soil amendments and methods of application shall be approved by the Engineer or Landscape Architect prior to adding them in the soil. All cost to perform the analysis and prepare the report will be paid by Contractor.

. Soil shall be cultivated until the condition of the soil is loose and fine-textured to a depth of six inches (6"). The top two inches (2") shall be cleared of all stones larger than one inch (1") in diameter and debris. Soil amendment shall be applied as shown on the plans or identified in the Special Provisions. Soil conditioner shall be cultivated into the top six inches (6") of the soil and thoroughly watered in. Contractor shall provide proof of soil conditioner application to the Engineer or Project Construction Inspector.

Weeds shall be sprayed with an approved chemical, which controls both broadleaf plants and grasses, but which will not contaminate the soil, such as "Round-up". Any substitutes shall be approved by the Engineer or Landscape Architect.

The use of rubber-tired equipment will be permitted for cultivating operations, provided that any compaction caused by the equipment used is completely eradicated, to the satisfaction of the Engineer or Landscape Architect.

35-6 WEED AND PEST CONTROL

Prior to planting all weeds including bermuda grass in the areas to be planted with trees, shrubbery and groundcover, seeds and sod shall be completely killed and removed. After planting, all areas, except seed and turf areas, shall be treated with a pre-emergent as—approved by Engineer or Landscape Architect. Appling the pre-emergent shall be according to the manufacture's recommendations.

Before applying any pesticides, Contractor shall provide the Engineer or Landscape Architect written recommendations from a licensed pest control advisor and the Engineer or Landscape Architect shall provide Contractor written approval for the materials to be used, the rate of application, method of application, name of applicator and area to which material is to be applied. If special permits are required for the materials to be used, they shall be obtained from the County Agricultural Commissioner and submitted with the request for the use of the materials.

35-7 PLANTING TREES

Plantings shall consist of furnishing, preparing and planting 15-gallon trees in accordance with these provisions, Section 10, and the Contract documents and as directed by the Engineer or Landscape Architect.

1. Preparing of Planting Areas shall conform to Section 35-5.

Soil in lawn areas adjacent to paved areas shall be graded so that after settlement, the soil will be one half inch (½") below the top of the paving.

Weed Control shall conform to Section 35-6

2. Trees and Planting Materials

a. Trees shall be located as shown on the plans. Proposed tree locations shall be field staked by Contractor prior to planting, subject to the approval of the Engineer or Landscape Architect.

No tree planting will be allowed until all soil amendment delivery tags are received and quantities used are approved by the Engineer or Landscape Architect.

Planting trees will not be allowed in any area which in the opinion of the Engineer or Landscape Architect is unsuitable for planting. Finish grade of all planting areas shall be reviewed and approved

by the Engineer or Landscape Architect before proceeding with planting.

Trees shall have a planting pit twice the diameter of the root ball. Trees that are root bound shall have the root ball scored to prevent restriction of root growth.

b. Plant Schedules shown on the plans are for Contractor's convenience only. Contractor shall confirm all quantities and shall plant as required by the Planting Plan when discrepancies exist.

c. Trees shall be of the variety and size as shown on the plans and shall conform to Sections 10-43 and 35-7.

d. Fertilizer Tablets shall be 21-gram tablets with 20-10-5 NPK ratio, with eight (8) tablets per 15-gallon container being applied.

e. Backfill Mix shall consist of three parts native soil to one part soil amendment. Soil Amendment for planting pits shall be a 90% bark based product, fir, and 0-1/4" in size, treated with nitrogen having a 2-0-0 NPK ratio.

f. Tree Staking shall conform to the applicable paragraphs of Section 35-7. At the time the trees are planted, stakes shall be placed and the trees shall be tied thereto. The size and number of stakes and ties to be installed shall be as shown on the tree planting detail. Stakes shall be placed against but not through the rootball.

g. Ties shall be cotton webbing material one inch (1") wide and approximately one-eighth inch (1/8") thick, or rubber ties stapled or nailed to the tree stakes, and placed as shown on the tree planting detail.

35-8 PLANTING SHRUB AND GROUNDCOVER AREAS

Plantings shall consist of furnishing, preparing and planting shrubs and groundcover in accordance with the following provisions, Section 10, and as directed by the Engineer or Landscape Architect.

Where shrubs are shown on the Plans to be planted in groups, the outer rows shall be parallel to the nearest pavement or fence. Adjustment in the number or alignment of plants shall be made between the outer rows. Otter row plantings shall be adjusted so at plant maturity they will not encroach onto curbs, sidewalks or fences.

No more plants shall be placed at planting locations on any day than can be planted and watered on that day.

Containers shall be cut and plants shall be removed from the containers in such a manner that the ball of earth surrounding the roots remains intact, and they shall be planted and watered as hereinafter specified immediately after removal from the containers. Containers shall not be cut prior to delivery of the plants to the planting area. Plants that are root bound shall have the root ball scored to prevent continued restriction of the root growth.

Roots of plants not in containers shall be kept moist and covered at all times, and shall not be exposed to the air except while actually being placed in the ground.

Plants shall be set in the backfill material in flat bottomed holes to such depth that after the soil has settled the top of the plant ball will be one inch (1") above the bottom of the basin or even with the surrounding soil where there is no basin. Plants shall be planted in such a manner that the roots will not be restricted or distorted. Soil shall not be compacted around the roots or ball of the plant during or after planting operations.

Any plants which have settled deeper or stand higher than specified in the above paragraph shall be adjusted to the required level or replaced at the option of Contractor.

Groundcover plants in areas equipped with an irrigation system shall be planted in blocks which conform to the design of the irrigation system. The area covered by one unit of the irrigation system shall be as completely planted as possible, and then watered. Not more than one (1) hour shall elapse from the time any groundcover is planted until it has been watered, unless otherwise specified in the Special Provisions or authorized by the Engineer or Landscape Architect.

Groundcover plants shall be planted in moist soil and in neat, straight rows parallel to the nearest pavement or fence.

Plants shall be spaced as indicated on the Plans or in the Special Provisions. Plants in adjacent rows shall be staggered. Groundcover plants shall not be planted closer than three feet (3') to trees or shrubs nor closer than eighteen inches (18") to curbs, paved areas and fences, unless otherwise shown on the Plans.

Planting areas that in the opinion of the Engineer or Landscape Architect have been compacted for any reason, either before or after planting, shall be

re-cultivated by Contractor, at his expense.

Trees, shrubs and vines in groundcover areas shall be planted before groundcover plants or cuttings are planted.

At the time the plants are planted, stakes shall be placed at certain plants and the plants shall be tied thereto. The plants to be staked and the size of stake and number of ties to be installed shall be as shown on the Plans or specified in the Special Provisions. Stakes shall be placed against, but not through, the plant ball and shall be placed on the side toward the prevailing wind, unless otherwise directed by the Engineer or Landscape Architect.

Planting area slopes shall not exceed 4:1 ratio for shrubs unless otherwise specified in the Special Provisions.

From the time any plants are planted until the beginning of the plant maintenance period, plants shall be watered, trash and debris shall be removed, weeds shall be controlled and replacements shall be made.

1. Preparing of Planting Areas shall conform to Section 35-5.

Soil in Shrub and Groundcover areas adjacent to paved areas shall be graded so that after settlement, the soil will be three inches (3") below the top of the adjacent paving or curb.

2. Weed Control shall conform to Section 35-6.

a. Granular Pre-emergent Herbicide shall be Ronstar G Pre-emergent Herbicide or approved equal applied in all shrub and groundcover planter areas after completion of all planting and before installation of landscape fabric and wood mulch at the rate as recommended by the manufacturer. Contractor shall provide proof of application of pre-emergent herbicide to the Engineer or Landscape Architect.

b. Landscape Fabric shall be Fabriscape Professional Landscape Fabric, 3 ounce Spunbond or an approved equal. Tensile Strength shall be 130 lbs and shall conform to ASTM D -4632. Elongation at break shall be less than 70% and conform to ASTM D -4632 and Puncture Strength shall be a minimum of 35 lbs and conform to ASTM D -4751. The Coefficient of Permeability shall be 4x10-2 cm / second and conform to ASTM D -4491. The landscape fabric shall be secured to the prepared sub-grade with 4” mulch. Installation of the landscape fabric shall be installed to cover all of the shrub and ground cover areas. The landscape fabric shall

be installed as one piece and installation of landscape fabric shall not have pieces smaller than 3' x 3' square unless approved by the construction inspector. The landscape fabric shall only have holes no greater than the root ball diameter of the plant material. No landscape fabric shall be exposed upon final acceptance by the City of Sacramento.

c. Landscape fabric shall be held in place by the use of staples or fasteners along all corners and seams at approximately 10 feet on center (O.C.) or closer as required to hold landscape fabric in place. No staples or fasteners shall be placed within the shrub or groundcover root ball.

3. Soil Preparation Materials

Soil Conditioner/Fertilizer shall be 6-20-20 applied at 12 lbs. per 1000 square feet and soil sulfur applied at 1lb. per 1000 square feet, or approved equal. Soil conditioner shall be a 90% bark based product, fir, and 0-1/4" in size, treated with nitrogen having a 2-0-0 NPK ratio applied at a rate of 3 yards per 1000 square feet. The above rate is for bid purposes only.

4. Planting Materials

a. Schedules shown on the plans are for the Contractor's convenience only. Contractor shall confirm all quantities and shall plant as required by the Planting Plan when discrepancies exist.

b. Plants shall be of the variety and size as shown on the plans and shall conform to Sections 35-7 and 10-43 of the Standard Specifications.

c. Fertilizer Tablets shall be 21-gram tablets with 20-10-5 NPK ratio, and shall be applied as follows:

One (1) tablet per One (1) gallon container
Three (3) tablets per Five (5) gallon container

d. Backfill Mix shall consist of three parts native soil to one part soil amendment. Soil Amendment for planting pits shall be a 90% bark based product, fir, and 0-1/4" in size, treated with nitrogen having a 2-0-0 NPK ratio.

e. Mulch shall be evenly spread in all shrub and groundcover areas to a three-inch (3") finished depth at the time of final acceptance by

the City. Mulch shall be shredded cedar bark, fibrous in nature, one-inch (1") minimum to four-inch (4") maximum in length or Douglas Fir Walk on Bark or as specified on the plans. Contractor shall submit a mulch sample to the Engineer or Landscape Architect for approval at least forty-eight (48) hours prior to installation.

35-9 PLANTING SEED

Grass seed shall be sowed at the rate specified in the Special Provisions sowing one-half (½) of the amount in each direction.

Planting area slopes shall not exceed 5:1 ratio for grass unless otherwise specified in the special provisions.

An even finish grade shall be maintained during seeding operations to insure proper surface drainage with ridges and depressions removed.

No seeding will be allowed between October 15 and March 15, without approval of the Engineer or Landscape Architect.

Soil shall be watered so that the soil is moist, not soggy, or dried out.

From the time grass has been sowed until the beginning of the establishment period, grass shall be watered, trash and debris shall be removed, weeds shall be controlled and replacements shall be made.

Full compensation for such work will be considered as included in the contract unit prices paid for landscape planting.

At the time of sowing grass commercial fertilizer approved by Engineer or Landscape Architect shall be applied to all lawn areas as specified in the Special Provisions.

35-10 HYDRO-SEED PLACEMENT

Work will consist of all labor, materials, transportation and appurtenances required to turf hydroseed the areas shown on the Plans in accordance with the following provisions and as directed by the Engineer or Landscape Architect.

Contractor shall submit data including irrigation schedule, type and analysis of fertilizer, application frequency, recommended coverage of fertilizer and cutting and trimming schedule.

Contractor shall provide seed mixture in container showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging. USDA seed shall have a rating of 5.9 or higher.

Contractor shall have a minimum of 5 years documented experience and shall comply with the County Agricultural Commission's recommendations for pesticide application. Contractor shall provide certificate of compliance from authority having jurisdiction indicating approval of plants, fertilizer and herbicide mixture and be licensed by regulatory agency to perform work.

Contractor shall deliver, store, protect and handle all products. Fertilizer shall be delivered in waterproof bags showing weight, chemical analysis, and name of manufacturer. Grass seed mixture shall be delivered in sealed containers and damaged packaging will not be accepted.

Contractor shall not install hydro-seed when the ambient temperature is below 45 degrees F (12 degrees C) or above 95 degrees F (39 degrees C). Contractor shall not install hydro-seed when the wind velocity exceed 30 mph.

Contractor shall coordinate the hydro-seed application with the installation of irrigation piping, watering heads and electrical conduit and shall comply with the plans and Special Provisions.

1. Preparing of Planting Areas, Section 35-5 shall be amended as follows: Soil shall be cultivated until the condition of the soil is loose and fine-textured to a depth of four inches (4"). Prior to hydro-seeding Contractor shall prepare the soil base to receive hydro-seed. This shall include, but not necessarily be limited to,

a. repairing the surface eliminating uneven areas and low spots

b. maintaining lines, levels, and contours and making changes in grade gradual

c. blending slopes into level areas

d. cultivating areas where equipment has compacted sub-soil

Finish grade of all hydro-seed areas shall be reviewed and approved by the Engineer or Landscaped Architect before proceeding with planting. Four (4) to seven (7) days prior to hydro-seeding, Contractor shall irrigate area to be planted to obtain twelve (12) inches of penetration.

Soil in lawn areas adjacent to curbs or paved areas shall be graded so that after settlement, the soil will be one-half inch (1/2") below the top of curb or paving.

2. Weed Control shall conform to Section 35-6.

3. Soil Preparation Materials

a. Contractor shall place topsoil as indicated on the plans, rake until smooth and remove vegetation and non-organic material from topsoil while spreading. After smooth raking of topsoil and prior to roller compaction, Contractor shall apply fertilizer in accordance with manufacturer's instructions and mix it thoroughly into upper 4 inches to topsoil. Contractor shall lightly water fertilized area to aid in the dissipation of the fertilizer. Contractor shall not mix the fertilizer with the hydo-seed.

b. Soil Conditioner/Fertilizer shall be 6-20-20 applies at 12 lbs. per 1000 square feet and soil sulfur applied at 1lb. per 1000 square feet, or approved equal. Soil conditioner shall be a 90% bark based product, fir, and 0-1/4" in size, treated with nitrogen having a 2-0-0 NPK ratio applied at a rate of 3 yards per 1000 square feet. The above rate is for bid purposes only.

4. Turf Hydroseeding shall conform to Section 10-42, 35-7 and the following provisions.

a. Seed Mix shall consist of 90% Dwarf fescue, 10% Dwarf Kentucky Blue Grass applied at the rate of not less than twelve (12) lbs. of viable seed per 1,000 square feet. Seed mix shall be submitted to the Engineer or Landscape Architect for approval. All seed shall be labeled in accordance with the California Food and Agricultural Code and shall be delivered to the site in original, unopened containers and shall bear a dated guaranteed analysis.

b. Wood Fiber Mulch shall be applied at the rate of 60 lbs. per 1,000 square feet. Wood Mulch shall be fibrous cellulose mulch containing no growth or germination inhibiting substances, and shall be manufactured in such a manner that when thoroughly mixed with seed, fertilizer, and water, in the proportions specified, it will form homogenous slurry, which is capable of being sprayed to form a porous mat. The fibrous mulch in its air-dry state shall contain not more than 10 percent by weight of water.

c. Fungicide shall be applied at the rate of one-third (1/3) lbs. per 1,000 square feet.

d. Binder shall be Am-Tac tackifier or approved equal applied at the rate as recommended by the manufacturer. Binder shall bind the fiber mulch to prevent erosion.

5. Turf Starter Fertilizer shall be applied at the rate of ten (10) lbs. per 1,000 square. Starter fertilizer shall conform to the requirements of the California Food and Agricultural Code A.

For non irrigated areas Contractor shall apply hydro-seed mixture with a hydraulic seeder having a minimum capacity of 1,500 gallons with agitator in tank, minimum pressure of 100 psi, and a distribution rate of 12,000 square feet within a fifteen (15) minute period. Contractor shall apply hydro-seed mixture evenly in two intersecting directions. Spraying shall be done in a sweeping motion allowing the slurry to fall evenly and eventually building consistent matting. All hydro-seed mixture, which has not been applied within four hours after mixing, will be rejected, removed and disposed, as directed by the Engineer or Landscape Architect. Contractor shall prevent hydro-seed from being sprayed in irrigation drainage appurtenances.

35-11 HYDRO-SEED PLACEMENT (Non-irrigated Native Grass/Wildflower)

NOTE:

Please note that the following items are project specific and are used as an example only. They must be modified to reflect the requirements for the particular project.

Work will consist of all labor, materials, transportation and appurtenances required to turf hydroseeded the areas shown on the Plans in accordance with the following provisions, Section 10-42, and as directed by the Engineer or Landscape Architect.

1. Preparation of Planting Areas as shown on the plans, including mowing, raking, and removing existing vegetation.

2. Native grass/wildflower hydroseeding shall conform to Section 10-42 and the following provisions.

a. Wildflower Seed Mix shall be pre-mixed and packaged by a commercial seed supplier, labeled in accordance with California Agricultural Code, shall be delivered to the site in original, unopened containers, and shall bear a dated guaranteed analysis. The seed mix shall include the following seed proportions:

Species	PLS lbs/acre
Hordeum brachyanthorum (Meadow Barley)	7
Bromus carinatus (California Brome)	7
Lolium multiflorum (Italian Ryegrass)	6
Eschscholzia californica (California Poppy)	1
Lupinus species (Lupine)	2
Trifolium hirtum (Rose Clover)	1
Layia platyglossai (Tidy Tips)	1
Nemophila menziesii (Baby Blue Eyes)	1
Castilleja exserta (Purple Owl's Clover)	1

Seed shall be submitted to the Landscape Architect for approval.

Native Grass Mix shall be as specified on the plans.

b. Fertilizer shall conform to the applicable state fertilizer laws. It shall be uniform in composition, dry and free flowing and shall be delivered to the site in original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer that becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.

c. Cellulose Fiber shall be colored with a non-toxic, water-soluble green dye to provide a visual gauge for metering of material over ground surfaces.

Fiber shall be produced from natural or recycled (pulp) fiber, such as wood chips or similar wood materials or from newsprint, chipboard, corrugated cardboard or a combination of these processed materials, and shall be free of synthetic or plastic

materials. Fiber shall not contain more than 7 percent ash as determined by the Technical Association of the Pulp and Paper Industry (TAPPI) Standard T-413, shall contain less than 250 parts per million boron, and shall be otherwise nontoxic to plant or animal life.

Fiber shall have a water holding capacity by weight of not less than 1,200 percent as determined by the procedure used in the Department's Final Report, CA-DOT-TL-2176-1-76-36, "Water-holding Capacity for Hydromulch", available at the Transportation Laboratory, 5900 Folsom Boulevard, Sacramento, CA 95819.

Fiber shall be of such character that the fiber will disperse into uniform slurry when mixed with water. Water content of the fiber before mixing into slurry shall not exceed 15 percent of the dry weight of the fiber. The percentage of water in the fiber shall be determined by California Test 226. Commercially packaged fiber shall have the moisture content of the fiber marked on the package. Fiber shall be colored to contrast with the area on which the fiber is to be applied and shall not stain concrete or painted surfaces.

A Certificate of Compliance for fiber shall be furnished to the Engineer or Landscape Architect.

d. Organic Stabilizer shall be a biodegradable tackifier, non-toxic to plant or animal life, such as Sentinel or M-Binder.

e. Water shall be provided by Contractor.

3. Hydroseeding installation shall be performed during a windless period using approved equipment and materials. Contractor shall verify that hydroseed areas are adequately graded for seed application and free of deleterious material and weeds at the time of planting.

a. Hydraulic equipment shall be reviewed by the Engineer or Landscape Architect prior to starting work.

i. Equipment shall have a built-in agitation system and operating capacity sufficient to agitate, suspend and homogeneously mix a slurry of water, fertilizer, fiber, seed and other additives.

ii. Slurry Distribution Lines shall be large enough to prevent clogging and shall be equipped with a set of hydraulic spray

nozzles which provide a continuous nonfluctuating discharge and uniform delivery of slurry in prescribed quantities without misses, waste or erosion.

iii. Slurry Tank shall have a minimum capacity of 1000 gallons and shall be mounted on a traveling unit which may be drawn by a separate or self propelled unit in order to properly place the slurry tank and spray nozzle for uniform distribution.

b. Slurry Preparation shall occur on site and materials shall be added in such a manner that they are uniformly blended into the mixture. Slurry shall be completely homogenous before application.

i. With Agitation System operating at half speed, water shall be added to the tank, and good circulation established. The seed shall be added first; then fiber. The mixture shall be agitated at full speed when the tank is half full.

ii. Fiber shall not be added until the tank is at least one-third filled with water. Fertilizer and seed mix shall be added at the last practical moment. Total time from the addition of seed to seed discharge shall be less than one hour; if more than one hour, the remainder of the load shall be recharged with seed.

c. The operator shall spray the areas with a uniform, visible coat using the green color of the wood pulp as a guide. The slurry shall be applied in a sweeping motion, so as to allow the fibers to build on each other until a good coat is achieved and the material is spread at the required rate per acre.

d. The materials shall be mixed and applied in the approximate proportions:

Materials	Per Acre
Fiber	1800 lbs.
Seed Mix	See 2.1 MATERIALS
16-20-20 (N-P-K)	350 lbs.
Organic Stabilizer	80 lbs.
Water	As needed for application

e. The limits indicated on the drawings reflect the only part of the area required to be hydroseeded. This area, plus all other areas

graded and disturbed by Contractor shall be hydroseeded. Any compacted or otherwise unsuitably prepared areas within these descriptions shall be scarified and rototilled to prepare the areas for seeding.

f. Prior to completion of all operations, Contractor shall remove, wash clean, or otherwise correct any unsightly overspray, trash, excess soil, other debris, or damage. All walks and pavement shall be swept and washed clean, and clean-up operations performed in the general work area as needed to leave the entire area in neat, orderly condition.

35-12 SOD PLACEMENT

Contractor shall place and establish sod in all areas as delineated on the Plans. Work will consist of labor, materials, transportation, and all appurtenances required to install the sod.

Contractor shall submit data including irrigation schedule, type and analysis of fertilizer, application frequency, recommended coverage of fertilizer, and cutting and trimming schedule. Contractor shall provide growers certificate, percentage of seed mix, and year of production.

Contractor shall have a minimum of 5 years documented experience and shall comply with the County Agricultural Commission's recommendations for pesticide application. Contractor shall provide certificate of compliance from authority having jurisdiction indicating approval of plants, fertilizer and herbicide mixture and be licensed by regulatory agency to perform work.

Contractor shall deliver, store, protect and handle all products. Fertilizer shall be delivered in waterproof bags showing weight, chemical analysis, and name of manufacturer.

Contractor shall not install Sod when the ambient temperature may drop below 45 degrees F (12 degrees C) or rise above 95 degrees F (39 degrees C). Contractor shall not install Sod when the wind velocity exceeds 30 mph.

Contractor shall coordinate the installation of irrigation piping, watering heads and electrical conduit with sod application.

Sod support materials shall be as specified in the following table.

Fertilizer	16-8-8 Commercial "Gro-power" or approved equal fertilizer
Herbicide:	Round-up or approved equal
Topsoil:	Class 'A' - fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum Ph value of 5.4 and maximum of 7.0.

Prior to placing sod, Contractor shall prepare the soil base to receive hydro-seed as per Section 35-5. This shall include, but not necessarily be limited to,

1. preparing the surface eliminating uneven areas and low spots,

2. maintaining lines, levels, and contours and making changes in grade gradual,

3. blending slopes into level areas,

4. cultivating areas where equipment has compacted sub-soil.

Four (4) to seven (7) days prior to planting, Contractor shall irrigate area where Sod is to be placed to obtain twelve (12) inches of penetration.

Contractor shall place topsoil as indicated on the plans, rake until smooth and remove vegetation and non-organic material from topsoil while spreading. After smooth raking of topsoil and prior to roller compaction, Contractor shall apply fertilizer in accordance with manufacturer's instructions and mix it thoroughly into upper 4 inches of topsoil. Contractor shall lightly water fertilized area to aid in the dissipation of the fertilizer.

Contractor shall install trees and liner stock plant material before lawn areas are sodded and shall place Sod only when weather and soil conditions are suitable according to locally accepted practices. Any Sod that does not take hold and dies after fourteen (14) days from its installation shall be replaced by Contractor. This replaced Sod will also have to be replaced if it dies after fourteen (14) days.

Placing Sod shall include, but not necessarily be limited to:

1. laying sod as shown on the plans,

2. appling slow release 13-8-4 or approved equal commercial fertilizer prior to placing sod,

3. laying all sod on the same day delivered,

4. laying strips of sod straight and tight, stagger joints,

5. rolling sod with suitable weighted roller, and

6. watering with a fine spray to keep surface moist until roots take hold.

Engineer may require Sod to be replaced take and analyze samples of materials for conformity to specifications at any time. Contractor shall furnish samples upon Owner's request. Rejected materials shall be immediately removed from the site at Contractor's expense. Costs of testing materials not meeting specifications shall be paid by Contractor.

All material shall be of standard, approved, and first-rate quality and shall be in prime condition when installed and accepted. Any commercially processed or packaged material shall be delivered to the site in the original unopened container bearing the manufacturer's guaranteed analysis.

35-13 WATERING

All plants shall be watered immediately after planting. Water shall be applied in a moderate stream until the backfill soil around and below the roots or ball of earth around the roots of each plant is thoroughly saturated.

Precautions shall be taken to prevent water from wetting vehicles, pedestrians and pavement. Any erosion or slippage of the soil caused by watering shall be repaired by Contractor, at his expense.

Compliance with the provisions in this section shall not relieve Contractor of his responsibility for the replacement of plants. Any additional watering measure required to maintain the plants in a growing condition shall be furnished by Contractor, at his expense.

Contractor is responsible for all water bills until the City accepts the project for maintenance.

35-14 REPLACEMENT

All trees, plants, shrubs, seeds and grass areas that show signs of failure to grow at any time or which are injured or damaged as to render them unsuitable for the purpose intended as determined by the Engineer or Landscape Architect shall be removed and replaced. The Engineer or Landscape Architect will inspect the work once each week or at longer intervals at his discretion and will mark or otherwise indicate all plants or lawn areas to be replaced. Contractor shall replace unsuitable plants or lawn areas within one (1) week of such inspection.

Replacements shall be furnished and planted by Contractor, at his expense. Contractor and Engineer or Landscape Architect may agree to the substitute alternative species of plants to be used as replacements.

Any damage to the finish grading caused by re-planting operations and/or vandalism shall be repaired and re-planted by Contractor, at his expense. Damage caused by premature or heavy use of facilities before final acceptance will be determined by the Engineer or Landscape Architect.

Lawn damage caused by vandalism or premature use shall be repaired and reseeded before final inspection but will not cause extension of the maintenance period.

Lawn failure caused by improper maintenance practices and/or weather shall be re-planted, and the maintenance period shall be extended to thirty (30) days after the re-planting, or as required by the Engineer or Landscape Architect.

35-15 START OF MAINTENANCE PERIOD

After all planting and related work within the planting area is completed,—Contractor shall request an inspection by the Engineer, the Landscape Architect or a representative of the City's Streetscape Office. The request shall be given 48-hours in advance of the inspection and Contractor must attend the inspection.

The Engineer or Landscape Architect shall test the irrigation system for coverage and review the plant materials for proper installation. The written approval of the completed work by the Engineer or Landscape Architect shall establish the beginning of the maintenance period. The Engineer or Landscape Architect will confirm start date, in writing. No partial approvals will be given.

35-16 LANDSCAPE MAINTENANCE

Landscape maintenance work shall consist of caring for the landscape planting portion of the project and satisfying the City's Landscape Maintenance Specification and Provisions (LS05-1) .

Landscape maintenance period shall be as specified in the Special Provisions. Plant establishment shall continue until final acceptance of the work.

The time required for plant establishment work shall be considered as included in the total time limit specified for the Contract.

Contractor will be required to fill trench settlement, adjust sprinkler heads, water plants, replace unsuitable plants and lawn areas, do weed, rodent and other pest control work as determined necessary by the Engineer or Landscape Architect.

Contractor shall provide and insure that an experienced foreman is present during maintenance operations. All sprinkler materials used either shall conform to Section 36 of the Standard Specifications, or otherwise be acceptable to the Engineer or Landscape Architect.

Contractor shall perform the following:

1. Check the irrigation system weekly for proper operation. Lateral lines shall be flushed out after removing the last sprinkler head or two heads at each end of the lateral. All sprinkler heads are to be adjusted as necessary for unimpeded coverage and to protect structures.

2. Contractor shall set and program automatic controllers for seasonal water requirements. Contractor shall give Engineer or Landscape Architect a spare key to controllers, instruction on their operation, and a 24-hour phone number in case of emergency.

3. Repair all damages to sprinkler irrigation system at Contractor's expense. Repairs shall be made within one watering period or one week, whichever is the shortest time.

4. Weeding and/or cultivation weekly of all plated and seed areas to maintain the project in a neat and uniform condition at all times, as determined by the Engineer or Landscape Architect.

5. Sidewalks, gutters, etc. shall be cleaned weekly. Failure to comply will result in an extension of the landscape maintenance period, as

determined by the Engineer or Landscape Architect.

6. All planting and seeding shall be kept in a healthy growing condition by watering, weeding, cultivation, pruning, mowing, edging, spraying, fertilizing, and by performing any other necessary operation of maintenance.

7. Lawn mowing of turf will commence when the grass has reached a height of three (3) inches.

a. The height of cut will be as recommended for the type of turf specified. Lawn growing around trees, light poles, fences, and other obstacles shall be maintained at a height equal to that of the adjacent lawn areas, or may be chemically controlled with the approval of the Engineer or Landscape Architect.

b. Mowing will be at least weekly after the first cut. Following a minimum of three (3) mowings Contractor shall be required to treat the lawn with a selective broadleaf and grass weed herbicide that will not harm the lawn. Contractor shall conform to Section 35-6 of the Standard Specifications for application of herbicides.

c. Turf must be well established and free of bare spots and weeds to the satisfaction of the Engineer or Landscape Architect prior to final acceptance.

d. Edges shall be trimmed at least twice monthly or as needed for neat appearance.

e. Unless otherwise required in the Special Provisions, clipping shall be removed at the time of mowing.

f. Lawns shall be watered at such frequency, as weather conditions require replenishing soil moisture below root zone; normally, a total of 1½ inches of water is needed weekly in hot weather.

g. Fertilize the turf areas at the start of the landscape maintenance period and every 30 days thereafter with a 16-6-8 N-P-K fertilizer at the rate of six pounds per 1,000 square feet, unless otherwise directed.

h. Re-sod lawn areas weekly as needed or directed by Engineer or Landscape Architect.

8. Application of pesticide spray by a licensed Pest Control Applicator shall be used, if needed, to control:

a. crabgrass

b. broad leaf weeds

c. nut sedge

d. insects pests

During the coarse of the maintenance period, all planted areas shall be in a weed free and/or neatly mowed condition and shall receive a second application of fertilizer as may be specified in the Special Provisions.

Contractor shall provide the Engineer or Landscape Architect a monthly report of all herbicides, insecticides, and disease control chemicals used, as well as dates and rates of application applied.

9. All work shall be executed in an orderly and careful manner to protect new concrete walks, work of other trades, and other improvements.

10. Cleanliness on paved areas and other public areas used by equipment shall be maintained.

a. Contractor shall be responsible for immediate removal of all spillage on all paved areas.

b. Contractor shall remove from project site all rubbish and debris found thereon and all material and debris resulting from work, leaving site in a safe and clean condition.

11. Improper maintenance or poor condition of any planting at the termination of scheduled maintenance period may cause postponement of completion date; maintenance shall be continued until all work is accepted.

12. Regular on-site meetings shall be held by Contractor and Engineer or Landscape Architect; dates and location to be jointly agreed upon. Meeting notes shall be prepared.

13. Contractor shall guarantee all new plant materials for duration of landscape maintenance period.

a. Plants not alive and in satisfactory growing condition, as determined by Engineer or Landscape Architect, shall be replaced within one week of notification, at no cost to the City.

b. Replace guarantee shall include all plants damaged or destroyed by any action, including but not limited to, vandalism, theft, neglect or pests.

c. Plants shall be replaced of same kind and size as specified, furnished and installed as herein specified.

14. Trees and Shrubs shall be pruned and shaped as directed by the Landscape Architect. Trees shall be restaked as necessary. Maintain watering basins and shrub and groundcover areas free of weeds.

15. Surplus earth, Papers, trash and debris, which accumulate in the planted areas shall be removed and disposed of and the planted areas shall be so cared for as to present a neat and clean condition at all times.

35-17 PRE-FINAL INSPECTION

One month prior to the end of the maintenance period or as modified in the special provisions, the Engineer or Landscape Architect will conduct a pre-final inspection. At this time Contractor will acquaint the Engineer or Landscape Architect with the operational requirements of the project. At this time, all systems will be tested, and a punch list will be prepared and presented to Contractor by the Engineer or Landscape Architect.

35-18 FINAL INSPECTION

At the end of the maintenance period and when all the punch list items from the pre-final have been completed Contractor shall schedule the final inspection with the Engineer or Landscape Architect, giving him two (2) working days notice. If no other punch list items are identified, the project will be accepted and Contractor will be relieved of responsibility for the work, except for warranties or guarantees.

At the time of acceptance of the project, all lawn areas shall be in a neatly mowed condition. All planting areas shall be fertilized as specified in the Special Provisions.

35-19 RECORD DRAWINGS AND CONTROLLER CHARTS

Prior to the final inspection, Contractor shall submit to the City, for review and comment by the Engineer or Landscape Architect, two (2) sets of

Record Drawings. The work will not be formally accepted until the Record Drawings are accepted by the Engineer or Landscape Architect. Upon approval by the Engineer or Landscape Architect, these records shall be delivered to the City, in reproducible form, and in good and acceptable condition prior to final acceptance of the work.

Contractor shall also provide two (2) reduced (original 11"X 17") charts for each controller. Once copy shall be placed on the inside of the controller enclosure door. The second copy shall be provided to the Engineer or Landscape Architect. Record Drawings shall be approved by the Engineer or Landscape Architect prior to preparing the charts.

Each controller chart shall show the as-built condition of the area controlled by the automatic controller. All symbols shall be readable at the final reduced size. The controller chart shall include:

1. Connection to existing water lines.

2. Routing of pressure lines.

3. Routing of control valves.

4. Locations of remote control valves, gate valves, quick coupling valves, and electrical power source.

5. Other items as directed by the City.

The chart shall be colored or otherwise coded to indicate the area of coverage for each station.

When completed and approved, the chart shall be hermetically sealed between two (2) pieced of 10 mil plastic, minimum.

Each chart shall be completed and approved prior to final inspection of the irrigation system.

35-20 PAYMENT

Unless otherwise specified in the Special Provisions payment for:

1. Maintenance work shall be at the contract lump sum bid price which payment shall include full compensation for all labor, tools, equipment, materials and incidentals necessary to complete the items.

2. Trees shall be made at the unit price bid per each, and shall include full

compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all work involved in completing the Trees as shown on the plans, as specified in these Special Provisions and as directed by the Engineer or Landscape Architect.

3. Shrub and groundcover areas shall be made at the lump sum price bid and shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all work involved in completing the Shrub and Groundcover Areas as shown on the plans, as specified in these Special Provisions and as directed by the Engineer or Landscape Architect.

4. Hydro-seed (non-irrigated), seed and sod, shall be at the lump sum price bid and shall include full compensation for all submittals, labor, materials, tools, equipment, and incidentals, and for doing all work involved with placing and establishing hydro-seed and sod as shown on the Plans, as specified in the Special Provisions and as directed by the Engineer or Landscape Architect.

5. Hydro-seed turf areas shall be made at the lump sum price bid and shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all work involved in completing the Turf Hydro seeding as shown on the plans, as specified in these Special Provisions and as directed by the Engineer or Landscape Architect.

Section 36

IRRIGATION SYSTEM

36-1 GENERAL

Irrigation system shall include all appurtenances, incidentals and accessories required for proper installation and operation of the system.

36-2 MANUFACTURER'S WARRANTIES

Manufacturer's warranties, guarantees, instruction sheets and parts lists which are furnished with certain articles or materials incorporated in the work, shall be delivered to the Engineer before acceptance of the Contract.

36-3 GUARANTEE

The entire sprinkler system shall be guaranteed for a period of one (1) year from date of completion. Should any trouble develop within the time specified above due to faulty workmanship or materials, the trouble shall be corrected by, without expense to the City.

Any settling of backfilled trenches which may occur during the one (1) year period after completion shall be repaired by, without expense to the City, including the complete restoration of all damaged property.

36-4 RECORD DRAWINGS

Contractor shall furnish the Engineer 2 sets of "as built" drawings showing any changes in plans, location of pipe and valves, depth, electric power source for controllers, etc. The irrigation system will not be accepted until "as-builts" are furnished and accepted.

36-5 WATER TAPS ON CITY MAINS

Unless otherwise set forth in the Special Provisions, all taps on existing City mains will be made by the City at Contractor's expense. When such taps are made within the City street section, the City will do all work necessary to bring the water service to the edge of the right-of-way.

When taps are made in any location other than street sections, all excavations and backfill necessary for the connection shall be done by Contractor. Contractor shall make the necessary arrangements with the Water Division of the City to have City crews available to make the connection. No taps will be made until tap fees have been paid to the Water Division.

36-6 CONNECTIONS TO EXISTING STREETSCAPE

Unless otherwise set forth in the Special Provisions, all connections to existing park mains including labor, excavation, cutting and furnishing necessary materials to do the work shall be done by Contractor.

Contractor will notify the Engineer twenty-four (24) hours prior to proposed connections.

City forces will make necessary shut-downs of existing facilities for Contractor.

36-7 SALVAGE

Unless otherwise specified, all salvageable material and equipment removed from present installations which are not to be reinstalled shall be delivered in good condition to the Streetscape Division at the City Corporation Yard.

36-8 CONDUIT

Conduit shall conform to Section 34-10 of these Specifications, except that conduit for 24 volt irrigation control wire installed under pedestrian walks and paved areas within landscape project limits shall be PVC Schedule 40 solvent weld pipe conforming to Section 10-45 of these Specifications.

36-9 BACKFLOW PREVENTION ASSEMBLIES

Backflow prevention assemblies shall conform to Section 10 of these Specifications.

Installation shall be in the location indicated on the Plans and shall conform to the drawings shown in Section 38 of these Specifications, unless otherwise indicated in the Contract Documents.

36-10 IRRIGATION PIPE AND FITTINGS

Pipe and fittings used in irrigation systems shall be in accordance with Section 10 of these Specifications.

The Special Provisions may designate that a particular type of pipe shall be used in which case the use of an alternate type of pipe shall not apply.

36-11 ELECTRIC AUTOMATIC CONTROLLERS

Electric automatic controllers shall be of the type shown on the Plans or specified in the Special Provisions and shall conform to Section 10 of these Specifications.

Installation shall be in the location indicated on the Plans or in the Special Provisions and shall conform to the drawings in Section 38 of these Specifications, unless otherwise indicated on the Plans.

Electrical service of electric automatic controllers shall conform to Section 34 of these Specifications.

For medians 24 Station maximum. Controllers shall be sole sourced and not shared by medians and side roads.

36-12 ELECTRIC CONTROL CONDUCTORS

Irrigation control conductors shall conform to Section 10 of these Specifications and shall be installed in conformance with Section 34 of these Specifications and as amended in this section.

Conductors shall be buried directly in the ground a minimum of eighteen inches (18”) below the surface and shall follow irrigation supply lines whenever possible, except that where conductors pass under paved areas, conductors shall be installed in conduit conforming to the provisions in Section 36-8 of these Specifications.

Conductors shall be run continuous without splices from controller enclosure to the valve boxes. Splices shall be clamped and sealed with waterproof connectors.

At least one foot (1’) of slack shall be left in each conductor at each splice.

Conductors from controllers to valves shall be wrapped together with electrical tape at ten-foot (10’) intervals.

36-13 IRRIGATION CONTROL VALVES AND VALVE BOXES

Irrigation control valves and valve boxes shall be of the type shown on the Plans or specified in the Special Provisions and shall conform to Section 10 of these Specifications.

Installation shall be in the location indicated on the Plans and shall conform to the drawings shown in Section 38 of these Specifications, unless

otherwise shown on the Plans or called for in the Special Provisions.

Valves boxes indicated to be installed at grade shall include valve box extensions as required.

36-14 VALVE MANIFOLDS

Valve manifolds shall be constructed of PVC Schedule 80 fittings.

36-15 TYPE B SPRINKLER RISER ASSEMBLIES

Type B Sprinkler Riser Assemblies shall be constructed as indicated on the drawings. Risers and cells shall be galvanized steel. Adapters shall be Class 1 or 2, PVC Schedule 80. The horizontal nipple shall be Flexible PVC complying with ASTM D 2287 and D2466. This unit shall be equal to Excalibur Flexible PVC Nipple.

36-16 SWING JOINT ASSEMBLIES

Swing joint assemblies shall be constructed of galvanized steel pipe and marlex fittings conforming to Section 10 of these Specifications. All joints of swing joint assemblies shall be tightened one (1) turn beyond hand tight.

Installation shall conform to the drawings shown in Section 38 of these Specifications.

36-17 SPRINKLERS

Sprinklers and bubbler heads shall be of the type shown on the Plans or specified in the Special Provisions.

Sprinklers “Type B, C and D” shall be made theft resistant by applying “Loctite Retaining Compound No. 3, Catalog No. 35-31” on all pipe threads down to the first elbow underground. Mating threaded surfaces shall first be primed with “Locquic Primer T”. This compound shall only be applied on male threads to prevent excess compound from entering the working mechanism of the sprinklers.

Sprinklers “Type C and D” including risers and stakes shall be painted gray.

Installation shall conform to the drawings shown in Section 38 of these Specifications.

36-18 QUICK COUPLING VALVES

Quick coupling valves shall conform to Section 10 of these Specifications.

Installation shall conform to the drawings shown in Section 38 of these Specifications.

39-19 TRENCHING FOR IRRIGATION PIPE

Trenches shall be dug to an even laying grade and to a depth sufficient to provide twenty-four inches (24") of cover over all pipe on the supply side of the irrigation valve and eighteen inches (18") of cover over all pipe on the discharge side of the irrigation valve. Trenches shall be excavated only as far in advance of pipe laying as is permitted by the Engineer. Excavated material shall be piled in a manner that will not endanger the work and will avoid obstructing sidewalks and driveways. Open trenches and piles of dirt will be so marked and lighted as to provide safety to all pedestrians and to vehicular traffic.

Trenches shall be of sufficient width to permit snaking of all plastic pipe not connected by rubber ring-tite fittings. Pipe connected with ring-tite fittings need not be snaked.

Trenches for plastic pipe shall be smooth and free of jagged rubble or sharp objects which will cause abrupt bending stress and uneven weight distribution during backfilling operation.

Rock, pavement and other debris encountered during trenching operation shall be removed and disposed of outside of the project limits at Contractor's expense. The size and quantity of material to be disposed of will be determined by the Engineer.

36-20 INSTALLATION OF IRRIGATION AND POTABLE PIPE

Installation of irrigation and potable pipe shall be as shown on the Plans and in accordance with these Specifications and the Special Provisions.

Plastic pipe, including fittings, shall be installed according to the Manufacturer's directions and as directed by the Engineer.

Portland Cement concrete thrust blocking conforming to Standard Drawing W-103 shall be provided at each change in alignment and at the ends of plastic pipe (ring-tite) supply lines. Concrete for thrust blocking shall be Portland Cement concrete Class "C" and shall conform to Section 10-5 of these Specifications.

The quantity of concrete used shall be as required to provide contact with undisturbed soil.

Plastic irrigation pipe shall be placed in trenches on level, undisturbed or well compacted earth and shall be snaked from side to side in the trench at intervals of approximately fifty feet (50'). Pipe shall be held down between joints with small mounds of earth to prevent movement.

Foreign material shall be prevented from entering the irrigation system during installation. Immediately prior to assembling all pipes, valves and fittings, all valves shall be plugged or capped pending the attachment of additional pipe or fittings. All lines shall be thoroughly flushed out prior to attachment of terminal fittings.

Pipe shall be cut with a fine tooth hacksaw and any burrs shall be removed. The outside surface of the pipe and the inside surface of the fittings shall be wiped with a clean cloth to remove all dirt and moisture before the cement solution is applied. The cement solution shall be applied to the pipe and fitting socket with a brush having a width approximately three-quarters (¾) of the depth of the socket. The cement solution shall be applied freely with a light wiping action to spread the cement uniformly over the surface. The pipe surfaces or fitting socket shall not be rubbed with the brush any more than is necessary to spread the cement. If the cement thickens, it shall be discarded. Solvent weld connections on the supply side of valves shall first be cleaned with Weld-on Solvent No. 660, or equal. Cement solution shall be Weld-on Solvent No. 715, or approved equal.

Pipe cleaner and cement shall be same brand to assure compatibility.

Immediately after the cement has been applied to the surface to be joined, the pipe shall be inserted into the fitting with a twisting motion to the full depth of the fitting socket. Immediately after joining is completed, any excess cement shall be thoroughly wiped from the pipe and fitting. The jointed members shall be allowed to cure for at least five (5) minutes before they are handled. An additional fitting or pipe section may be added to the completed joint within three (3) minutes if care is exercised in handling so that strain is not placed on the previous joint.

The male pipe threads of all threaded connections on PVC plastic pipe shall be coated with a joint compound suitable for use with plastic pipe.

36-21 TESTING OF IRRIGATION SYSTEM

After laying and before backfilling and compacting of irrigation main and

laterals, they shall be tested in presence of Engineer for leakage and for sprinkler coverage.

1. Leakage Test for Irrigation Main

The section of main to be tested shall be flushed to remove all air from the line, capped and tested under full static pressure for a minimum of four (4) hours. Any leaks which develop in the portion of the system being inspected shall be repaired and all defective material shall be replaced.

At Contractor's option a one (1) hour pressure test of one hundred pounds per square inch (100 psi) may be substituted for the above test. Contractor shall provide the necessary pump and equipment required for this test.

2. Leakage Test for Irrigation Laterals

Laterals shall be tested as specified above, except that the test period shall be a minimum of one (1) hour. The pipe shall be plugged or capped where sprinklers are to be installed while making this test.

3. Sprinkler Coverage Test

The risers for sprinklers on slopes shall be set approximately perpendicular to the slope. Each series of sprinklers shall be installed and test operated. Nozzles of all sprinklers and bubblers shall be adjusted for proper rate of flow and coverage. Sprinklers or bubblers shall be relocated as required to produce uniform coverage.

Extra sprinklers or bubblers required to produce uniform coverage as determined by the Engineer shall be paid for as extra work.

36-22 STERILIZING PLASTIC POTABLE PIPE

Sterilization of plastic potable pipe shall conform to Disinfection of Water Mains, Section 27-12 of these Specifications.

36-23 BACKFILL OF IRRIGATION PIPELINES

Backfill in street sections shall be as specified in Section 27-8 of these Specifications. Sand backfill is not required in planting areas.

Special backfill requirements may be set forth in the Special Provisions.

36-24 REPAVING

Repaving over trenches shall be as specified in Section 26-9 of these Specifications, unless otherwise set forth on the Plans or in the Special Provisions.

36-25 PAYMENT

Unless unit prices are required by the Special Provisions, payment for the Irrigation System shall be at the lump sum price bid. Such payment shall be full compensation for furnishing all labor, materials, tools and equipment and doing all work involved in installing and testing of the Irrigation System as required herein, in the Special Provisions, on the Plans or by the Standard Drawings.

Section 37

BORING AND JACKING

37-1 GENERAL

This section covers tunneling and/or boring and jacking of casing pipe and furnishing and placing water pipe, sewer or drain pipe (conveyance pipe) within the casing pipe (two-pass system) or direct jacking of conveyance pipe (single-pass system) at the location(s) indicated on the Plans, to the lines, grades, and details given. Installation of casing pipe shall meet the applicable requirements of the Construction Safety Orders of the State of California Department of Industrial Relations and Division of Occupational Safety and Health.

Casing pipe shall be installed either by tunneling or by dry boring and jacking, as dictated by existing soil conditions and/or the size of the casing pipe. Only workers experienced in tunneling or boring and jacking operations shall be used in performing the work.

Prior to proceeding with the work, Contractor shall submit to the Engineer for review and approval, a written description of the materials, equipment, method, and sequence of operations proposed to be used to furnish and install the casing pipe or the direct jack pipe, including the conveyance pipe grades.

Contractor shall also provide detail drawings and structural calculations to the Engineer indicating the materials and methods to be used to shore the excavated jacking and receiving pits signed by a civil or structural engineer licensed by the State of California. Approval of the proposed method by the Engineer shall not relieve Contractor of the full responsibility of making a satisfactory installation meeting the criteria set forth herein and on the plans.

Excavation for the boring operation shall be the minimum necessary to satisfactorily complete the work. Contractor shall use extreme care in shoring the jacking and receiving pits so as to insure the stability of adjacent improvements and structures and to protect workmen. Special backfill requirements may be specified in the Special Provisions for pipe installed in the area excavated for the boring operations.

37-2 SINGLE-PASS SYSTEM

Unless specified otherwise, Contractor may elect to jack the conveyance pipe directly in a single pass in conformance with these Specifications.

RCP Class V flush bell pipe with double-rubber gasket joints, or with fiberglass reinforced epoxy collar, or approved equal type joints may be jacked directly for installation of drainage or sewer facilities. The pipe must be designed to safely bear all loads imposed by jacking in addition to the design D-loads. A cushion material of plywood or hardwood spacers shall be placed in the joints between adjacent pipe sections being jacked in order to distribute the jacking load uniformly throughout the entire pipe length and avoid radial gasket pressures which may over stress the pipe sockets or grooves.

Guide rails shall be accurately set to line and grade to insure installation within tolerances allowed. Maximum length of direct jacking shall be one hundred feet (100'). The diameter of the hole shall not be more than 0.1 foot greater than the outside diameter of the reinforced concrete pipe.

37-3 TWO-PASS SYSTEM

The two-pass system utilizes a conveyance pipe within a casing pipe.

1. Casing Pipe Material

Material for casing pipe shall be either welded steel pipe or reinforced concrete pipe. Joints for the casing pipe shall provide for a rigid and watertight installation. Contractor shall be fully responsible for any or all damage arising from subsidence or any other disturbance due to any boring and jacking operation.

a. Welded Steel Pipe

Contractor is fully responsible for design and selection of steel casing pipe consistent with the requirements herein. Unless otherwise approved, steel casing pipe shall be welded steel with a wall thickness of three-quarter inch (¾") conforming to AWWA C 200 or ASTM A 752 as appropriate for the project and site subsurface conditions. Field joints shall be either full circumference welded butt joints or integral machined press-fit connections such as Permalok or approved equal. It shall be Contractor's responsibility to provide stress transfer across the joints which is capable of resisting the jacking forces involved.

b. Reinforced Concrete Pipe

Reinforced concrete casing pipe shall conform to ASTM C 76. The design of reinforced concrete pipe shall be based upon dead and live loads and jacking forces. RCP casing pipe shall have double-rubber gasket joints. A cushion material of plywood or hardwood spacers shall be placed in the joints between adjacent pipe sections being jacked in

order to distribute the jacking load uniformly throughout the entire pipe length and avoid radial gasket pressures which may over stress the pipe sockets or grooves.

c. Casing Pipe Spacers

Insulating spacers shall be installed at the intervals recommended by the manufacturer. Insulating spacers shall be Pipeline Seal and Insulator (PSI) Model A12, Calpico Model M-12 or approved equal.

d. Casing Pipe End Seals

Casing Pipe End Seals shall be PSI Model C, Calpico Model C, or approved equal.

2. Installation of Casing Pipe

The jacking pit shall be of sufficient size for the following: provide ample working space for soil removal and room for the jacking head, if used; jacks; jacking frame; reaction blocks; and one or two sections of pipe. Guide rails shall be accurately set and anchored in the bottom of the pit so that the casing pipe, while being jacked, will be guided along the prescribed line and grade within the tolerances allowed.

Excavation or tunneling for the subsequent accommodation of the casing pipe shall have a diameter of not more than 0.1 foot greater than the outside diameter of the respective casing pipe and shall be performed by dry bore methods. All excavated material shall be removed from the casing pipe as excavation progresses, and no accumulation of such material within the casing pipe will be permitted.

The leading section of casing pipe shall be equipped with a jacking head securely anchored thereto and extending at least eighteen inches (18”) from the leading edge of the pipe to protect the end of the pipe, to maintain equal pressure around the circumference of the pipe and to prevent any wobble or variation in alignment during the jacking operation. The jacking head shall cover the upper two-thirds (2/3) of the casing pipe and project not more than one-half inch (½”) beyond the outer surface. Excavation shall not be made in advance of this jacking head.

The driving ends of the casing pipe shall be properly protected against spalling and other damage, and intermediate joints shall be similarly protected by the installation of sufficient gearing shims to properly distribute the jacking stresses. Any section of conduit showing signs of failure shall be removed and replaced with a new section of casing pipe which is adequate to carry the loads

imposed upon it.

3. Installation of Conveyance Pipe

Guide rails shall be accurately set to line and grade to insure installation of the conveyance pipe within allowable limits. Casing pipe diameter shall be sufficient to allow adjustment of line and grade of the conveyance pipe to meet allowable tolerance. Minimum casing pipe diameter shall be six inches (6”) larger than the outside diameter of the conveyance pipe joints.

Conveyance Pipe sections shall be joined outside the casing pipe and then slid into place. Necessary adjustments in grade shall be made by adjusting the height of the skids.

All pressure pipe installed within the casing pipe shall be restrained. The annular space between the conveyance pipe and the casing pipe shall not be backfilled.

37-4 GROUTING OF VOIDS

Upon completion of the jacking operation, Contractor shall pressure grout all voids around the outside of the casing pipe. Grouting equipment and material shall be on the work site before jacking operations and drilling of grout holes are completed in order that grouting around the jacked casing pipe may be started immediately after the jacking operations have finished. The spacing of grout holes shall be eight (8) foot staggered and located 22-1/2 degrees from the vertical axis of the casing pipe. Pressure shall not exceed five (5) PSI for a duration sufficient to fill all voids to refusal, following which Contractor shall repair the drilled holes.

37-5 TOLERANCES

Extreme care shall be exercised by Contractor to maintain line and grade during jacking operations. Maximum deviation from design line and grade of casing pipe shall be such that line and grade of the conveyance pipe can be adjusted a sufficient amount within the casing pipe to achieve the tolerances for line and grade indicated below. This adjustment shall be made to all pipe deviating from line and grade and not merely to the sections of pipe nearest the ends of the casing pipe. Deviation from design line and grade shall not exceed 0.2 foot for line and 0.20 foot for grade per 100 feet of pipe length.

Directly jacked reinforced concrete pipe will be allowed a maximum deviation of 0.25 foot per one hundred feet (100’) from intended line and grade unless more stringent tolerances are shown on the Plans or directed by the Engineer.

37-6 BORING UNDER CURB, GUTTER AND SIDEWALK

Portions of sanitary sewers, house connections, drainage lines, and water mains which pass beneath curbs and gutters, sidewalks, and other obstructions may be placed by boring. If under the curb, gutter and sidewalk, the bore shall begin at the lip of the gutter and continue to a point from twelve inches (12") to eighteen inches (18") beyond the property line The terminus of all house connections which are bored shall be exposed in order to determine final line and grade and to place the locating stake.

If the connection is vitrified clay pipe it shall be plain end pipe connected with compression type couplings. The bore shall be just large enough to pass the couplings and need not be backfilled. The maximum length of bore shall be fifteen feet (15'), unless otherwise specified.

Boring shall not be used on sewer house connections when the required slope is such that probable deviation of the bore from the intended line would result in a final slope of less than one-quarter inch (¼") per foot.

37-7 DRILLING WITH BENTONITE

When required by the Special Provisions or permitted by the Engineer, casing or conductor pipe may be placed by drilling with bentonite. Equipment, methods, sequence of operations, and proportions of bentonite, water, and soil shall be approved by the Engineer prior to drilling. The maximum drilled hole diameter shall be fourteen inches (14"); the minimum diameter shall be two inches (2"). The minimum thickness of the bentonite slurry around the pipe wall shall be one inch (1"). Undermining of pavement or softening of the subgrade shall not be permitted. Voids shall be filled by injecting bentonite slurry into the cavity. In soils where the clay content is high, other chemicals may be substituted for water in a quantity that will establish a workable mixture.

37-8 REPAVING IN EXCAVATED AREAS

Asphalt pavement removed in association with boring and jacking shall be restored. Pavement restoration shall conform to the provisions of Sections 10, 22, 26-11, and 38 (DWG No. T-8). All exposed edges and aggregate base against which asphaltic concrete is to be placed shall be tacked with emulsion prior to paving.

Contractor shall restore the surface to the thickness of the pavement removed; but in no case shall be less than four (4) inches of asphaltic concrete and twelve (12) inches aggregate base. Where expansive or other low R value subgrade material exists as determined by the Engineer, the City will provide

an engineered design of the structural section based on the Caltrans "Flexible Pavement Structural Section design Guide for California Cities and Counties" or other acceptable method and Contractor shall construct the section accordingly.

The new asphaltic concrete pavement shall be type A Max-Medium with a three-quarter inch (3/4")maximum aggregate in accordance with Sections 10 and 22. Aggregate base material shall be Class 2 and conform to Sections 10 and 17.

37-9 PAYMENT

Payment for Boring and Jacking shall be at the price bid per lineal foot for furnishing and placing by boring and jacking the respective sizes and types of pipe as indicated on the Plans and in the Proposal. The unit price shall include the casing pipe, if specified or permitted, the conveyance pipe all excavation, backfill, and all other tools, material, labor, and equipment necessary to complete the installation.

Section 38

STANDARD DRAWINGS

NUMBER	DRAWING TITLE (TRANSPORTATION)
T-11	STANDARD CURB AND GUTTER DETAILS
T-12	BUS STOP REINFORCEMENT CURB AND GUTTER DETAIL
T-13	CURB & GUTTER NEAR TREE DETAILS
T-21	SIDEWALK DRIVEWAY DETAIL
T-22	PLANTER STRIP DRIVEWAY DETAIL
T-31	THROUGH SDWK DRAIN DETAIL (C&G TYPE 1)
T-32	THROUGH SDWK DRAIN DETAIL (C&G TYPE 2)
T-40	SUBDRAIN TRENCH, DETAIL
T-50	CURB RAMP ELEMENTS DEFINITION AND STANDARDS
T-60	CURB RAMP GENERAL DETAILS
T-71	SINGLE PAN CURB RAMPS
T-72	DUAL PAN CURB RAMPS
T-73	SINGLE FLARE CURB RAMPS
T-74	DUAL FLARE CURB RAMPS
T-75	SINGLE COMBINATION CURB RAMP
T-76	DUAL COMBINATION CURB RAMPS
T-77	PLANTER STRIP CURB RAMPS
T-78	TRUNCATED DOME STANDARD LAYOUT

NUMBER	DRAWING TITLE (TRANSPORTATION)
T-79	TRUNCATED DOME DETAIL
T-80	BACKFILL RESURFACING IN PAVED AREAS
T-90	CHAIN LINK FENCE AND GATE
T-101	STREET BARRICADE
T-102	CURB, GUTTER AND SIDEWALK BARRICADE
T-103	SIDEWALK BARRICADE
T-110	SIGNS AND BARRICADES AT ENDS OF PAVEMENT WIDENING
T-120	50'-0" CONFORM DETAIL
T-130	18'-0" CONFORM DETAIL
T-140	18'-0" CONFORM DETAIL (WITHOUT KEY CUT)
T-150	SIDE STREET CONFORM DETAIL
T-160	CURB PAINTING
T-170	BIKE LANE/ ROUTE MARKINGS
T-180	CROSSWALK, CENTERLINE AND STOP LEGEND
T-190	DISABLED PARKING SIGNING AND STRIPING
T-200	RAISED PAVEMENT MARKERS (RPM'S)
T-210	OBJECT MARKER DETAIL
T-221	SPEED HUMP DETAIL 1
T-222	SPEED LUMP DETAIL A
T-223	SPEED LUMP DETAIL B
T-224	SPEED LUMP DETAIL C
T-226	SPEED TABLE

NUMBER	DRAWING TITLE (TRANPORTATION)
T-227	SPEED LUMP DETAIL D
T-230	BOLLARD INSTALLATION
T-250	1 FT MEDIAN ISLAND WITH REFLECTORS
T-260	MEDIAN ISLANDS WITH SOCKET JOB & RPM'S
T-270	STANDARD 2" PIPE SIGN MOUNTING
T-280	STANDARD ELECTROLIER SIGN MOUNTING
T-290	STANDARD STREET NAME SIGN
T-301	STANDARD OVERHEAD STREET NAMES SIGN
T-302	STANDARD OVERHEAD STREET NAME (SMALL SIGNS)
T-303	OVERHEAD STREET NAME SIGN SWING ARM BRACKET
T-310	METER PIPES DETAIL
T-320	METER PIPE FLANGE JOB
T-330	20' ALLEY CLOSURE WITH 4 BOLLARDS
T-340	STANDARD BOLLARD & METERED PIPE FOOTING
T-350	CONCRETE SURVEY MONUMENT
T-360	TEMPORARY STREET SIGN
NUMBER	**DRAWING TITLE (ELECTRICAL)**
E-10	GENERAL NOTES
E-20	METERED SERVICE PEDESTAL
E-30	METERED SERVICE PEDESTAL
E-40	UNMETERED SERVICE PEDESTAL
E-50	UNMETERED SERVICE PEDESTAL

NUMBER	DRAWING TITLE (ELECTRICAL)
E-60	ORNAMENTAL STREET LIGHT STYLE I
E-70	ORNAMENTAL STREET LIGHT STYLE II
E-80	ORNAMENTAL STREELIGHT DETAILS
E-90	POST TOP LUMINAIRES AND DETAILS
E-100	MAST ARM LUMINAIRE AND DETAILS
E-110	TYPICAL FIXED-TIME SIGNAL PHASING
E-120	TYPICAL 6 AND 8 SIGNAL PHASING
E-130	TYPICAL DETECTOR LOOP LAYOUT
E-140	LOOP SAW CUTTING
E-150	DETECTOR HANDHOLE
E-160	LOOP WINDING PATTERNS
E-170	PEDESTRIAN PUSH BUTTON PLATE & POLE
E-180	OPTICAL DETECTOR LAYOUT
E-190	"T" TRENCH DETAIL & DIRECTIONAL DRILL
E-200	TRENCH DETAIL & DIRECTIONAL DRILL
E-210	CONCRETE PULL BOX
E-220	PULL BOX WITH SWEEP 90°
E-230	ELECTRICAL EQUIPMENT PLACEMENT
NUMBER	**DRAWING TITLE (WATER)**
W-102	TRACER/LOCATOR WIRE FOR ALL WATER MAINS
W-103	CHANGES IN MAIN ELEVATION & THRUST BLOCKING FOR WATER MAINS

NUMBER	DRAWING TITLE (WATER)
W-104	BACKFILL & REPAIR AT SEWER & DRAIN UTILITY CROSSING
W-105	WATER MAIN “CUT-IN” INSTALLATIONS
W-106	RAISING AND LOWERING EXISTING WATER MAINS
W-107	TYP. CONNECTIONS FOR INTIAL FILING OF NEW WATER MAIN
W-201	FIRE HYDRANT INSTALLATIONS
W-202	FIRE HYDRANT PROTECTION
W-203	REQUIREMENTS FOR FIRE HYDRANT USE PERMITS WATER TRUCKS
W-204	PORTABLE WATER TRUCK FILL STATIONS
W-301	STANDARD 2-INCH AND 4-INCH BLOW-OFF
W-302	TEMPORARY 2-INCH SAMPLING DEVICE
W-303	STANDARD VALVE BOX INSTALLATION FOR CITY STREETS, ALLEY EASEMENTS
W-304	STANDARD VALVE BOX AND DROP CAP
W-305	WATER SERVICE BOX INSTALLATIONS
W-306	RAISING VALVE BOXES AND DROP CAPS
W-307	WATER SERVICE BOX AND COVERS
W-208	VALVE OPERATING NUT EXTENSION
W-309	AREAS OF OPEN LEFT AND OPEN RIGHT GATE VALVES
W-401	LOCATION OF RESIDENTIAL WATER METERS-NEW CONSTRUCTION
W-402	INSTALLATION OF RESIDENTIAL WATER METER SETTER & BOX
W-403	STANDARD WATER SERVICE TAPS 1-INCH THRU 2-INCH
W-404	TAP EXCAVATION REQUIREMENTS ON EXISTING MAINS THRU 12” TAPS

NUMBER	DRAWING TITLE (WATER)
W-405	NON-METERED WATER SERVICE CONNECTIONS 1-INCH THRU 2-INCH
W-406	WATER SERVICE CONNECTION AT HOSE BIBB
W-501	APPROVED INSTALLATION FOR AIR GAP SEPARATION
W-502	SINGLE BACKFLOW ASSEMBLIES FOR BUILDING INSTALLATIONS
W-503	PARALLEL BACKFLOW ASSEMBLIES FOR BUILDING INSTALLATIONS
W-504	INSTALLATION OF METERED TEMP. WTR SVC W/BACKFLOW PREVENTERS
W-505	INSTALLTION OF 2-INCH & SMALLER RP ASSEMBLY WITH WATER METER
W-506	INSTALLATION OF 3-INCH & LARGER RP DEVICE WITH WATER METER
W-507	2” & SMALLER COMMERCIAL METERED WATER SERVICE WITH NO RP DEVICE
W-508	3-INCH AND LARGER METERED WATER SERVICE INSTALLATIONS
W-509	3-INCH AND LARGER METERED WATER SERVICE WITHOUT RP ASSEMBLY
W-510	4-INCH & LARGER FIRE SERVICE WITH DOUBLE CHECK VALVE ASSEMBLY
W-511	4-INCH & LARGER FIRE SERVICE WITH DOUBLE CHECK VALVE ASSEMBLY
W-601	2-INCH & SMALLER BACKFLOW ASSEMBLY IN MEDIAN STRIP OWNED BY CITY
W-602	2-INCH & SMALLER BACKFLOW ASSEMBLY IN PARK STRIP OWNED BY CITY
W-603	2-INCH & SMALLER BACKFLOW ASSEMBLY IN LANDSCAPE CORRIDOR OWNED BY CITY
W-604	2-INCH & SMALLER BACKFLOW ASSEMBLY IN LANDSCAPED SETBACK OWNED BY CITY
W-605	IRRIGATION SYSTEMS STREET CROSSINGS
W-606	2-INCH & SMALLER RP ASSEMBLY W/METER ON ALL CITY IRRIGATION SYSTEMS

NUMBER	DRAWING TITLE (WATER)
W-607	3-INCH & LARGER RP DEVICE W/METER ON ALL CITY IRRIGATION SYSTEMS
W-702	ACCESS MANHOLE DETAILS
W-801	BUTTERFLY VALVE STANDARD BURIED INSTALLATION DETAIL
W-802	2-INCH AIR VACUUM AND AIR RELEASE VALVE INSTALLATION
W-803	4-INCH COMBINATION AIR AND VACUUM VALVE
W-804	6-INCH BLOW OFF FOR DUCTILE IRON PIPE
W-805	6-INCH BLOW OFF FOR WELDED STEEL AND CONCRETE CYLINDER PIPE
W-901	CASING INSULATOR SPACING ASSEMBLY
W-902	FLANGE INSULATION FOR T-MAIN SIDE OUTLET THRU 12-INCH PIPE
W-903	CCP AND WSP JOINT DETAILS
W-904	DETAIL OF FIELD WELDED BUTT-STRAP JOINT
W-905	DIELECTRIC INSULATING FLANGE DETAIL
W-1001	INSULATING JOINT TEST STATION
W-1002	TEST STATION INSTALLATION DETAIL
W-1004	TEST STATION HOUSING DETAIL IN TRAFFIC/NON-TRAFFICE AREAS
W-1005	INSULATING JOINT TEST BOARD DETAIL
W-1006	TEST BOARD DETAIL
W-1008	CCP AND WS PIPE JOINT BOND CABLE DETAIL
W-1009	CCP AND WS PIPE JOINT BOND CLIP DETAIL
W-1011	EXOTHERIC WELD
W-1012	JOINT BOND CABLE DETAIL
W-1013	GALVONIC ANODE INSTALLATION DETAIL

NUMBER	DRAWING TITLE (WATER)
W-1014	ANODE TEST BOARD DETAIL
W-1015	ANODE CABLE IDENTIFICATION DETAIL

NUMBER	DRAWING TITLE (SEWER AND DRAINAGE)
S-10	TYPE “B” DPOP INLET
S-20	MODIFIED TYPE “B” D.I. (WITH TRAP AND SUMP)
S-21	TYPE “B” DROP INLET ROLLED CURB
S-30	DITCH BOX
S-40	TYPE “B” GRATE AND FRAME
S- 42	GUTTER DRAIN NO. 20
S-45	GUTTER DRAIN NO. 21
S-50	GUTTER DRAIN NO. 22
S-55	GUTTER DRAIN NO. 24
S-60	OPTIONAL GUTTER DITCH INSTALLATION
S-65	ROLLED CURB TYPE “B” DROP INLETS
S-70	STANDARD MANHOLE NO. 3
S-80	STANDARD MANHOLE NO. 3A
S-90	STANDARD MANHOLE NO. 3 (WITH TRAP AND SUMP)
S-110	STANDARD MANHOLE NO. 4
S-120	SADDLE TYPE MANHOLE
S-125	INSIDE DROP CONNECTION FOR MAINLINE & SERVICES 6 IN. AND LESS
S-130	INSIDE/OUTSIDE DROP CONNECTION FOR MAIN LINES 8 IN. AND MORE

NUMBER	DRAWING TITLE (SEWER AND DRAINAGE)
S-140	STANDARD MANHOLE HEAD 1, COVER A
S-150	STANDARD MANHOLE HEADS 3 AND 4, COVER B
S-160	STANDARD MANHOLE HEAD AND COVER 1-C
S-230	UTILITY CROSSING
S-240	FLUSHER BRANCH
S-250	CONCRETE PROTECTIVE COVERING
S-260	A.B.S SEWER SERVICE
S-265	TYPICAL SEWER SERVICE CLEANOUT LOCATIONS
S-270	PIPE INLET/OUTLET STRUCTURE 22" PIPE & SMALLER
S-280	PIPE INLET/OUTLET STRUCTURE 24" TO 60" PIPES
S-290	TRASH RACK 24" TO 60" PIPES
S-300	PIPE OUTLET ACCESS CONTROL RACK
S-310	TYPICAL JUNCTION BOX PIPE CONNECTION DETAIL

NUMBER	DRAWING TITLE (WATER QUALITY)
Q-10	STABILIZED CONSTRUCTION ENTRANCE
Q-20	INLET SEDIMENT CONTROL
Q-30	STORM DRAIN INLET FILTER BAG
Q-40	FIBER ROLLS
Q-50	SILT FENCE - 36”
Q-60	SILT FENCE – 18”
Q-70	STORM DRAIN MESSAGE LAYOUT
Q-80	CONCRETE WASHOUT

NUMBER	DRAWING TITLE (WATER QUALITY)
Q-90	EROSION CONTROL BLANKETS/MATS SLOPE INSTALLATION

NUMBER	DRAWING TITLE (LANDSCAPING)
L-10	AUTOMATIC FLUSH VALVE DETAIL
L-20	INSTALLATION OF CONTROL VALVE
L-30	DRIP FILTER DETAIL
L-40	INSTALLATION OF MOW STRIP
L-50	INSTALLATION OF SPRINKLER HEADS

Notes

38-1 REQUESTS FOR CLARIFICATION

A. Requests for clarification of the plans and/or specifications shall be directed to the ENGINEER using the Request for Clarification form provided at the end of this Section. Such requests shall not be received directly from a Subcontractor or Supplier; all such requests for clarification shall be made by Contractor to the ENGINEER. The written form may be used by Contractor to transmit a letter which makes a request for clarification.

B. Normally, a separate form shall be used for each specific item for which a clarification is required. Requests for clarification for more than one item using a single transmittal form will be permitted only when the items are so functionally related that expediency indicates review of the group of items as a whole.

C. The ENGINEER will reply to Contractor's request for clarification within fifteen (15) working days following receipt by the ENGINEER.

38-2 DEVIATION REQUESTS

A. Requests for deviation from the plans and/or specifications shall be directed to the ENGINEER using the Deviation Request form provided at the end of this Section. Such requests shall not be received directly from a subcontractor or Supplier; all such requests for deviation shall be made by Contractor to the ENGINEER. The written form may be used by Contractor to transmit a letter which makes a request for deviation.

B. The ENGINEER will reply to Contractor's request for deviation within fifteen (15) working days following receipt by the ENGINEER.

INDEX

Subject **Page**

A

Addendum 1-1
Adequate Resources, Work Schedule and 7-1
Adhesive Capsules for Dowel Anchorage 10-55
Aggregate
    Bases 10-6
    Concrete 10-1
Aggregate Subbase (Graded) 10-7
Agreement 1-1
Agreement to Assign 2-6
American Association of State Highway and Transportation Officials 1-1
American Society for Testing Materials 1-1
American Water Works Association 1-1
Approval of Contractor's Plans No Release from Liability 6-12
Approval of Sources of Supply of Materials 5-11
Appurtenances (Water Transmission)
    Air Release Valves 10-35
    Air Vacuum Valves 10-35
    Blind Flanges 10-36
    Dished Heads 10-36
Asphalts, Liquid Asphalts and Asphaltic Emulsions 10-13
Asphaltic Concrete
    Density Testing, Pavement 22-8
    Keycutting, Conforms, and Planing 22-3
    Materials 22-1
    Mixing Equipment 22-2
    Pavement Reinforcing Fabric 22-9
    Pay Factors 22-8
    Payment 22-11
    Placing 22-5
    Placing, General Requirements 22-2
    Tack Coat 22-6
    Type and Mix Design 22-1
    Spreading and Compacting 22-6
Assignment of Claims 8-4
Award and Execution of Contract 3-1

B

Backfill
    Roadway 14-1

Slurry Cement 10-11
Structure 14-1
Trench 14-2
Backflow Prevention Assembly 10-47
Bases
Aggregate 10-6
Cement Treated 10-8
Laying 17-1
Treated Permeable 10-8
Bedding Sand 10-10
Bid 1-1
Bidder 1-1
Bituminous Seals
Cape 23-2, 10
Chip 23-1, 7
General Requirements 23-10
Measurement & Payment 23-13
Placing 23-12
Sand 23-2
Slurry 23-2
Types and Mix Design 23-1
Boring and Jacking
Boring Under Curb, Gutter and Sidewalk 37-5
Drilling with Bentonite 37-5
General 37-1
Grouting of Voids 37-4
Payment 37-6
Repaving in Excavated Areas 37-5
Single-Pass System 37-1
Tolerances 37-4
Two-Pass System 37-2
Butterfly Valves & Flexible Couplings (Transmission) 10-32
Butterfly Valves (Transmission)
Coating, (Interior, Exterior) 10-34
General 10-32
Manual Valve Actuator 10-34
Materials and Construction 10-33

C

Castings for Manholes, Covers, Etc. 10-18
Certain Laws Affecting the Work 6-1
Changes in the Work 4-2
Change Order 1-1
City 1-1
City Council 1-1
City Manager 1-2

Claims
Assignment of 8-4
Disputed..... 4-5
Notice of Claims for Additional Compensation or Damages 4-5
Review by Claim Review Committee and Issuance of Decision by Department Director 4-6
Cleaning Up..... 4-1
Clearing and Grubbing, Tree Removal
Disposal 12-2
Existing Facilities 12-1
General..... 12-1
Payment..... 12-2
Trees..... 12-1
Vegetation and Debris..... 12-1
Commercial Fertilizer 10-44
Comparison of Bids 3-1
Completion Date 1-2
Completion of Work and Final Payment 8-2
Compliance with OSHA..... 6-7
Conformity with Plans and Allowable Deviations 5-1
Concrete
Aggregates 10-1
Curing Compounds for..... 10-6
Water for..... 10-1
Concrete Structures
Concrete Placed Under Water 20-14
Construction Joints 20-10
Curing 20-11
Design of Mixes..... 20-8
Drain Inlets 20-4
Expansion Joints and Rubber Waterstops 20-10
Flatness Tolerance for Floor Slab 20-8
Flatwork..... 20-11
Finishing Formed Surfaces..... 20-11
Footings 20-4
Formwork 20-4
General..... 20-1
Grouting and Drypacking 20-13
Measurement of Quantities..... 20-15
Payment..... 20-15
Placing Concrete..... 20-9
Preparing to Place Concrete 20-8
Quality Control..... 20-14
Reinforcement 20-7
Removal of Forms..... 20-6

Surface Finishes 20-11
Weep Holes in Walls 20-13
Construction Materials 10-1
Contract
Assignment 7-1
Definition of 1-2
Contract Documents 1-2
Contract Price 1-2
Contractor
Cooperation of 5-3
Definition of 1-2
Legal Address 6-13
Not an Agent of City 6-12
Payments by 8-5
Shall Not Mortgage Equipment 6-13
Control of Work and Materials 5-1
Control Density Fill (CDF) 10-11
Controlling Operation 1-2
Coordination of Contract Documents 5-2
Critical Path Method (CPM) Schedule 1-2
Crushed Rock 10-10
Crushed Rock, Clean 10-12
Culvert, Driveway 28-1
Curbs, Gutters, and Sidewalks
Concrete 24-1
Concrete Cutting 24-1
Curb Dowel and Tie Bars 10-18
Curbs & Gutter Reconstruction to Accommodate Driveways 24-4
Curb Ramps and Driveways 24-4
Curing 24-3
Damage and Repairs 24-4
Dowel Reinforcement 24-4
Expansion Joints and Score Lines 24-2
Extruded (Slip-Form) 24-2
Finishing 24-3
Formwork – Nonextruded 24-1
Payment 24-5
Slope and Width of Sidewalks 24-4
Subgrade and Aggregate Base 24-1

D

Day, Definition of 1-2
Date of Signing Contract 1-2

Definitions and terms 1-1
Payment Bond 1-4
Performance Bond 1-4
Project Estimate 1-4
Proposal Form 1-4
Proposal Guarantee 1-4
Subcontractor 1-5
Determination of Amount Bid – Mathematical Error 2-3
Detours 7-7
Director 1-2
Disputed Claims 4-5
Disqualification of Bidders 2-5
Division Manager 1-2
Dowel Anchorage, Adhesive Capsules 10-55
Drain Inlets, Gutter Drains and Ditch Boxes 30-1
Driveway Culvert and Sidewalk French Drains 28-1
Duties and Powers of Inspectors 5-10

E

Earthwork, Excavation, Embankment and Subgrade 14-1
Electric Automatic Controller 10-46
Electric Remote Control Valves – Sizes ¾” to 2” 10-48
Electrical
Bonding and Grouting 34-11
City Furnished Equipment 34-15
Conductors 34-9
Conduits 34-5
Electric Service 34-11
Equipment and Drawings 34-1
Excavating and Backfill 34-3
Field Test 34-12
Foundations 34-3
General 34-1
Inspection 34-14
Maintaining Existing Electrical Facilities 34-3
Maintenance of Traffic and Public Safety 34-2
Painting 34-11
Panelboards 34-11
Protection of Existing Improvements 34-2
Pull Boxes 34-8
Rules and Regulations 34-1
Salvage 34-14
Scheduling of Work 34-2
Standards 34-12
Traffic Signal Controller and Intersection Turn On 34-12
Traffic Signal Controller Functional Test 34-13

Wiring 34-10
Electronic Marker System (EMS) 10-49
Eliminated Items 4-4
Embankment and Fill 14-4
Engineer
Authority of 5-1
Definition of 1-2
ESBE Participation 1-3
Examination of Contract Documents and Site of Work 2-1
Excavation
Roadway 14-1
Structure 14-1
Trench 14-2
Execution of Contract 3-2
Existing Facilities
Maintaining Water, Sewer, and Drainage Flows 13-1
Pavement for Trench Surface Restoration 13-4
Payment 13-5
Protection 13-1
Removing/Relocating 13-3
Extra Work 4-4
Extra Work a Part of the Contract 8-6
Expansion Joint Filler, Premoulded 10-1
Explosives
Use of 6-13

F

Failure to Execute Contract 3-2
Federal Specifications 1-3
Fencing – Chain Link
Constructing 31-1
Materials 10-42, 31-1
Payment 31-2
Vinyl Slats 31-2
Field Order 1-3
Final Acceptance of the Work 8-3
Final Payment 8-3
Finance Director 1-3
Fire Hydrants 10-36
Fixed Cost 1-3
Flexible Couplings (Transmission) 10-35
Float Period 1-3
Form of Agreement and Surety Bonds 3-3
French Drains, Sidewalk 28-1

G

Geogrid 10-8

Grout
- Cement 10-52
- Drypack 10-51
- Epoxy 10-53
- Nonshrink 10-52

Grouting, Pressure 10-55
Gunite (See Pneumatically Applied Mortar) 33-1

H

Headers 18-1
Holiday Season Construction Moratorium 6-10
Housekeeping Practices 6-6

I

Inspection 5-10
Inspection and Payments No Waiver of Contract Provisions 8-6
Inspector
- Definition of 1-3
- Duties and Powers of 5-10

Intent of Plans and Specifications 4-1
Iron Sulfate 10-44
Irrigation System
- Backfill of Irrigation Pipelines.....36-7
- Backflow Prevention Assemblies.....36-2
- Conduit 36-2
- Connections to existing Streetscape 36-2
- Control Conductors 10-47, 36-3
- Control Valves 36-3
- Electrical Automatic Controllers.....36-3
- General 36-1
- Guarantee.....36-1
- Installation of Irrigation and Potable Pipe 36-5
- Manufacturer's Warranties 36-1
- Payment 36-8
- Pipe and Fittings 36-2
- Quick Coupling Valves 36-5
- Record Drawings 36-1
- Repaving.....36-8
- Salvage 36-2
- Sprinklers.....36-4

Sterilizing Plastic Potable Pipe 36-7
Swing Joint Assemblies 36-4
Testing 36-6
Trenching 36-5
Type B Sprinkler Riser Assemblies 36-4
Valve Boxes 10-48, 36-3
Valve Manifolds 36-4
Water Taps on City Mains 36-1
Issuance of Punchlist 8-2
Items Containing Trade Secrets or Proprietary Rights Prohibited 6-16

J

Joint Materials
Clay Pipe 10-41
Concrete Pipe 10-41
Manholes 10-41
Joint Venture Bids 2-6

L

Landscape Architect 1-4
Landscape Fill 14-5
Landscape Planting
Certificate of Compliance – Materials 35-1
General 35-1
Hydro-Seed Placement 35-8
Hydro-Seed Placement (Non-irrigated Native Grass/Wildflower) 35-11
Inspection, Final 35-22
Inspection, Pre-Final 35-22
Maintenance 35-19
Maintenance Period, Start of 35-18
Materials 35-1
Measurement of Quantities 35-1
Payment 35-23
Planting Seed 35-8
Planting Trees 35-3
Preparing Planting Areas 35-2
Record Drawings and Controller Charts 35-22
Replacement 35-18
Shrub and Groundcover Areas 35-4
Sod Placement 35-15
Watering 35-17
Weed and Pest Control 35-3
Laws or Regulations 1-3
Laws

Certain Laws Affecting the Work 6-1
Local Ordinances 6-2
State Laws 6-1
To be Observed 6-1
Laying Aggregate Bases 17-1
Laying Road-Mixed and Plant-Mixed Cement Treated Bases 17-2
Legal Relations and Responsibilities to the Public 6-1
Licensing of Bidders 2-5
Lime Stabilization 10-8
Lines and Grades 4-1
Liquidated Damages 1-3

M

Main and Trunkline Utilities 6-15
Manholes, Sanitary Sewer & Storm Drains
Adjusting Manhole Heads 25-6
Castings 25-1
Construction of Manholes (New or Reconstructed) 25-1
Flusher Branches 25-7
Payment 25-7
Standard 25-1
Manual Control Valves 10-48
Manufacturer's Direction 5-9
Materials
Property Rights in 6-13
Storage of 5-8
Mathematical Error, Determination of Amount Bid 2-3
Measurement of Quantities 8-1
Methods of Sampling and testing 5-12
Moving or Changing Utilities and Water Services 29-1

N

Notice of Claims for Additional Compensation or Damages 4-5
Notice to Contractors 2-1

O

On Street Parking Removal 6-14

P

Parking Removal, On Street 6-14
Payment
- By Contractor 8-5
- By Cost and Percentage 8-6
- Final 8-3
- On Engineer's Certificate 8-1
- Scope of 8-1

Performance and Payment Bonds 3-1
Permits, Licenses and Fees 6-4
Pipe, Sewer and Drainage
- Acrylonitrile-Butadiene-Styrene (ABS) 10-14
- Glass-Fiber-Reinforced Thermosetting-Resin 10-17
- Closed Profile Poly Vinyl Chloride (CPPVC) 10-14
- Corrugated HDPE 10-17
- Corrugated Metal 10-16
- Deflection 10-13
- High Density Polyethylene (HDPE) Solid Wall Fusion Jointed 10-14
- Joints 10-13
- Manhole Connections 10-13
- Polyvinyl Chloride (PVC) 10-15
- Reinforced Concrete (RCP) 10-16
- Sewer and Drainage 10-13
- Vitrified Clay Pipe (VCP) 10-16

Pipe, Water Distribution (12inch diameter & smaller)
- Ductile Iron 10-19
- Fittings 10-20
- Polyvinyl Chloride (PVC) 10-19

Pipe, Water Transmission (greater than 12 inch diameter)
- Concrete Cylinder (CCP) 10-25
- Ductile Iron (DIP) 10-29
- Welded Steel (WSP) 10-22

Plans 1-4
- Project Plans 1-4
- Standard Details 1-4

Plants 10-44
Plastic Irrigation Pipe 10-45
Plastic Irrigation Pipe Fittings 10-47
Plastic Potable Pipe 10-46
Plate Culvert, Field Assembled 10-17
Pneumatically Applied Mortar
- Curing and Protecting 33-3
- General 33-1
- Joints 33-3
- Materials 33-1
- Mixing 33-1
- Payment 33-4

Placing 33-2
Preparation of Surface 33-2
Proportions 33-1
Reinforcement 33-3
Polymer Concrete (For Resurfacing or Patching) 10-54
Portland Cement 10-1
Portland Cement Concrete
Composition 10-2
Curing Compounds for Concrete 10-6
Grading and Composition Requirements 10-3
Mixing 10-4
Placing 10-5
Proportioning 10-2
Water Control 10-5
Portland Cement Concrete Pavement
Curing 19-3
Cutting 19-1
Damage and Repair 19-3
Expansion Joints in Alley Pavement 19-1
Finishing 19-2
General Description 19-1
Payment 19-3
Placing 19-2
Protection of 19-3
Sideforms 19-1
Subgrade 19-1
Preconstruction Photographs 11-1
Preparation for Testing 5-12
Preparation of Proposal 2-2
Prequalification of Bidders 2-6
Pressure Grouting 10-55
Project Estimate 2-1
Property Rights in Materials 6-13
Proposal Form 2-1
Proposal Requirements and Conditions 2-1
Proposal Form 1-4
Proposal Guarantee 2-3
Proprietary Rights Prohibited, Items Containing Trade Secrets or 6-16
Protection of City Against Patent Claims 6-4
Protection of Work, Persons and Property Against Damage 7-3
Provisions for Emergencies 5-7
Public Convenience and Safety 6-5
Public Opening of Proposal 2-5

Q

Quality of Materials and Workmanship 5-9
Quick Coupling Valves 10-49

R

Record Drawings 5-6
Regulations, Laws and 1-3
Reinforcement
- Bending 21-2
- Cleaning 21-2
- Materials 21-1
- Payment 21-4
- Placing 21-3
- Preparation for Placing 21-2
- Submittals 21-1
- Welds and Splicing 21-3

Reinforcing Steel 10-17
Rejection of Proposals 2-3
Release at Time of Final Payment 8-5
Relief of Bidders 2-5
Removal of Rejected Materials and Structures 5-11
Removal of Unsatisfactory Employees 7-3
Request for Modification of Work 5-6
Return of Proposal Guarantees 3-2
Right to Perform Extra Work 5-7
Right to Retain Imperfect Work 5-8

S

Sanitary Regulations 6-5
Sanitary Sewer and Storm Drain Manholes 25-1
Saturday, Sunday, Holiday, and Night Work 7-2
Scope of Work 4-1
Seed 10-44
Separate Contracts 7-3
Sewer and Drainage Pipe 10-13
Sewer and Drain Pipe, Laying
- Dewatering 26-2
- Drain and Ditch Box Leads 26-12
- Excavation 26-1
- Health & Safety 26-3
- Joints 26-13
- Laying Pipe 26-4
- Materials/Types 26-3
- Payment 26-24
- Protective Covering 26-13
- Repaving Trenches 26-17
- Services 26-12
- Testing 26-13
- TV Inspection 26-18

Shotcrete (See Pneumatically Applied Mortar) 33-1
Slurry Cement Backfill 10-11
Soil Amendment 10-44
Special Provisions 1-5
Specifications 1-5
State Specifications 1-5
Storage of Materials and Equipment 5-8
Subcontractors 2-4
Subgrade 14-5
Submission of Proposal 2-5
Submittals 5-5
Substantially Complete 1-5
Subsurface Drains 10-17
Suggestions to Contractor Adopted at Contractor's Own Risk 5-6
Supplier 1-5
Survey
    Construction Stakes 5-4
    Permanent Survey Monuments 5-4
Suspension of Work to Protect Health, Safety or Welfare of Persons or Property 5-7

T

Terms and definitions 1-1
Temporary Paving 14-3
Temporary Suspension of Work 7-5
Time of Award 3-1
Time of Completion 7-4
Trade Names and Alternatives 5-9
Trade Secrets or Proprietary Rights Prohibited, Items Containing 6-16
Traffic Control Requirements 6-7
Traffic Signs, Markings, and Barricades
    Painted Markings 32-5
    Raised Reflective Markers 32-6
    Signs 32-1
    Street Barricades 32-8
    Temporary Markings 32-6
    Temporary Street Signs 32-8
    Thermoplastic Markings 32-2
Trench Safety Plans 6-7

U

Unsuitable Material/Import 14-5
Utilities and Franchises 29-1
Utilities and Water Services, Moving or Changing 29-1
Utilities, Main and Trunkline 6-15

Utility Connection, Provision for 29-1

V

Valves 10-39
Valve Boxes and Covers, Drop Caps, and Service Valve Boxes 10-40

W

Water for Concrete 10-1
Water Distribution Systems
- Air Release Valves, Adjusting 27-27
- Appurtenances 27-11
- Bedding and Backfilling of Trenches 27-16
- Corrosion Monitoring 27-28
- Cut-In Connection to Existing Water Mains 27-26
- Disinfection 27-20
- General 27-1
- Laying 27-5
- Payment 27-36
- Pipe 27-1
- Placing Locating Wire with Distribution Mains 27-10
- Pressure Testing 27-25
- Repaving of Trenches 27-17
- Services 27-19
- Taps to New and Existing Mains 27-19
- Thrust Blocking and Restrained Joints 27-10
- Trenching 27-2
- Valve Boxes, Setting, Adjusting and Locating 27-27

Water Pipe – Distribution (12 inch diameter & smaller) 10-18
Water Pipe – Transmission (greater than 12 inch diameter) 10-21
Water Quality Control
- Enforcement 16-6
- Erosion, Sediment, and Pollution Control 16-3
- Ground Water Discharges 16-1
- Water Quality Control 16-1,16-2

Water Service Connection Materials 10-40
Water Transmission, Appurtenances 10-35
Water Used in Construction 15-1
Work 1-5
Working Day
- Definition of 1-6
- Saturday, Sunday, Holiday, and Night Work 7-2

Work Schedule and Adequate Resources 7-1
Work Under Unfavorable Weather and Other Adverse Conditions 7-2