Standard Specifications

CITY OF PITTSBURG
ENGINEERING DIVISION

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CITY OF PITTSBURG

STANDARD SPECIFICATIONS

GENERAL PROVISIONS

CITY OF PITTSBURG

COMMUNITY DEVELOPMENT DEPARTMENT

ENGINEERING DIVISION

STANDARD SPECIFICATIONS

PART I - GENERAL PROVISIONS

TABLE OF SECTIONS

STANDARD SPECIFICATIONS

PART I - GENERAL PROVISIONS

TABLE OF CONTENTS

PART I

TABLE OF CONTENTS

(continued)

PART I

TABLE OF CONTENTS

(continued)

PART I - GENERAL PROVISIONS

SECTION 1.
TERMS, DEFINITIONS, AND ABBREVIATIONS

1-1 General - Unless otherwise stated, the words directed, required, permitted, ordered, instructed, designated, applicable, appropriate, sufficient, proper, desirable, necessary, prescribed, approved, acceptable, satisfactory or words of like import, refer to actions, expressions and prerogatives of the Engineer.

Masculine gender words include the feminine. References to gender, such as "workman" and "flagman" and the pronoun "he" or "his" referring to such titles, are abstract in the specifications, used for the sake of brevity and are intended to refer to persons of either sex.

Singular words include the plural and "person" includes firms, companies and corporations.

1-2 Abbreviations - Wherever in the specifications and other contract documents abbreviations, terms or pronouns in place of them are used, the intent shall be interpreted in the conventional common usage and general meaning within the related context and as outlined in this Section.

AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CRSI	Concrete Reinforcing Steel Institute
EEI	Electrical Engineers Institute
EIA	Electronic Industries Association
IEEE	Institute of Electrical and Electronics Engineers
NEC	National Electric Code
NEMA	National Electrical Manufacturer's Association

NESC	National Electric Safety Code
NFPA	National Fire Protection Association
NLMA	National Lumber Manufacturers Association
PUC	Public Utilities Commission
REA	Rural Electrification Administration
UBC	Uniform Building Code
UL	Underwriters' Laboratories Inc.
UPC	Uniform Plumbing Code

1-3 Definitions

Acceptance - The formal written acceptance by the City of an entire contract which has been completed in all respects in accordance with the Contract Documents and any modifications thereof previously approved.

Act of God - An earthquake, flood, cyclone or other cataclysmic phenomenon of nature. A rain, windstorm, high water or other natural phenomenon or unusual intensity for the specific locality of the work, which might reasonably have been anticipated from historical records of the general locality of the work, shall not be construed as an Act of God.

Addenda - Written or graphic instruments issued prior to the Bid which modify or interpret the Contract Documents, Drawings and Specifications, by additions, deletions, clarifications or corrections.

Bidder - Any properly licensed and qualified individual, firm, partnership, corporation, joint venture or combination thereof, submitting a proposal for the work contemplated, acting directly or through a duly authorized representative.

City - The governing body of the City of Pittsburg, County of Contra Costa, State of California, also called the Owner.

City Engineer - The engineer designated by the City to have administrative control over the work, sometimes referred to as Engineer.

Contract - The written agreement covering the performance of the work as more fully described in, but not limited to, the Plans, Standard Specifications, Special and Technical Provisions, Contract Bonds, Proposal, Addenda, Change Orders.

Contract Change Order - A written order to the Contractor, covering changes in the plans or quantities, or both, within the scope of the contract, and establishing the basis of payment and time adjustments for the work affected by the changes.

Contract Documents - The written agreement covering the performance of the work and the furnishing of labor, materials, and Contractor's Plant and equipment in the construction of the work, also referred to herein as the Contract.

The Contract Documents include, but are not limited to: The Accepted Standard Proposal Packet; General Provisions; Technical Provisions; Special Provisions; Standard Plans; Project Plans, Approved Revisions to the Plans; Reference Specifications; Permits from other Agencies as may be required by law; Contract Change Orders; and other

written supplemental Agreements. The Contract Documents do not, however, include the logs of geologic test borings and other geologic records, reports and interpretations.

Contract Item - A specific unit of work for which a price is provided in the contract, also Bid Item or Pay Item.

Contract Price - The total amount of money for which the contract is awarded.

Contract Time - The number of calendar days or working days stated in the Contract Documents for the completion of the Work.

Contract Unit Price - The contractor's original bid for a contract item of work in the Proposal.

Contractor - The person or persons, firm, partnership, corporation, or combination thereof, who have entered into a contract with the City, as party or parties of the second part or his or their legal representatives.

Contractor's Plant and Equipment - Everything, except labor, used by the Contractor in order to carry out the work, but not to be incorporated in the work.

Days - Days shall mean consecutive calendar days unless otherwise specified.

Designated Authority - The term Designated Authority, if used in the Contract Documents, shall be taken as a general reference to designate the party or parties authorized or employed by the City to observe and test materials or completed work and to observe their general compliance with the Contract Documents. The Designated Authority may include the following, among others, insofar as they perform designated functions within the scope of their authority.

City Engineer and his duly authorized representative.
Consulting Engineers.
Soils Engineers.
Public Utility Agencies.
Public Agency Authorities.

Engineer - The Engineer designated by the City to have administrative control over the work acting either directly or through duly authorized representatives such agents acting within the scope of the particular duties delegated to them; also referred to as the City Engineer or Public Works Director.

Engineer's Estimate - The list of estimated quantities of work to be performed as contained in the "Bidders Proposal".

Extra Work - An item of work not provided for in the Contract or not included in bid items and not appurtenant or incidental to the items included, but found by the Engineer to be essential to the satisfactory completion of the Contract within its intended scope.

Fixed Costs - Any necessary labor, material and equipment costs directly expended on the item or items under consideration which remain constant regardless of the quantity of the work done.

Herein - "Herein", "hereinafter", "hereinabove", "hereof", and words of similar import shall refer to the contract documents as appropriate.

Inspector - An authorized representative of the Engineer assigned to make all necessary inspection of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

Install - The installation complete in place of an item, material or piece of equipment with all its appurtenant and subordinate accessories, connections, supports and other work, labor and materials to perform same.

Invitation to Bid - The notice published and included in the proposal package also called the Notice to Contractors.

Laboratory - The designated materials testing laboratory authorized by the City Engineer to test materials and work involved in the contract.

Liquidated Damages - The amount prescribed in the specifications, pursuant to the authority of Government Code Section 14376, to be paid to the City or to be deducted from any payments due or to become due the Contractor for each day's delay in completing the whole or any specified portion of the work beyond the time allowed in the specifications.

Notice of Award of Contract - The formal notice of the contract for the work, issued by the City to the lowest responsible bidder awarded said contract.

Notice to Proceed - The formal notice to proceed, issued by the City Engineer after all contract, insurance and bond forms have been approved and agreement has been executed by the City.

Owner - The City of Pittsburg acting through its appointed and duly authorized officials.

Plans - The official project plans and standard plans, profiles, cross sections, working drawings and supplemental drawings, approved by the Engineer, which show the location, character, dimensions and details of the work to be performed. All such documents are to be considered as a part of the Contract Documents whether or not reproduced in the special provisions and are to be considered as a part of the contract supplementary to the specifications.

Processing - Any operation or operations of whatever nature and extent required to produce a specified material.

Proposal - The offer of the bidder for the work when made out and submitted in the prescribed proposal form, properly signed and guaranteed, also referred to as Proposal Form.

Proposal Guaranty - The cashier's check, certified check, or bidder's bond accompanying the proposal submitted by the bidder, as a guaranty that the bidder will enter into a contract with the City for the perforamnce of the work if the contract is awarded to him.

Public Works Specifications - The Standard Specifications for Public Works Construction in effect at the time of advertising the work.

Reference Specifications - Those bulletins, standards, rules, methods of analysis or tests, codes, and specifications of other agencies, engineering societies, or industrial associations referred to in the contract documents. These refer to the latest edition, including amendments in effect and published at the time of advertising the project or issuing the permit, unless specified otherwise.

Shall be Approved - The term "shall be approved by the Engineer" or phrases of like import mean subject to the approval of the Engineer.

Shall, Will or May - "Shall" or "will", whenever used to stipulate anything is mandatory and means shall or will be done or be performed and means that the Contractor or the Owner has thereby entered into a covenant with the other party to do or perform the same. "May", wherever and in whatever manner used, is permissive.

Shop Drawings - All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a subcontractor, manufacturer, supplier or distributor, which illustrate how specific portions of the Work shall be fabricated or installed.

Specifications - The written directions, provisions and requirements herein contained pertaining to the method and manner of performing the work or to the quantities and qualities of the materials to be furnished under the contract, together with all other directions, provisions and requirements herein contained, plus such amendments, deletions from or additions thereto which may be provided for by supplemental agreement or agreements. Specifications include the General Provisions, the Technical and Special Provisions and the Plans, Drawings and Materials related to the work.

Special Provisions - Specific clauses setting forth conditions or requirements peculiar to the work and supplementary to the Standard Specifications.

Standard Specifications - Whenever the words "Standard Specifications" are used without further identification or title, they shall be understood to mean the "Standard Specifications" of the City of Pittsburg and its most recent revisions.

State Specifications - The State of California, Department of Transportation Agency's Standard Specifications in effect at the time of advertising the work, also called State Standard Specifications.

State - The State of California.

Subcontractor - The individual, partnership, corporation or other legal entity entering into a contract with the contractor to perform a portion of the work, sometimes referred to as employee of the contractor.

Submitted - Submitted to the Engineer for his consideration.

Substantial Completion - That date, as certified by the Engineer; when the construction of the work or a specified part thereof is sufficiently completed, in accordance with

the Contract Documents, so that the Work or specified part can be utilized for the purposes for which it is intended.

Surety - Any individual, firm or corporation, bound with and for the contractor for the acceptable performance, execution, and completion of the work, and for the satisfaction of all obligations incurred.

Utility - Tracks, overhead or underground wires, pipe lines, conduits, ducts, or structures, sewers or storm drains, operated, maintained, or existing in or across a public right of way or private easement.

Work - The term "work" shall be taken to mean all the work specified, indicated, shown or contemplated in the contract to construct the improvement, including all alterations, amendments or extensions thereto made by contract change order or other written orders of the Enginer. The term includes all labor and materials and equipment necessary to produce the construction required by the Contract Documents, and all materials, equipment and incidentals incorporated or to be incorporated in such construction. Anything and everything to be done for the setting out, execution, completion and fulfillment of the contract to be satisfaction of the City.

Working Day - Any day, other than a legal holiday, Saturday or Sunday, on which the Contractor may proceed with regular work on the current controlling operation as determined by the Engineer, toward the completion of the Contract, unless the controlling operation of work is delayed by inclement weather as may be specified in the General Provisions.

PART I

SECTION 2.
PROPOSAL REQUIREMENTS

2-1 Proposal Forms - The City will furnish to each Bidder a Standard Proposal Form, which, when filled out and executed may be submitted as his bid. Bids not presented on forms so furnished will be disregarded. The Proposal Form bound together with the Contract Proposal Packet which must remain intact in its entirety.

If applicable, the proposal shall set forth for each Contract item of work, in clearly legible figures, an item price and a total for the item in the respective spaces provided, and shall be signed by the bidder, who shall fill out all blanks in the proposal form as required.

All forms contained in the proposal packet shall be completed and the proposal submitted in accordance with the instructions contained therein and with the requirements of this section. Exceptions are those marked (Forms) included as illustrations.

The Financial Statement of the apparent low bidder shall be submitted within 5 calendar days of the bid opening to the City.

The Proposal Packet shall be submitted as directed in the Notice to Contractors under sealed cover plainly marked as a "Proposal", and identifying the project to which the proposal relates and the date of the bid opening therefor. Proposals which are not properly marked may be disregarded.

When proposals are signed by an agent, other than the officer or officers of a corporation authorized to sign contracts on its behalf or a member of a partnership, a "Power of Attorney" must be filed with the City prior to opening bids or shall be submitted with the proposal; otherwise, the proposal may be rejected as irregular and unauthorized.

All Proposal Packets may be obtained from the City Clerk, 2020 Railroad Avenue, Pittsburg, CA 94565.

2-2 Examination of Documents and Site - The Bidder shall examine carefully both the site of the work contemplated, and the Contract Documents. The submission of a bid proposal shall be conclusive evidence that the bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and scope of work to be performed, the quantities of materials to be furnished, and as to the requirements of the contract and the Contract Documents.

Where the City has made investigations of subsurface conditions in areas where work is to be performed under the contract, 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. Where such investigations have been made, bidders or Contractors may, upon written request, inspect the records of the City as to such investigations subject to and upon the conditions hereinafter set forth.

The records of such investigations are not a part of the contract and are shown solely for the convenience of the bidder or Contractor. It is expressly understood and agreed that the City assumes no responsibility whatsoever in respect to the sufficiency or accuracy of the investigations thus made, the records thereof, or of the interpretations set forth therein or made by the Engineer in its use thereof and there is no warranty or guaranty, either expressed 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 unlooked-for developments may not occur, or that materials other than, or in proportions different from those indicated, may not be encountered.

When a log of test borings showing a record of the data obtained by the City's investigation of subsurface conditions is included with the contract plans, it is expressly understood and agreed that said log of test borings does not constitute a part of the contract, represents only the opinion of the City as to the character of the materials encountered by it in its test borings, is included in the plans only for the convenience of bidders and its use is subject to all of the conditions and limitations herein set forth.

No information derived from such inspection of records of investigations or compilation thereof made by the City or from the Engineer, or his assistants, will in any way relieve the bidder or Contractor from any risk or form properly fulfilling the terms of the contract.

2-3 Withdrawal of Proposals - Any bid may be withdrawn at any time prior to the time fixed in the public notice for the opening of bids only by written request for the withdrawal of the bid filed with the City Clerk. The request shall be executed by the Bidder or his duly authorized representative. The withdrawal of a bid does not prejudice the right of the Bidder to file a new bid. Whether or not bids are opened exactly at the time fixed in the public notice for opening bids, a bid will not be received after that time, nor may any bid be withdrawn after the time fixed in the public notice for the opening of bids or amendments thereto preceded by Addendum.

2-4 Public Opening of Proposals - Proposals will 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. After opening of Bids, the City Engineer will review all bids for accuracy and reserves the right to make corrections of obvious errors. Upon completion of the City Engineer's review, bids will be positioned and an apparent low bidder will be determined and notified.

2-5 Disqualification of Bidders - More than one proposal from an individual, firm, partnership, corporation, or combination thereof under the same or different names will not be considered. Reasonable grounds for believing that any individual firm, partnership, corporation or combination thereof is interested in more than one proposal for the work contemplated may cause the rejection of all proposals in which such individual, firm, partnership, corporation or combination thereof is interested. If there is reason for believing that collusion exists among the bidders any or all proposals may be rejected. Proposals in which the prices obviously are unbalanced may be rejected.

2-6 Relief of Bidders - Attention is directed to the provisions of Government Code Sections 14350 to 14355, inclusive, of the State Contract Act concerning relief of bidders and in particular to the requirement therein, that if the Bidder claims a mistake was made in his bid, the Bidder shall give the City written notice within five (5) days after the

opening of the bids of the alleged mistake, specifying in the notice in detail how the mistake occurred.

The Contractor accepts all risks directly or indirectly connected with the performance of the contract. The Contractor further warrants that there has been no collusion and that he has not been influenced by any oral statement or promise of the Engineer, but only by the Contract Documents.

2-7 Rejection of Proposals - Proposals may be rejected if they show any alteration of form, additions not called for, conditional bids, incomplete bids, erasures, or irregularities of any kind.

The City reserves the right to reject any or all bids for: improper form, upon finding the Contractor to be irresponsible or incompetent, collusion, unbalanced bids, inability to perform the contract or any other reason found to be detrimental to the City's interest or welfare.

2-8 Proposal Guaranty - All bids shall be presented under sealed cover and accompanied by one of the following forms of bidder's security:

A cashier's check, a certified check, or a bidder's bond consisting of City's Standard Bond Form and executed by an admitted surety insurer, made payable to the City.

The security shall be in an amount equal to at least 10 percent of the amount bid. A bid will not be considered unless one of the forms of bidder's security is enclosed with it.

A bidder's bond will not be accepted unless it conforms to the bond form included in the Contract Documents.

2-9 Addenda - The Engineer may, when he deems necessary, and at a time prior to the bid opening, issue addenda to the Contract Documents to amend, clarify or correct matter contained therein. Such addenda shall constitute a part of said Contract Documents and shall be binding. Addenda will be forwarded to all prospective bidders, insofar as they are known to the Engineer.

2-10 Approximate Estimate - The quantities given in the proposal and contract forms are approximate only, being given as a basis for the comparison of bids, and the City does not, expressly or by implication, agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or portion of the work, or to omit portions of the work, as may be deemed necessary or advisable by the Engineer.

2-11 Substitution of Equals - Whenever in the Contract Documents, any material, equipment or process is indicated or specified by patent or proprietary name or by name of manufacturer, and the Bidder desires to offer a substitute material, equipment or process as the case may be, on the basis that a substitute is the equal in every respect to that so indicated or specified, then the Bidder shall first submit to the Engineer a request in writing for his approval along with such detailed plans and specifications and other data as the Engineer may deem necessary to enable him to determine if the substitute is the equal of that called for. A request by a prospective bidder for such approval shall be submitted to the Engineer at least ten (10) days in advance of the time and date set for

opening of bids in order that all interested bidders may be notified of such approval or approved alternative, as the case may be.

The Engineer shall in all cases be the judge as to whether the substitute offered is the equal in all respects of the material, equipment or process specified.

If the material, equipment or process offered by the Bidder is not, in the opinion of the Engineer, equal in every respect to that specified, then the Bidder must furnish the material, equipment or process specified, or one that, in the opinion of the Engineer, is the equal thereof in every respect.

2-12 Interpretation of Documents - If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the Contract Documents, or finds discrepancies in, or omissions from the plans or specifications, he may submit to the Engineer a written request for an interpretation or correction thereof. The person submitting the request will be responsible for its prompt delivery at least 7 days prior to the bid opening. Any interpretation or correction of the proposed documents will be made only by addendum duly issued, and a copy of such addendum will be mailed or delivered to each person receiving a set of such documents. Any addenda issued during the period of bidding shall be duly executed by the bidder, and said addenda must be attached to and submitted with the proposal. Absence of such attachment of addenda shall be cause for rejection of a proposal. The City will not be responsible for any other explanations or interpretations of the Contract Documents.

Neither the City nor the Engineer shall be deemed responsible for any oral clarification nor will same be binding.

PART I

SECTION 3.
AWARD AND EXECUTION OF CONTRACT

3-1 Award of Contract - The right is reserved to reject any or all proposals and to waive irregularities in the bid procedure and proposal.

The award of the contract, if it be awarded, will be to the lowest responsible bidder whose proposal complies with all the requirements prescribed. Such award, if made, will be made within 30 calendar days after the opening of the proposals. If the lowest responsible bidder refuses or fails to execute the contract, his bid security is forfeited and the City may award the contract to the second lowest responsible bidder. Such award, if made, will be made within 45 calendar days after the opening of proposals. If the second lowest responsible bidder refuses or fails to execute the contract, his bid security is forfeited, and the City may award the contract to the third lowest responsible bidder. Such award, if made, will be made within 60 calendar days after the opening of the proposals. The periods of time specified above within which the award of contract may be made shall be subject to extension for such further period as may be agreed upon in writing between the City and the bidder concerned.

All bids will be compared on the basis of the Engineer's Estimate of the quantities of work to be done, whenever applicable.

3-2 Contract Bonds - The Contractor simultaneously with execution of the Contract, shall furnish a surety bond to secure the faithful performance of the contract for the work in an amount of 100% of the contract price. He shall also furnish a bond to secure payment for all labor, material, equipment, and supplies furnished for the work in an amount equal to 100% of the contract price. The form of the Bonds shall be as contained in the Contract Documents and satisfactory to the City.

3-3 Execution of Contract - The contract shall be signed by the successful bidder and returned, together with the contract bonds and insurance certificates, within 10 calendar days after the Notice of Award.

3-4 Failure to Execute Contract - Failure of the lowest responsible bidder, the second lowest responsible bidder, or the third lowest responsible Bidder to execute the contract and file acceptable bonds as provided within ten days after such Bidder has received notice that the contract has been awarded to him shall be just cause for the annulment of the award and the forfeiture of the proposal guaranty. The successful bidder may file with the City a written notice, signed by the Bidder or his authorized representative, specifying that the Bidder will refuse to execute the contract if presented to him. The filing of such notice shall have the same force and effect as the failure of the Bidder to execute the contract and furnish acceptable bonds within the time prescribed.

3-5 Contract Documents - The Contract Documents shall consist of, but not be limited to, the following:

1. Accepted Proposal
2. Notice to Bidders
3. Contract Agreement
4. Bond for Faithful Performance
5. Bond for Labor and Material
6. Addenda
7. List of Subcontractors
8. These Standard Specifications and General Provisions
9. The Special and Technical Provisions
10. Drawings
11. Permits from Agencies as Required
12. Insurance Certificates

3-6 Bond Renewal and Extension - Should any bond become insufficient, the Contractor shall renew the bond within 10 calendar days after receiving notice from the City.

Should any Surety at any time be unsatisfactory to the City, notice will be given the Contractor to that effect. No further payments shall be deemed due or will be made under the contract until a new Surety shall qualify and be accepted by the City.

Changes in the work, or extensions of time, made pursuant to the contract, shall in no way release the Contractor or Surety from their obligations. Notice of such changes or extensions shall be waived by the Surety.

3-7 Return of Proposal Guarantees - Within 10 calendar days after Bids are opened, checks furnished as bid security will be returned to bidders whose proposal is rejected or is otherwise not to be considered in making an award.

Retained proposal guarantees will be held until the contract has been finally executed and returned to the Contractor (but not to exceed 60 days) after which all proposal guarantees (except bidders bonds and any guarantees which have been forfeited) will be returned to the bidders whose proposal they accompany.

PART I

SECTION 4.
SCOPE OF WORK - CHANGES IN WORK

4-1 Intent of Plans and Specifications - The intent of the Plans and Specifications is to describe the details for the construction and completion of the work which the Contractor undertakes to perform in accordance with the terms of the contract. Where the Plans or 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 first quality are to be used. Unless otherwise specified, the contractor shall furnish all tools, equipment, and incidentals, and do all the work involved in executing the contract in a satisfactory and workmanlike manner.

In the event materials or equipment are to be furnished by the City, as designated in the Special Provisions or as agreed on, this shall not relieve the Contractor of the requirements to furnish all other labor, materials and equipment to complete the contract.

4-2 Final Clean Up - Before final inspection of the work, the Contractor shall clean the construction area, material sites, and all ground occupied by him in connection with the work of all rubbish, excess materials, form lumber, etc. All parts of the work shall be left in a neat and presentable condition.

4-3 Changes

4-3.1 Changes Initiated by the City - The City may change the Contract, character of the work, or quantity of work for any bid item. Provided this total value of all such changes for that bid item does not exceed 25% of the total Contract bid price, no adjustment in the Contract Unit Price shall be made. Should it become necessary to exceed this limitation, payment and time adjustments for the work affected will be provided by contract change order.

4-3.2 Changes Requested by the Contractor - Changes requested in the plans and specifications shall be made in writing. Approved changes shall be made by change orders at a reduction in cost or at no additional cost to the City. Nothing herein shall be construed as granting a right to the Contractor to demand acceptance of such changes.

4-3.3 Compensation - The Contract Unit Price or combinations, as set forth in the Contractor's accepted proposal, shall be used in determining compensation to be made for any alterations, deviations, additions or deletions. Where this contract unit price does not apply, compensation shall be based on one or more of the following methods:

(a) By unit price or as subsequently agreed upon.

(b) By the daily accumulation of costs (Force Account) as provided by Section 9-3.

(c) By an agreed on lump sum price.

(d) As Extra Work as set forth in the Specifications and in the Special Provisions.

Should any contract item be deleted in its entirety, payment will be made in accordance with Section 9-3 only for actual costs incurred prior to notification of such deletion, without markups specified in Sections 4-6 and 9-3.

4-3.4 Contract Change Orders - Change orders shall be in writing and state the dollar value of the change or establish method of payment, any adjustment in contract time, and shall provide for the Contractor's signature indicating his acceptance. A contract change order will not become effective until the Engineer approves it.

4-3.5 Extra Work - New and unforeseen work will be classed as extra work when determined by the Engineer that such work is not covered by any of the various items for which there is a bid price or by combinations of such items. In the event portions of such work are determined by the Engineer to be covered by none of the various items for which there is a bid price of combinations of such items, the remaining portion of such work will be classed as extra work. Extra work also includes work specifically designated as extra work in the Plans or Specifications. The City may defer or have others perform extra work.

The Contractor shall do such extra work and furnish labor, materials and equipment therefor upon receipt of an approved contract change order or other written order of the Engineer. The Contractor shall not be entitled to payment without an approved contract change order or written order of the Engineer.

4-3.6 Procedure and Protest - A contract change order approved by the Engineer may be issued to the Contractor at any time. Should the Contractor disagree with any terms or conditions set forth in an approved contract change order which he has not or refused to execute, he shall submit a written protest to the Engineer within five (5) calendar days after the receipt of such approved contract change order and shall state therein any and all reason for such protest.

If the Contractor has failed to protest pursuant to the above, the contract change order will be considered as executed. Any additions, deletions or alterations to the contract shall be compensated for as set forth in such contract change order and no additional compensation will be allowed.

4-4 As Built Drawings - The Contractor shall maintain a set of project plans at the job site for the sole purpose of noting changes, details, corrections, and any other information reflecting or clarifying actual conditions. Both the Contractor and the Engineer shall have access to and entrance of information thereon, such information duly initialled and dated. All entries shall be clear and sufficiently detailed to be used as entries on the original plans as Final "As Built Drawings". The said plans at the job site shall be City Property under custody of the Contractor, returned to the City upon completion of the Project.

PART I

SECTION 5.
CONTROL OF THE WORK AND MATERIALS

5-1 Authority of Engineer - The Engineer shall decide all questions which may arise as to the quality or acceptability of materials furnished and work performed and as to the manner of performance and rate of progress of the work; all questions which may arise as to the interpretation of the Plans and Specifications; all questions as to the acceptable fulfillment of the contract on the part of the Contractor; and all questions as to compensation. His decision shall be final and he shall have authority to enforce and make effective such decisions and orders which the Contractor fails to carry out promptly.

5-2 Assignment - The performance of the contract may not be assigned, except upon the written consent of the Engineer. Consent will not be given to any proposed assignment which would relieve the original Contractor or his surety of their responsibilities under the contract nor will the Engineer consent to any assignment of a part of the work under the contract.

5-3 Subcontracting - The Contractor shall give his personal attention to the fulfillment of the contract and shall keep the work under his control.

No subcontractor will be recognized as such, and all persons engaged in the work of construction will be considered as employees of the contractor and he will be held responsible for their work, which shall be subject to the provisions of the contract and specifications.

5-4 Precedence of Contract Documents - In the event of any conflict in the provisions thereof, the terms of said documents shall control, each over the other, in the following order:

1) Permits from other agencies as required.
2) Supplemental Agreements
3) Contract Change Orders
4) Approved Revisions to the Plans
5) Addenda
6) Proposal Packet
7) Special Provisions
8) Reference Specifications
9) Project Plans
10) Technical Provisions
11) Standard Plans
12) General Provisions

The plans, specifications and other Contract Documents will govern the work. The Contract Documents are intended to be complementary and cooperative and to describe and provide for a complete project. Anything in the specifications and not on the plans, or on the plans and not in the specifications, shall be as though shown or mentioned in both. Reference specifications and standard plans are a part of the Contract Documents.

In the event of any discrepancy between any drawing and the figures written thereon, the figures shall be taken as correct.

5-5 Plans and Working Drawings - The contract plans furnished consist of general drawings and show such details as are necessary to give a comprehensive idea of the construction contemplated. All authorized alterations affecting the requirements and information given on the contract plans shall be in writing.

Working drawings or plans for any structure not included in plans furnished by the Engineer shall be approved by the Engineer before any work involving these plans is performed, unless approval be waived in writing by the Engineer.

It is mutually agreed, however, that approval by the Engineer of the Contractor's working plans does not relieve the Contractor of any responsibility for accuracy of dimension and details, and that the Contractor shall be responsible for agreement and conformity of his working plans with approved plans and specifications.

Full compensation for furnishing all working drawings shall be considered as included in the price bid for the contract items of work to which such drawings relate and no additional compensation will be allowed therefor.

The Contractor shall keep at the worksite a copy of the Plans and Specifications, including addenda and change orders, to which the Engineer shall have access at all times.

The Plans, Specifications and other Contract Documents will govern the work. The Contract Documents are intended to be complementary and cooperative and to describe and provide for a complete project. Anything in the specifications and not on the plans, or on the plans and not in the specifications, shall be as though shown or mentioned in both. Reference specifications and standard plans are a part of the Contract Documents.

While it is believed that much of the information pertaining to conditions which may affect the cost of the proposed work will be shown on the plans or indicated in the specifications, the City does not warrant the completeness or accuracy of such information. It is the Contractor's responsibility to ascertain the existence of any conditions affecting the cost of the work which would have been disclosed by careful examination of the site.

Existing improvements visible at the job site, for which no specific disposition is made on the plans, but which could reasonably be assumed to interfere with the satisfactory completion of the improvements contemplated by the plans, shall be removed and disposed of by the Contractor as part of the work at no additional cost to City.

The Contractor shall, upon discovering any error, omission or conflict in the plans or specifications, immediately call it to the attention of the Engineer.

5-6 Shop Drawings - When shop drawings or other details are necessary to adequately control the work or are required by the Contract Documents, or requested by the Engineer, they shall be prepared in accordance with current modern engineering/architectural practice and at the Contractor's expense. Drawings shall be of a size and scale to show clearly all necessary details and shall be transmitted by letter to the Engineer for review or correction at least ten (10) working days before such drawings will be required for commencing the work.

Materials shall not be furnished or fabricated nor any work done for which drawings are required, before review of the drawings.

When first submitted by the Contractor, each drawing shall be a good quality transparency, accompanied by five prints. If reviewed without change or correction, three such copies will be returned to the Contractor. If extensive additions or corrections are required, the Engineer will return one marked-up copy to the Contractor, together with the transparency, for correction and resubmission. Approved transparencies will be retained by the Engineer.

Review and approval of drawings by the Engineer shall not relieve the Contractor from the responsibility for errors or omissions in the drawings or from deviations from the Contract Documents unless such deviations were specifically called to the attention of the Engineer in the letter of transmittal submitted with the drawings. The Contractor shall be responsible for the correctness of the drawings, for shop fits and field connections, and for the results obtained by use of such drawings.

Such review and approval is a general review only, for compliance with the Contract Documents, and does not constitute a detailed check of dimensions, quantities, materials, or fabrication processes. This review shall not relieve the contractor, subcontractor, or vendor from conforming with all aspects of the Contract Documents, and neither the Engineer nor the City shall be held responsible for any errors or omissions by reason of such review.

5-7 Lines and Grades - Such stakes or marks will be set as the Engineer determines to be necessary to establish basic control lines and grades required for the completion of the work.

The Contractor shall deliver at least 2 working days' notice in writing when he will require the services of the Engineer for laying out any portion of the work.

Basic horizontal and vertical control points will be established by the Engineer at no cost to the Contractor. These points shall be used as datum for the work. All additional survey, layout, and measurement work shall be considered as included in the various Contract items of work unless a separate bid item is provided for "Construction Surveys" in the Bidder's Proposal.

The Contractor shall keep the Engineer informed of the times and places at which he wishes to do work, so that horizontal and vertical control points may be established and any checking deemed necessary by the Engineer may be done with minimum inconvenience to the City and Contractor.

The Contractor shall preserve all such stakes and marks set for lines, grades, or measurements of the work, or permanent survey monuments, bench marks or boundary markers, in their proper places until authorized to remove them by the Engineer. All expenses incurred in replacing stakes and marks that have been removed without proper authority shall be paid by the Contractor. Such expenses will be deducted from any monies due or to become due the Contractor.

All construction surveys and measurements, stakes and marks and all such related work necessary to prosecute the project except such initial basic control survey furnished

by the Engineer, shall be the Contractor's responsibility and the costs therefor included in the various Contract items of work. Such construction surveys shall be performed only under supervision of properly experienced and licensed persons and be sufficiently extensive, in the opinion of the Engineer, to assure compliance with the plans and specifications.

5-8 Superintendence - At all times during the progress of the work, the Contractor shall have an authorized representative or agent present at the construction site who shall have complete authority to represent and to act for the Contractor. Before initial work is begun on the contract, the Contractor and his superintendent shall file with the Engineer, addresses and telephone numbers where they can be reached during all hours, including nights and weekends, when the work is not in progress.

Whenever the Contractor or his authorized representative is not present on any particular part of the work where it may be desired to give direction, orders will be given by the Engineer, which shall be received and obeyed by the superintendent or foreman who may have charge of the particular work in reference to which the orders are given.

5-9 Defective and Unauthorized Work - All materials, parts and equipment furnished by the Contractor in the work shall be new, high grade, and free from defects. Used or secondhand materials, parts and equipment may be used only if permitted by the Special Provisions. Workmanship shall be in accord with the generally accepted standards. Material and workmanship shall be subject to the Engineer's approval.

Materials and workmanship not conforming to the requirements of the Contract Documents shall be considered defective and will be subject to rejection. Defective work or material, whether in place or not, shall be removed immediately from the site by the Contractor, at his expense, when so directed by the Engineer.

Any work done beyond the limits of Work, lines and grades shown on any approved plans or established by the Engineer, or any extra work done without written authority, will be considerd as unauthorized and will not be paid for.

Upon failure on the part of the Contractor to comply forthwith with any order of the Engineer made under the provisions of this article, the Engineer shall have authority to cause defective work to be remedied, or removed and replaced, and unauthorized work to be removed, and to deduct the costs thereof from any monies due or to become due the Contractor. Costs to be deducted shall include twenty (20) percent markup for engineering and administration by the City.

5-10 Character of Workmen - If any subcontractor or person employed by the Contractor who appears to the Engineer to be incompetent or to act in a disorderly or improper manner, he shall be discharged from the site immediately by the Contractor upon written direction of the Engineer, and such person or subcontractor shall not again be employed on the work.

5-11 City Furnished Materials - Materials, if furnished by the City, will be made available as designated in the Special Provisions. The cost of loading, unloading, hauling and handling and placing City-furnished materials shall be considered as included in the price bid for the contract item involving such City-furnished material.

Contractor shall inspect and assure himself of the amount and soundness of such materials and acknowledge written receipt for same.

The Contractor will be held responsible for all materials furnished to him, and he shall pay all demurrage and storage charges. City-furnished materials lost or damaged from any cause whatsoever shall be replaced by the Contractor. The Contractor will be liable to the City for the cost of replacing City-furnished material and such costs may be deducted from any monies due or to become due the Contractor.

5-12 Storage of Materials - Materials shall be stored in such a manner as to insure the preservation of their quality and fitness for the work. When considered necessary by the Engineer, materials shall be placed on platforms or other hard, clean surfaces and covered when directed. Materials shall be stored so as to facilitate inspection and if necessary to protect the public or the material, shall be suitably fenced.

Unless otherwise designated in the Special Provisions, locations and arrangments for storage sites for materials and equipment outside the right-of-way or limits of work, shall be selected and maintained by the Contractor at his expense. Full compensation for furnishing such storage sites as may be necessary or required by the Contractor shall be considered as included in the prices bid and no additional compensation will be allowed therefor.

5-13 Trade Names and Alternatives - It is the intent of these specifications to permit the Contractor to supply any of the materials specified or offer an equivalent. The Engineer shall determine whether the material offered is equivalent to that specified. Adequate time shall be allowed for the Engineer to make this determination.

Whenever any particular material, process, or equipment is indicated by patent, proprietary or brand name, or by name of manufacturer, such wording is used for the purpose of facilitating its description and shall be deemed to be followed by the words "or approved equal". A listing of materials is not intended to be comprehensive, or in order to preference. The Contractor may offer any material, process, or equipment which he considers to be equivalent to that indicated. Requests for substitutions of equivalent materials and data substantiating said request shall be made in ample time to permit approval without delaying the work.

The Contractor shall, at his expense, furnish data concerning items offered by him as equivalent to those specified. He shall have the material tested as required by the Engineer to determine that the quality, strength, physical, chemical, or other characteristics, including durability, finish, efficiency, dimensions, service, uniformity, and suitability are such that the item will fulfill its intended function.

Test methods shall be subject to the approval of the Engineer. Test results shall be reported promptly to the Engineer, who will evaluate the results and determine if the substitute item is equivalent. His findings shall be final. Installation and use of a substitute item shall not be made until approval by the Engineer.

If a substitute offered by the Contractor is found to be not equal to the specified material, the Contractor shall furnish and install the specified material.

In the event an item is specified for matching, aethetic, maintenance, interfacing or other reason based on similarity or compatability with existing or planned facilities, there may be no acceptable substitute.

The specified contract completion time shall not be affected by any circumstance developing from the provisions of this subsection.

Cost of any redesign necessitated by the substitution shall be borne by the Contractor.

5-14 Samples and Tests - Before incorporation in the work, the Contractor shall submit samples of materials, as the Engineer may require, at no cost to the City. The Contractor, at his own expense, shall deliver materials for testing to the place and at the time designated by the Engineer. Unless otherwise provided, all initial testing shall be at no expense to the Contractor. Contractor shall however bear all costs initial and otherwise of materials or services proposed for substitution. Any retesting shall be at the Contractor's expense. When required by the Engineer, the Contractor shall furnish at no cost to the City the manufacturer's Certificate of Compliance and other documents which state that tests and quality have been passed.

The Contractor shall notify the City in writing at least fifteen (15) calendar days in advance, of his intention to use materials for which tests are specified, to allow sufficient time to perform the tests. The notice shall name the proposed supplier and source of material.

5-15 Inspection - All work and materials are subject to inspection and approval of the Engineer. The Contractor shall notify the Engineer before noon of the working day before inspection is required. Unless otherwise authorized, work shall be done only in the presence of the Engineer or his authorized representatives. Any work done without proper inspection will be subject to rejection. The Engineer and his authorized representatives shall at all times have access to the work during its construction at shops and yards as well as the project site. The Contractor shall provide every reasonable facility for ascertaining that the materials and workmanship are in accordance with the Contract Documents. Inspection of the work shall not relieve the Contractor of the obligation to fulfill all conditions of the contract.

No portion of any work or installed materials shall be covered or concealed in any manner whatsoever without first obtaining an inspection. The cost of uncovering and replacing work and materials not inspected shall be borne by the Contractor.

Projects financed in whole or in part with County, State or Federal funds shall be subject to inspection at all times by the agency involved.

Whenever the work provided for and contemplated by the contract shall have been satisfactorily completed and the final cleaning up performed, the Contractor shall request in writing a final inspection. The City Engineer and/or his authorized representative will make the final inspection. Any deficiencies encountered shall be corrected and reinspected.

5-16 Suggestions to the Contractor - Any plan or method of work suggested by the Engineer or Designated Authority to the Contractor but not specified or required if

adopted, followed, or ignored by the Contractor in whole or part, shall be at the risk and responsibility of the Contractor and the City, Engineer or Designated Authority shall not be responsible therefor.

5-17 Foreign Materials - Section 6-1.08 of the State Standard Specifications shall apply to any item processed, manufactured or assembled outside the United States.

PART I

SECTION 6.
LEGAL RELATIONS AND RESPONSIBILITY

6-1 Laws to be Observed - The Contractor shall keep himself fully informed of all existing and future County, State and National laws and regulations and all municipal ordinances and regulations of the City of Pittsburg which in any manner affect those engaged or employed in the work, or the materials used in the work, or which in any way affect the conduct of the work, and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same; and shall protect and indemnify the City of Pittsburg and all of its Officers, Employees, Agents and Servants against any claim or liability arising from or based on the violation of any such laws, ordinances, regulations, orders, or decrees whether by himself, his employees, or his subcontractors. If any discrepancy or inconsistency is discovered in the Contract Documents for the work in relation to any such law, ordinance, regulations, order or decree, the Contractor shall forthwith report the same to the Engineer in writing.

6-2 Contractor's Equipment and Facilities - The Contractor shall furnish and maintain in good condition all equipment, plant and other facilities as required for the proper execution and inspection of the work. Such facilities shall meet all requirements of applicable ordinances and laws.

6-3 Labor

6-3.1 General - Only competent workmen shall be employed on the work. Any person employed who is found to be incompetent, intemperate, troublesome, disorderly or otherwise objectionable, or who fails or refuses to perform his work properly and acceptably, shall be immediately removed from the work by the Contractor and not be reemployed on the work.

6-3.2 Laws - The Contractor, his agents and employees shall be bound by and comply with all applicable provisions of the Labor Code and with Federal, State and local laws related to labor.

The Contractor shall strictly adhere to the provisions of the Labor Code regarding minimum wages, the 8-hour day and 40-hour week, overtime, Saturday, Sunday, and holiday work, and non-discrimination because of race, color, national origin, ancestry, religion and other characteristics specified in the Labor Codes. The Contractor shall forfeit to the City the penalties prescribed in the Labor Code for violations.

In accordance with the Labor Code, the City Engineer has on file a schedule of prevailing wage rates for the types of work to be done under these specifications. The Contractor shall pay not less than the prevailing rates as required in the Labor Code.

Pursuant to Section 1773.8, each workman shall be paid subsistence and travel as required by the collective bargaining agreements on file with the State of California, Department of Industrial Relations.

6-3.3 Apprentices - The Contractor shall comply with Section 1777.5 of the Labor Code relating to the employment of indentured apprentices on work to be performed hereunder.

6-4 Contractor's Licensing Laws - Attention is directed to the provisions of the California Business and Professions Code concerning the licensing of contractors. All contractors shall be licensed in accordance with the laws of the State of California and any contractor not so licensed is subject to the penalties imposed by such laws.

6-5 Vehicle Code - Vehicles and equipment traveling to and from the "limits of work" or "jobsite" over or along a public way shall conform in every respect to the applicable provisions of the Vehicle Code.

6-6 Weight Limitation - Unless expressly permitted in the special provisions, construction equipment or vehicles of any kind shall not exceed the maximum weight and size limitations set forth in the California Vehicle Code and Pittsburg Municipal Code unless approved by the Engineer in writing. The Contractor shall repair all facilities damaged by overloaded equipment or vehicles.

6-7 Payment of Taxes - The contract prices bid for the work shall include full compensation for all taxes which the Contractor is required to pay, whether imposed by Federal, State of local government, including, without being limited to, Federal excise tax. No tax exemption certificate nor any document designed to exempt the Contractor from payment of any tax will be furnished to the Contractor by the City for Pittsburg, as to any tax on labor, services, materials, transportation, or any other items furnished pursuant to this contract.

6-8 Permits and Licenses - The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the work. On contracts let by the City, fees and charges for City issued permits will be waived. All contractors and subcontractors must have or obtain a City Business license and such business license fees will be required for all work undertaken within the limits of the City of Pittsburg.

6-9 Patents - The Contractor shall assume all responsibilities arising from the use of patented materials, equipment, devices or processes used on or incorporated in the work, and agrees to indemnify and save harmless the City of Pittsburg, its Officers and their duly authorized representatives, from all suits at law, or actions of any nature, for or on account of the use of any patented materials, equipment, devices, or processes.

6-10 Safety Provisions - The Contractor shall conform to all requirements of title 8 chapter 4 of the California Administrative Code and the rules and regulations pertaining to safety established by the California Division of Industrial Safety, California Occupational Safety and Health Act, the California and Federal Office of Safety and Health Administration and other applicable regulations.

6-11 Public Convenience and Safety - The Contractor shall so conduct his operations as to offer the least possible obstruction and inconvenience to the public and he shall have under construction no greater length or amount of work than he can prosecute properly with due regard to the safety, rights, and convenience of the public.

Provisions shall be made to insure proper functioning of all gutters, sewers, drainage ditches, culverts, and natural water courses.

No road or street shall be closed to the public except with the permission of the Engineer.

Construction equipment shall interfere as little as possible with the free passage of traffic. The Contractor shall provide at his own expense the necessary signs, lights and flagmen to safely direct public traffic past such equipment.

No material or other obstruction shall be placed within 25 feet of active fire hydrants and they shall at all times be kept readily accessible to the Fire Department.

The Contractor shall take due precaution against starting fires, and shall be responsible for any damage caused by fire started by his forces.

6-12 General Safety - In accordance with generally accepted construction practices, the Contractor will be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours.

Any duty of the Engineer to conduct construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site.

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work.

The Contractor shall take all reasonable precautions for the safety and shall provide all reasonable protection to prevent damage, injury or loss to all employees on the work and all other persons who may be affected thereby; all work, materials and equipment to be incorporated therein, whether in storage on or off the project site, under the care, custody or control of the Contractor or any of his subcontractors; and other property on the project site or adjacent thereto, including trees, shrubs, lawns, fences, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction. The Contractor shall be held fully responsible for such safety and protection until acceptance of the work. The City shall have the right to require warehousing, watch service or other types of protection if the same is deemed necessary.

The Contractor shall comply with the rules and regulations pertaining to safety established by the Safety and Health Regulations for Construction under OSHA (Occupational Safety and Health Administration) and the California Division of Industrial Safety and all other applicable laws, ordinances, rules, regulations and orders of any public authority having jurisdiction, for the safety of persons or property or to protect them from damage, injury or loss.

Special attention is directed to the Division of Occupational Safety and Health Administration, including, but not limited to, Article 6 of the State of California Construction Safety Orders concerning Excavations, Trenches, Earthwork.

The Contractor shall erect and maintain all reasonable safeguards for safety and protection of persons, including but not limited to, posting danger signs, warning lights, reflectors, fences, barriers, warnings against hazards, promulgating safety regulations, and any other necessary safety devices and measures in sufficient quantity to effectively warn of hazards to vehicles or persons at or adjacent to the project site.

In accordance with Section 6705 of the Labor Code, the Contractor shall submit to the Engineer detailed plans showing the design of any sheeting, shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during excavation, trenching, tunneling or boring. Additionally, the Contractor is referred to the miscellaneous safety requirements contained in Chapter 9, Part 1, Division 5, Sections 6700 through 6708 of the Labor Code.

In areas concerning the safety of the public and/or employees, whenever two or more laws, regulations, or standards apply, the more restrictive of those laws, regulations, or standards shall govern.

All costs incurred in providing and conforming to safety requirements shall be included in the prices bid and no separate payment will be made therefor.

6-13 Traffic - Unless otherwise provided in the special provisions, one lane in each direction for public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible.

Spillage resulting from hauling operations along or across any public traveled way shall be removed immediately by the Contractor at his expense.

Existing traffic signal and street lighting systems shall be kept in operation for the benefit of the traveling public during progress of the work.

The Contractor may be required to temporarily cover certain signs which regulate or direct public traffic. The Engineer will determine which signs shall be covered and period of covering.

Construction operations shall be conducted in such a manner as to cause as little inconvenience as possible to abutting property owners.

Roadway excavation and the construction of embankments shall be conducted in such a manner as to provide a reasonably smooth and even surface satisfactory for use by public traffic at all times; sufficient fill at culverts and bridges to permit traffic to cross shall be placed in advance of other grading operations; and if ordered by the Engineer, roadway cuts shall be excavated in lifts and embankments constructed part width at a time, construction being alternated from one side to the other and traffic routed over the side opposite the one under construction. Culvert installation or culvert construction shall be only conducted on one-half the width of the traveled way at a time and that portion of the traveled way being used by public traffic shall be kept open and unobstructed until the opposite side of the traveled way is ready for use by traffic. That portion of travel way left open to traffic shall not be less than required for full width safety as directed by the Engineer.

While subgrade and paving operations are underway, public traffic shall be permitted to use the shoulders and, if half-width paving methods are used, shall also be permitted to use the side of the roadbed opposite the one under construction. When sufficient width is available, a passageway wide enough to accommodate at least 2 lanes of traffic shall be kept open at all times at locations where subgrade and paving operations are in active progress.

At locations where traffic is being routed through construction under one-way controls and when ordered by the Engineer, the movement of the Contractor's equipment from one portion of the work to another shall be governed in accordance with such one-way controls.

In order to expedite the passage of public traffic through or around the work and where ordered by the Engineer, the Contractor shall install signs, lights, flares, barricades, and other warning safety devices for the sole convenience and direction of public traffic. Also where directed by the Engineer, the Contractor shall furnish competent flagmen whose sole duties shall consist of directing the movement of public traffic through or around the work.

Whenever a portion of the project has been completed, the Contractor shall open it to use by the public if the Engineer so orders or may open it to use by the public if the Engineer so consents. In either case the Contractor will not be allowed any compensation due to any delay, damage, or inconvenience to his operations caused by such public use. The Contractor will not be relieved of any other responsibility under the contract nor will he be relieved of cleanup and finishing operations.

The Contractor shall provide the necessary traffic control such as, but not limited to, barricades, signs, flagmen, lights and other warning and safety devices as required by the latest manual approved by the California Department of Transportation for traffic control through construction areas.

Should the Contractor appear to be neglectful or negligent in furnishing warning and protective measures as above provided, the Engineer may direct attention to the existence of a hazard and the necessary warning and protective measures shall be furnished and installed by the Contractor at no cost to the City. Should the Engineer point out the inadequacy of warning and protective measures, such action on the part of the Engineer shall not relieve the Contractor from responsibility for public safety or abrogate his obligation to furnish and pay for these devices.

6-14 Access for Adjacent Property - Convenient access to driveways, houses, and buildings along the line of the work shall be provided and maintained and temporary approaches to crossings or intersecting highways shall be provided and maintained in good condition. When the abutting property owner's access across the right-of-way line is to be eliminated, or to be replaced under the contract by other access facilities, the existing access shall not be closed until the replacement access facilities are usable.

6-15 Storage of Material. Temporary Equipment - No material or equipment shall be stored where it will interfere with the free and safe passage of the public, and at the end of each day's work and at other times when construction operations are suspended for any reason, the Contractor shall remove all equipment and other obstructions from that portion of the roadway open for public use.

6-16 Use of Explosives - All persons engaged in the activities of receiving, storing, using, handling or transporting any explosives must obtain a permit from the Fire Prevention Bureau; and all work shall be governed by the Health & Safety Code and any amendments or existing articles of the State of California Construction Safety Orders. Any use of explosives must be approved in writing by the Engineer.

6-17 Protection and Restoration of Improvements - The Contractor shall be responsible for the protection of public and private property adjacent to the work and shall exercise due caution to avoid damage to such property.

The Contractor shall repair or replace all existing improvements within the project which are not designated for removal or which are damaged or removed as a result of his operations. When a portion of a piping system must be removed, the remaining lines shall be capped. Repairs and replacements shall be at least equal to existing improvements and shall match them in finish and dimension.

Trees, lawns, and shrubbery that are not to be removed shall be protected from damage or injury. If damaged or removed because of the Contractor's operations, they shall be restored or replaced in as nearly the original condition and location as is reasonably possible. Lawns shall be reseeded and covered with suitable mulch or replaced with turf as directed by the Engineer.

The Contractor shall give reasonable notice to occupants or owners of adjacent property to permit them to salvage or relocate plants, trees, fences, sprinklers and other improvements which are designated for removal and would be destroyed because of the work.

All costs to the Contractor for protecting, removing, and restoring existing improvements shall be considered as included in his Contract bid prices and no additional compensation will be made therefor.

6-18 Disposal Outside Project Limits - The Contractor shall make his own arrangements for disposing of materials outside the right-of-way and he shall pay all costs involved. Such costs shall be included in the prices bid.

When any material is to be disposed of outside the right-of-way, the Contractor shall first obtain a written permit from the property owner on whose property the disposal is to be made and he shall file with the Engineer said permit or a certified copy thereof together with a written release from the property owner absolving the City from any and all responsibility in connection with the disposal of material on said property.

When material is disposed of as above provided, the Contractor shall conform to all requirements of the City Municipal Code pertaining to grading, hauling and filling of earth. Any City-issued permits so required shall be no fee for City contract projects but may require bonds, if required by the Engineer.

Full compensation for all costs involved in disposing of materials as specified in this subsection, including all costs of obtaining a disposal site, loading, hauling and disposal, shall be considered as included in the price paid for the contract item of work involving such materials and no additional compensation will be allowed therefor. No additional payment will be granted the Contractor for inconvenience or delays encountered in complying to the requirements of this subsection.

6-19 Responsibility for the Work and Materials - Until the acceptance of the work, the Contractor shall have the charge and care of the work and of the materials to be used therein, including materials for which he has received partial payment or materials which have been furnished by the City, and shall bear the risk of injury, loss or damage to any part thereof by the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work, except as provided under Section 6-33 titled "Relief from Maintenance and Responsibility." The Contractor shall rebuild, repair, restore, and make good all injuries, losses, or damages to any portion of the work or the materials occasioned by any cause before its completion and acceptance and shall bear the expense thereof, except as otherwise expressly provided. Where necessary to protect the work or materials from damage, the Contractor shall, at his expense, provide suitable drainage of the project and erect such temporary structures as are necessary to protect the work or materials from damage. The suspension of the work from any cause whatever shall not relieve the Contractor of his responsibility for the work and materials as herein specified. If ordered by the Engineer, the Contractor shall, at his expense, properly store materials which have been partially paid for by the City or which have been furnished by the City. Such storage by the Contractor shall be on behalf of the City and the City shall at all times be entitled to the possession of such materials, and the Contractor shall promptly return the same to the site of the work when requested. The Contractor shall not dispose of any of the materials so stored except on written authorization from the Engineer.

6-20 Subcontracting - The Contractor shall be as fully responsible to the City for the acts and omissions of his employees and subcontractors, and of persons either directly or indirectly employed by them

The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of the General Conditions and other contract documents insofar as applicable to the work of subcontractors and to give the Contractor the same power as regards terminating any subcontract that the City may exercise over the Contractor under any provision of the contract documents.

Nothing contained in this contract shall create any contractual relation between any subcontractor and the City.

6-21 Mutual Responsibility of Contractors - If, through acts of neglect on the part of the Contractor, any other contractors or any subcontractor shall suffer loss of damage on work, the contractor agrees to settle with such other contractor or subcontractor by agreement or arbitration if such other contractor or subcontractor will so settle. If such other Contractor or subcontractor shall assert any claim against the City on account of any damage alleged to have been sustained, the City shall notify the Contractor, who shall indemnify and save harmless the City, its agents, employees, officials and the Engineer against any such claim.

6-22 Separate Contracts - The Contractor shall coordinate his operations with those of other contractors. Cooperation will be required in the arrangement for the storage of materials and in the detailed execution of the work. The Contractor, including his subcontractors, shall keep informed of the progress and the detail work of other contractors and shall notify the Engineer immediately of lack of progress or defective workmanship on the part of other contractors. Failure of a Contractor to keep informed

of the work progressing on the site and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by him of the status of the work as being satisfactory for proper coordination with his own work.

6-23 Environmental Responsibilities - The Contractor shall comply with all air, water and other pollution and environmental control rules, regulations, ordinances and statutes which apply to any work performed pursuant to the contract.

6-24 Dust Control - Whenever the presence of dust becomes a problem, the Contractor shall apply dust control materials as necessary to alleviate the problem. If, in the opinion of Engineer, the presence of dust has become a problem, Engineer will specify water or a dust pallative which the Contractor shall apply as necessary to alleviate the problem. All costs for such control shall be included in the various Contract items of work.

6-25 Contractor Not an Agent of the City - The right of general supervision by the City shall not make the Contractor an agent of the City, and the liability of the Contractor for all damages to persons or to public or private property, arising from the Contractor's execution of the work, shall not be lessened because of such general supervision.

6-26 Cooperation - Should construction be under way by other forces or by other contractors within or adjacent to the limits of the work specified or should work of any other nature be under way by other forces within or adjacent to said limits, the Contractor shall cooperate with all such other contractors or other forces to the end that any delay or hindrance to their work will be avoided. The right is reserved to perform other or additional work at, in or near the site (including material sources) at any time, by the use of other forces.

When two or more contractors are employed on related or adjacent work, or obtain materials from the same material source, each shall conduct his operations in such a manner as not to cause any unnecessary delay or hindrance to the other. Each Contractor shall be responsible to the other for all damage to work, to persons or property caused to the other by his operations, and for loss caused the other due to his unnecessary delays or failure to finish the work within the time specified for completion.

6-27 Rights in Land and Improvements - Nothing in these general provisions shall be construed as allowing the Contractor to make arrangements with any person to permit occupancy or use of any land, structure, or building within the limits of the contract for any purpose whatsoever, either with or without compensation, in conflict with any agreement between the City and any owner, former owner, or tenant of such land, structure, or building.

The Contractor shall not occupy City-owned property outside the work as shown on the plans unless he enters into a rental agreement with the City.

6-28 Personal Liability - Neither the Engineer, nor any other officer or authorized employee or agent of the City, nor any authorized officer or employee of the State, County, or any District shall be personally responsible for any liability arising under or by virtue of the contract.

6-29 Repair of Equipment - The work of installing, assembling, repairing or reconditioning, or other work of any nature on machinery, equipment, or tools used in or upon the work shall be considered a part of the work to be performed under the contract and any laborers, workmen, or mechanics working on such machinery, equipment, or tools, unless employed by bona fide commercial repair shops, garages, blacksmith shops, or machine shops, which have been established and operating on a commercial basis for a period of at least 2 months prior to the award of the contract, shall be subject to all the requirements relating to labor set forth in the contract.

6-30 Material Plants - The construction, erection, and operation of material production, proportioning, or mixing plants from which material is used wholly on the contract or on contracts under the supervision of the City shall be considered a part of the work to be performed under the contract and any laborers, workmen, or mechanics working on such plants shall be subject to all of the requirements relating to labor set forth in the contract.

6-31 No Waiver by Owner - The failure of the City or Engineer in any one or more instances to insist upon strict performance of any of the terms of this contract or to exercise any option therein conferred, shall not be construed as a waiver or relinquishment to any extent of the right to assert or rely upon any such terms or option on any future occasion or at any future time.

6-32 Guarantee and Warranty - In addition to guarantees required in other provisions of the contract, the Contractor shall, and hereby does, guarantee and warrant all work for a period of at least one year after date of acceptance of work by City and shall repair or replace any or all such work, together with any other work, which may be displaced in so doing, that may prove defective in workmanship and/or materials within one year period from date of acceptance without expense whatsoever to City, ordinary wear and tear, unusual abuse or neglect excepted. The Contractor shall request in writing, a warranty inspection by the City not more than thirty (30) calendar days nor less than fifteen (15) calendar days prior to the expiration of the warranty period. The Engineer shall perform a warranty inspection and notify the Contractor of any defects in writing.

In the event the Contractor fails to commence repair of any defective conditions within one week after being notified in writing, the City is hereby authorized to proceed to have defects repaired and made good at the expense of the Contractor who hereby agrees to pay all costs and charges therefor immediately on demand including a twenty (20) percent markup for engineering and administration.

If, in the opinion of the Engineer, defective work creates a dangerous condition or requires immediate correction or attention to prevent further loss to the City or to prevent interruption of operations of the City, the City will attempt to give the notice required by this article. If the Contractor cannot be contacted or does not comply with the Engineer's request for correction within a reasonable time as determined by the Engineer, the City may, notwithstanding the provisions of this article, proceed to make such correction or provide such attention and the costs including a 20 percent markup of such correction or attention shall be charged against the Contractor. Such action by the City will not relieve the Contractor of the guarantees provided in this article or elsewhere in this contract.

The Contractor shall post a warranty bond prior to the City's acceptance of the project. Such bond shall be in the amount of ten (10) percent of the final Contract amount and shall be held by the City until satisfactory performance by the Contractor of the correction of any defective work or materials.

This section does not in any way limit the guarantee on any items for which a longer guarantee is specified or on any items for which a manufacturer gives a guarantee for a longer period, nor does it limit other remedies of the City in respect to latent defect, fraud or implied warranties.

6-33 Relief from Maintenance and Responsibility - Upon the request of the Contractor, the City may relieve him of the duty of maintaining and protecting certain portions of the work, which have been completed in all respects in accordance with the requirements of the contract and to the satisfaction of the Engineer, and thereafter the Contractor will not be required to do further work thereon. In addition, such action by the City will relieve the Contractor of responsibility for injury or damage to said completed portions of the work resulting from use by public traffic or from the action of the elements or from any other cause, but not from injury or damage resulting from the Contractor's own operations or from his negligence.

However, nothing in this Section shall be construed as relieving the Contractor of full responsibility for making good defective work or materials found at any time before the formal written acceptance of the entire contract by the City. Further, that the start of the guarantee period remains, as the date of acceptance by entire project.

6-34 Catastrophic Damage - In the event damage to the work is caused by a storm, flood, tidal wave or earthquake, which constitute an "occurrence" as described in Section 7-1.165 of the State Specifications, said Section shall apply insofar as applicable to this work except only those earthquakes in excess of 6.0 on the Richter scale shall be considered as an "occurrence".

6-35 Responsibility for Claims and Damages - The Contractor agrees to indemnify and save the City, its officers, agents and employees harmless from any loss or damage resulting from any claim or damage asserted under its care, custody or control. The City of Pittsburg and all such officers and employees therof connected with the work shall not be answerable or accountable in any manner for any loss or damage that may happen to the work or any part therof; for any loss or damage to any of the materials or other things used or employed in performing the work; for injury to or death of any person either workmen or the public; or for damage to property of others from any cause which might have been prevented by the Contractor, or his workmen, or anyone employed by him.

The Contractor shall be responsible for any liability imposed by law and for injuries to or death of any person or damage to property resulting from defects or obstructions or from any cause whatsoever during the progress of the work or any time before its completion and final acceptance.

The Contractor shall indemnify and save harmless the City of Pittsburg and all officers and employees thereof connected with the work, from all claims, suits or actions of every name, kind and description, brought for, or on account of, injuries to or death of any person or damage to property resulting from the construction of the work or by or in consequence of any negligence in guarding the work, use of improper materials in

construction of the work, or by or on account of any act or omission by the Contractor or his agents during the progress of the work or at any time before its completion and final acceptance.

In addition to any remedy authorized by law, so much of the money due the Contractor under and by virtue of the contract as shall be considered necessary by the City may be retained by the City until disposition has been made of such suits or claims for damages as aforesaid.

6-36 Insurance

6-36.1 General - The Contractor and his Subcontractor's Public Liability and Property Damage Insurance shall provide adequate protection against Public Liability, Property Damage, and Vehicular Liability.

The Contractor shall either (a) require each of his subcontractors to procure and to maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage and Vehicular Liability of the type and in the same amounts specified for the Contractor, or (b) insure the activities of his subcontractors in his own policy.

All insurance policies shall bear an endorsement or shall have attached a rider whereby it is provided that, in the event of expiration or proposed cancellation of such policies for any reason whatsoever, the City shall be notified by registered mail not less than thirty (30) days before expiration or cancellation is effective.

The Contractor shall not commence work under this contract until all the insurance required herein is obtained and such insurance has been approved by the City, nor shall the Contractor allow any subcontractor to commence work on a subcontract until the insurance required of the subcontractor has been so obtained and approved. The following requirements apply to the Contractor and his subcontractors.

At the time of the execution of the agreement, the Contractor shall, at his own expense, procure and at all times during the prosecution of the work hereunder and until final completion thereof maintain in full force and effect Workmen's Compensation Insurance and Public Liability Insurance, including motor vehicles and equipment, and include perils of explosion, collapse, underground and personal injury as follows:

A policy of public liability insurance naming the City of Pittsburg, its officers, agents and employees as insured against all loss from liability, contingent or otherwise, for injury to, or death of, any person or persons, or damage to real or personal property, arising in or by reason of or in connection with the performance of the work herein contemplated, and agreeing to defend against all claims, demands, actions or legal proceedings made or brought by any person by reason of any such injury, death or damage and to pay all judgments, interests, costs, legal and other expenses arising out of or in connection therewith.

The insurance required shall provide adequate protection for the Contractor and his subcontractors against damage claims which may arise from operations under this contract, whether such operations be by the insured or by any one directly or indirectly employed by him and also against any of the special hazards which may be encountered in the performance of this contract.

The policies shall be issued by an insurance carrier satisfactory to said City and shall be delivered to the City at the time of delivery of such contract. In lieu of actual delivery of such policies, a certificate issued by the insurance carrier showing such policies to be in force for the period covered by the contract, covering without exclusions the requirements as specified and covering the City, its officers, its agents and employees as additional insureds, may be delivered to the City. Such policies and such certificates shall be of a form approved by the City Attorney of said City. Should any policy be cancelled before final completion of the work herein contemplated and the Contractor fail to immediately procure other insurance as herein required, then the City may procure such insurance and the cost of such insurance shall be from any monies due to the Contractor. City may require a copy of the actual policy represented by any certificate in which case Contractor shall comply.

The Contractor shall save, keep and hold harmless the City, its officers, agents and employees from all damages, costs or expenses in law or equity that may at any time arise or be set up because of damages to property, or of personal injury received by reason of or in the course of performing work, which may be occasioned by any act or omission of the Contractor, any of the Contractor's employees, or any subcontractor. The City will not be liable for any accident, loss or damage to the work prior to its completion and acceptance.

In case an extension of time is granted to the Contractor, the Contractor shall submit evidence of required insurance coverage for the additional length of time such insurance policies shall be in effect.

6-36.2 Workers Compensation Insurance - The Contractor shall procure and shall maintain during the life of this contract Workers Compensation Insurance as required by applicable State law for all of his employees to be engaged in the project under this contract and, in case of any such work sublet, the Contractor shall require the subcontractor similarly to provide Workers Compensation Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Workers Compensation Insurance. In case any class of employees engaged in work on the project under this contract is not protected under the Workers Compensation Statute, the Contractor shall provide and shall cause each subcontractor to provide adequate employer's liability insurance for the protection of such of his employees as are not otherwise protected.

The Contractor shall also comply with Section 3800 of the Labor Code by securing, paying for, and maintaining in full force and effect for the duration of the contract, complete Workers Compensation Insurance, and shall furnish a Certificate of Insurance to the Engineer before execution of the Contract. The City, its officers, or employees will not be responsible for any claims in law or equity occasioned by failure of the Contractor to comply with this paragraph.

All workers compensation insurance policies shall bear an endorsement or shall have attached a rider whereby it is provided that, in the event of expiration or proposed cancellation of such policies for any reason whatsoever, the City shall be notified by registered mail not less than thirty (30) calendar days before expiration or cancellation is effective.

6-36.3 Contractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance - The Contractor shall procure and shall maintain during the life of this contract Contractor's Public Liability Insurance, Contractor's Property Damage Insurance and Vehicle Liability Insurance specified. The Contractor shall either require each of his subcontractors to procure and to maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance specified or insure the activities of his subcontractors in his policy.

The Contractor shall furnish to the City and maintain during the life of the contract such public liability and property damage insurance policies including "All Risk" Builder's risk coverage, as are necessary to insure the Contractor, his subcontractors, the City, and its officers, agents and employees, while acting within the scope of their duties, against all claims arising out of or in connection with the work to be performed.

The policies shall each provide in at least the following limits:

Public Liability	$1,000,000.00	each person
	$3,000,000.00	each occurrence
Property Damage	$ 500,000.00	each occurrence

Such policies shall provide coverage at least as broad as that provided in the Standard Form approved by the National Bureau of Casualty Underwriters together with such endorsements as are required to cover the risks involved. The City reserves the right to approve the form, sufficiency and manner or execution of the insurance contract.

The Contractor shall arrange for the policies to be so conditioned as to cover the performance of any necessary extra work during the contract.

The Contractor shall take out and pay for all property insurance on the work to be constructed under this contract and upon all materials, in or adjacent thereto and intended for use thereon. Said policy shall insure the work against all risks of fire, lightning, vandalism, water and other risks of loss provided in the "all risk" type policy. The City reserves the right to approve the form, suficiency and manner of execution of the contract of insurance. This insurance shall be written on a Builder's Risk Form for 100% of the value of the work completed at all times and materials delivered at the site at all times. The Contractor shall deliver to the City a duly certified copy of the insurance policy at the time the contract is signed; said policy shall be written in the name of both the City and the Contractor. All losses shall be paid to the insured as their interests appear.

If and whenever the Contractor or any subcontractor, in carrying on the contract operation, shall use and operate automobiles, trucks or other vehicles on public streets and highways, each shall carry, at his own expense, automobile public liability and property damage insurance, with limits of not less than $1,000,000.00 for any one person, and $3,000,000 for any one accident, and $500,000.00 property damage.

The term "public streets and highways" shall be deemed to include without limiting the generality thereof, all roads, roadways and thoroughfares used for access to the site of the work.

The cost of this insurance shall be considered as included in the prices bid for the various contract items of work and no additional compensation will be allowed therefor.

No payment will be made to the Contractor unless the provisions of this Section have been complied with.

6-37 Payment - Full compensation for conforming to all the provisions of Section 6 "Legal Relations and Responsibility" shall be considered as included in the prices bid for the various contract bid items of work and no additional compensation will be allowed therefor.

6-38 Affirmative Action and Equal Opportunity - The City has adopted Affirmative Action Requirements for all projects to be constructed in the City of Pittsburg and all the requirements set forth therein shall be deemed as mandatory and are part of the Contract Documents. Further, all the requirements set forth therein are mandatory as part of all subcontracts for the work of this contract and the same shall be included thereon.

The detailed requirements are available from the City and are included in the General Provisions for information.

The Contractor is also required to complete an Employment Utilization Report; pursuant to the Affirmative Action Requirement, and, during the Contract time, to submit the same monthly to the City. A sample copy of this form is also included in the Proposal.

INSTRUCTIONS FOR FILING EMPLOYMENT UTILIZATION REPORT (SF-257)

The Employment Utilization Report is to be completed by each subject contractor (both prime and subcontractors) and signed by a responsible official of the company. The reports are to be filed on the day required, each month, during the term of the contract, and they shall include the total work-hours worked for each employee level in each designated trade for the entire reporting period. The prime contractor shall submit a report for its aggregatre work force and shall collect and submit reports for each subcontractor's aggregate work force to the Federal Compliance Agency that is funding their construction project.

Reporting Period	Self-explanatory.
Compliance Agency	U.S. Government contracting or administering agency responsible for equal employment opportunity on the project.
Contractor	Any contractor who has a construction contract with the U.S. Government or applicant (See OFCCP Regs. 60-1.3).
1. Company's Name	Any contractor or subcontractor who has a federally involved contract.
2. Trade	Only those crafts covered under applicable Federal EEO bid conditions.
3. Work-hours of Employment	The total number of hours worked by all employees in each classification; the total number of hours worked by each *minority group in each classification and the total work-hours for all women.
Classification	The level of accomplishment or status of the worker in the trade. (C = Craftworker - Qualified, Ap = Apprentice, Tr = Trainee)
4. Percent of minority work-hours of total work-hours	The percentage of total minority work-hours worked of all work-hours worked. (The sum of columns b, c, d and e divided by column a.)
5. Total Number of minority employees	Number of minority employees working in contractor's aggregate work force during reporting period.
6. Total Number of Employees	Number of all employees working in contractor's aggregate work force during reporting period.

* Minority is defined as including Blacks, Hispanics, American Indians and Asian and Pacific Islanders - both men and women.

STANDARD FORM - 257
(Aug. 1976)

MONTHLY EMPLOYMENT
UTILIZATION REPORT
(Form)

Reporting Period
(Month, Year)

This report is required by Executive Order 11246, Section 203. Failure to report can result in sanctions which include suspension, termination, cancellations or debarment of contract.

To: (Name and location of Compliance Agency)

City of Pittsburg
2020 Railroad Avenue
Pittsburg, CA 94565

Attn: City Engineer

From: (Name and location of contractor)

1.	2.	3.							4.	5.	6.
		Work Hours of Employment (See footnote)									
Company's Name (I.D.)	Trade	Classifications	a. Total	b.* Black	c.* Hispanic	d.* Amer. Indian	e.* Asian Pacific Island	f.** Total Female	% minority w/h of Total w/h	Total number of minority Employees	Total number of Employees
		C									
		Ap									
		Tr									
		C									
		Ap									
		Tr									
		C									
		Ap									
		Tr									

7. Company Official's Signature and Title

8. Date Signed

9. Telephone Number (Include Area Code)

(* Male & Females ** Minorities & non-minorities)

NOTE: This is an abbreviated form illustrating the nature of information reauired on the official form.

BID CONDITIONS
AFFIRMATIVE ACTION REQUIREMENTS
EQUAL EMPLOYMENT OPPORTUNITY

For all Non-Exempt Federal and Federally-Assisted Construction Contracts to be Awarded in Contra Costa.

NOTICE

EACH BIDDER, CONTRACTOR OR SUBCONTRACTOR (HEREINAFTER THE CONTRACTOR) MUST FULLY COMPLY WITH EITHER PART I OR PART II, AS APPLICABLE, OF THESE BID CONDITIONS AS TO EACH CONSTRUCTION TRADE IT INTENDS TO USE ON THIS CONSTRUCTION CONTRACT AND ALL OTHER CONSTRUCTION WORK (BOTH FEDERAL AND NON-FEDERAL IN THE CONTRA COSTA COUNTY AREA DURING THE PERFORMANCE OF THIS CONTRACT OR SUBCONTRACT. THE CONTRACTOR COMMITS ITSELF TO THE GOALS FOR MINORITY MANPOWER UTILIZATION IN EITHER PART I OR PART II, AS APPLICABLE, AND ALL OTHER REQUIREMENTS, TERMS AND CONDITIONS OF THESE BID CONDITIONS BY SUBMITTING A PROPERLY SIGNED BID.

THE CONTRACTOR SHALL APPOINT A COMPANY EXECUTIVE TO ASSUME THE RESPONSIBILITY FOR THE IMPLEMENTATION OF THE REQUIREMENTS, TERMS AND CONDITIONS OF THESE BID CONDITIONS.

Part I: The provisions of this Part I apply to contractors which are party to Collective bargaining agreements with labor organizations which together have agreed to the Contra Costa County Area Construction Program (hereinafter the Contra Costa County Plan) for equal opportunity and have jointly made a commitment to specific goals of minority and, where applicable, female utilization. The Contra Costa County Plan is a tripartite voluntary agreement for Equal Opportunity. The Contra Costa County Plan, together with all implementing agreements that have been and may hereafter be developed pursuant thereto, are incorporated herein by reference.

Any contractor using one or more trades of construction employees must comply with either Part I or Part II of these Bid Conditions as to each such trade. A contractor may therefore be in compliance with Part I of these Bid Conditions by its participation with the labor organization which represents its employees in the Contra Costs County Plan as to one trade provided there is set forth in the Contra Costa County Plan a specific commitment by both the contractor and the labor organization to a goal of minority utilization for that trade. Contractors using trades which are not covered by Part I (See Part II, Section A) must comply with the commitments contained in Part II including goals for minorities and female utilization set forth in Part II.

If a Contractor does not comply with the requirements of these Bid Conditions, it shall be subject to the provisions of Part II.

Part II: A. Coverage. The provisions of this Part II shall be applicable to those contractors who:

1. Are not or hereafter cease to be signatories to the Contra Costa Plan incorporated by reference in Part I hereof;

2. Are signatories to the Contra Costa Plan but are not parties to collective bargaining agreements;

3. Are signatories to the Contra Costa Plan but are parties to collective bargaining agreements with labor organizations which are not or hereafter cease to be signatories to the Contra Costa Plan;

4. Are signatories to the Contra Costa Plan and are parties to collective bargaining agreements with labor organizations but the two have not jointly executed a specific commitment to goals for minority utilization and incorporated the commitment in the Contra Costa Plan; or

5. Are participating in an affirmative action plan which is no longer acceptable to the Director, OFCCP, including the Contra Costa Plan.

6. Are signatories to the Contra Costa Plan but are parties to collective bargaining agreements with labor organizations which together have failed to make a good faith effort to comply with their obligations under the Contra Costa Plan and, as a result, have been placed under Part II of the Bid Conditions by the Office of Federal Contract Compliance Programs.

B. Requirement - An Affirmative Action Plan.

Contractors described in paragraphs 1 through 6 above shall be subject to the provisions and requirements of Part II of these Bid Conditions including the goals and timetables for minority* utilization, and specific affirmative action steps set forth in Sections B.1 and 2 of this Part II. The contractor's commitment to the goals for minority utilization as required by this Part II constitutes a commitment that it will make every good faith effort to meet such goals.

1. Goals and Timetables.

The goals of minority utilization required of the contractor are applicable to each trade used by the contractor in the Contra Costa Plan area and which is not otherwise bound by the provisions of Part I.

For all such trades the following goals and timetables shall be applicable.

Until	9/30/71			3.5% - 9.3%
From	10/1/71	to	9/30/72	9.3% - 11.8%
From	10/1/72	to	9/30/73	11.8% - 14.5%
From	10/1/73	to	9/30/74	14.5% - 17.0%
From	10/1/74	to	9/30/75	17.0% - 19.5%
From	10/1/75	to	9/30/76	17.0% - 19.5%

Contact City Personnel Department for current requirements.

* "Minority" is defined as including Blacks, Spanish surnamed Americans, Orientals and American Indians, and includes both minority men and minority women.

In the event that any work which is subject to these Bid Conditions is performed in a year later than the latest year for which goals of minority utilization have been established, the goals for the last year of the Bid Conditions will be applicable to such work.

The goals of minority and female utilization above are expressed in terms of hours of training and employment as a proportin of the total number of hours to be worked by the contractor's aggregate work force, which includes all supervisory personnel, in each trade on all projects (both Federal and non-Federal) in the Contra Costa Plan area during the performance of its contract (i.e., the period beginning with the first day of work on the Federal or federally assisted construction contract and ending with the last day of work.)

The hours of miniority employment and training must be substantially uniform throughout the length of the contract in each trade and minorities must be employed evenly on each of the contractor's projects. Therefore, the transfer of miniority employees or trainees from contractor to contractor or from project to project for the purpose of meeting the contractor's goals shall be a violation of Part II of these Bid Conditions.

If the contractor counts the nonworking hours of trainees and apprentices in meeting the contractor's goals, such trainees and apprentices must be employed by the contractor during the training period; the contractor must have made a commitment to employ the trainees and apprentices at the completion of their training subject to the availability of employment opportunities; and the trainees must be trained pursuant to training programs approved by the Bureau of Apprenticeship and Training for "Federal Purposes" or approved as supplementing the Contra Costa Plan.

2. Specific Affirmative Action Steps.

No contractor shall be found to be in noncompliance with Executive Order 11246, as amended, solely on account of its failure to meet its goals, but shall be given an opportunity to demonstrate that the contractor has instituted all the specific affirmative action steps specified in this Part II and has made every good faith effort to make these steps work toward the attainment of its goals within the timetables, all to the purpose of expanding minority utilization in its aggregate work force in the Contra Costa Plan area. A contractor subject to Part I which fails to comply with its obligations under the Equal Opportunity clause of its contract (including failure to meet its fair share obligation if provided in the Contra Costa Plan) or subject to Part II which fails to achieve its commitments to the goals for minority utilization has the burden of proving that it has engaged in an affirmative action program directed at increasing minority utilization and that such efforts were at least as extensive and as specific as the following:

a. The contractor should have notified minority organizations when employment opportunities were available and should have maintained records of the organizations' response.

b. The contractor should have maintained a file of the names and addresses of each minority referred to it by any individual or organization and what action was taken with respect to each such referred individual, and if the individual was not employed by the contractor, the reasons therefor. If such individual was sent to the union hiring hall for referral and not referred back to the union or if referred, not employed by the contractor, the file should have documented this and the reasons therefor.

c. The contractor should have promptly notified the contracting or administering agency and the Office of Federal Contract Compliance Programs when the union or unions with which the contractor has collective bargaining agreements did not refer to the contractor a minority sent by the contractor, or when the contractor had other information that the union referral process has impeded efforts to meet its goals.

d. The contractor should have disseminated its EEO policy within its organization by including it in any employee handbook or policy manual; by publicizing it in company newspapers and annual reports and by advertising such policy at reasonable intervals in union publications. The EEO policy should be further disseminated by conducting staff meetings to explain and discuss the policy; by posting of the policy; and by review of the policy with minority employees.

e. The contractor should have disseminated its EEO policy externally by informing and discussing it with all recruitment sources; by advertising in news media, specifically including minority news media; and by notifying and discussing it with all subcontractors.

f. The contractor should have made both specific and reasonable recurrent written and oral recruitment efforts. Such efforts should have been directed at minority organizations, schools with substantial minority enrollment, and minority recruitment and training organizations within the contractor's recruitment area.

g. The contractor should have evidence available for inspection that all tests and other selection techniques used to select from among candidates for hire, transfer, promotion, training or retention are being used in a manner that does not violate the OFCCP Testing Guidelines in 41 CFR Part 60-3.

h. The contractor where reasonable should have developed on-the-job training opportunities and participated and assisted in all Department of Labor funded and/or approved training programs relevant to the contractor's employee needs consistent with its obligations under this Part II.

i. The contractor should have made sure that seniority practices and job classifications do not have a discriminatory effect.

j. The contractor should have made certain that all facilities were not segregated by race.

k. The contractor should have continually monitored all personnel activities to ensure that its EEO policy was being carried out including the evaluation of minority employees for promotional opportunities on a quarterly basis and the encouragement of such employees to seek those opportunities.

l. The contractor should have solicited bids for subcontracts from available minority subcontractors engaged in the trades covered by these Bid Conditions, including circulation of minority contractor associations.

Note - The Assistant Regional Administrators of the Office of Federal Contract Compliance Programs and the compliance agency staff will provide technical assistance on questions pertaining to minority recruitment sources, minority community organizations and minority news media upon receipt of a request for assistance from a contractor.

2. Reserved.

3. Subsequent Signatory to the Contra Costa Plan.

Contractors that are subject to the requirements of Part II at the time of the submission of their bids which, together with labor organizations with which they have collective bargaining agreements, subsequently become signatory to the Contra Costa Plan, either individually or through an association, will be deemed bound to their commitments to the Contra Costa Plan from that time until and unless they once again become subject to the requirements of Part II pursuant to Seciton A.1-6.

4. Non-discrimination.

In no event may a contractor utilize the goals and affirmative action steps required by this Part II in such a manner as to cause or result in discrimination against any person on account of race, color, religion, sex or national origin.

Part III: Compliance and Enforcement.

In all cases, the compliance of a contractor will be determined in accordance with its obligations under the terms of these Bid Conditions. Therefore, contractors who are governed by the provisions of either Part I or Part II shall be subject to the requirements of that Part regardless of the obligations of its prime contractor or lower tier subcontractors.

All contractors performing or to perform work on projects subject to these Bid Conditions hereby agree to inform their subcontractors in writing of their respective obligations under the terms and requirements of these Bid Conditions, including the provisions relating to goals of minority employment and training.

A. Contractors Subject to Part I.

1. A contractor covered by Part I of these Bid Conditions shall be in compliance with executive Order 11246, as amended, the implementing regulations and its obligations under Part I, provided the contractor together with the labor organization or organizations with which it has a collective bargaining agreement meet the goals for minority utilization to which they committed themselves in the Contra Costa Plan, or can demonstrate that every good faith effort has been made to meet the goal. In that event, no formal sanctions or proceedings leading toward sanctions shall be instituted unless the Office of Federal Contract Compliance Programs determines that the contractor has violated a substantial requirement in the Contra Costa Plan or Executive Order 11246, as amended, and its implementing regulations, including the failure of such contractor to make a good faith effort to meet its fair share obligation if provided in the Contra Costa Plan or has engaged in unlawful discrimination. Such violations shall be deemed to be noncompliance with the Equal Opportunity clause of the contract, and shall be grounds for imposition of the sanctions and penalties provided for in Executive Order 11246, as amended.

2. The OFCCP shall review Part I contactors' employment practices during the performance of the contract. Further, OFCCP shall be solely responsible for any final determination that the Contra Costa Plan is no longer an acceptable affirmative action

program and the consequences thereof. The OFCCP may, upon review and notice to the contractor and any affected labor oganization, determine that the Contra Costa Plan no longer represents effective affirmative action. In the event it shall be solely responsible for any final determination of that question and the consequences thereof.

3. Where OFCCP finds that a contractor has failed to comply with the requirements of the Contra Costa Plan and its obligation under Part I of these Bid Conditions, it shall take such action and/or impose such sanctions as may be appropriate under the Executive Order and its regulations. When the OFCCP proceeds with such formal action it has the burden of proving that the contractor has not met the requirements of these Bid Conditions. The failure of the contractor to comply with its obligations under the Equal Opportunity clause shall shift to it the requirement to come forward with evidence to show that it has met the good faith requirements of these Bid Conditions by instituting at least the specific affirmative action steps listed in Part II, Section 2. The contractor must also provide evidence of its steps toward the attainment of its trade's goals within the timetables set forth in the Contra Costa Plan. The pendency of such formal proceedings shall be taken into consideration by Federal agencies in determining whether such contractor can comply with the requirements of Executive Order 11246, as amended, and is therefore a "responsible prospective contractor" within the meaning of basic principles of Federal procurement law.

B. Contractors Subject to Part II.

In regard to Part II of these Bid Conditions, if the contractor meets the goals set forth therein or can demonstrate that it has made every good faith effort to meet these goals, the contractor shall be presumed to be in compliance with Executive Order 11246, as amended, the implementing regulations and its obligations under Part II of these Bid Conditions. In that event, no formal sanctions or proceedings leading toward sanctions shall be instituted unless the contracting or administering agency otherwise determines that the contractor is violating the Equal Opportunity clause.

Where the agency finds that the contractor failed to comply with the requirements of Executive Order 11246, as amended, the implementing regulations and the obligations under Part II of these Bid Conditions, the agency shall take such action and impose such sanctions, which include suspension, termination, cancellation, and debarment as may be appropriate under the Executive Order and its regulations. When the agency proceeds with such formal action it has the burden of proving that the contractor has not met the goals contained in Part II of these Bid Conditions. The contractor's failure to meet its goals shall shift to it the requirement to come forward with evidence to show that it has met the good faith requirements of these Bid Conditions by instituting at least the specific affirmative action steps listed in Part II, Section 2. The pendency of such proceedings shall be taken into consideration by Federal agencies in determining whether such contractor can comply with the requirements of Executive Order 11246, as amended, and is therefore, a "responsible prospective contractor" within the meaning of the basic principles of Federal procurement law.

C. Obligations Applicable to Contractors Subject to Either Part I or Part II.

It shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees. Discrimination in referral for employment, even if pursuant to provisions of a collective

bargaining agreement, is prohibited by the National Labor Relations Act, as amended, and Title VII of the Civil Rights Act of 1964, as amended. It is the policy of the Office of Federal Contract Compliance Programs that contractors have a responsibility to provide equal employment opportunity if they wish to participate in federally involved contracts. To the extent they have delegated the responsibility for some of their employment practices to a labor organization and, as a result, are prevented from meeting their obligations pursuant to Executive Order 11246, as amended, such contractors cannot be considered to be in compliance with Executive Order 11246, as amended, its implementing rules and regulations.

Part IV: General Requirements

1. Contractors are responsible for informing their subcontractors in writing regardless of tier, as to their respective obligations under Parts I and II hereof, as applicable. Whenever a contractor subcontracts a portion of the work in any trade covered by these Bid Conditions, it shall include these Bid Conditions in such subcontracts and each subcontractor shall be bound by these Bid Conditions to the full extent as if it were the prime contractor. The contractor shall not, however, be held accountable for the failure of its subcontractors to fulfill their obligations under these Bid Conditions. However, the prime contractor shall give notice to the Assistant Regional Administrator of the Office of Federal Contract Compliance Programs of the Department of Labor and to the contracting or administering agency of any refusal or failure of any subcontractor to fulfill its obligations under these Bid Conditions. A subcontractor's failure to comply will be treated in the same manner as such failure by a prime contractor.

2. Contractors hereby agree to refrain from entering into any contract or contract modification subject to Executive Order 11246, as amended, with a contractor debarred from, or who is determined not to be a "responsible" bidder for Government contracts and federally-assisted construction contracts pursuant to the Executive Order.

3. The Contractor shall carry out such sanctions and penalties for violation of these Bid Conditions and the Equal Opportunity clause including suspension, termination and cancellation of existing subcontracts and debarment from future contracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations by the contracting or administering agency and the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall also be deemed to be in non-compliance with these Bid Conditions and Executive Order 11246, as amended.

4. Nothing herein is intended to relieve any contractor during the term of its contract from compliance with Executive Order 11246, as amended, and the Equal Opportunity clause of its contract with respect to matters not covered in the Contra Costa Plan or in Part II of these Bid Conditions.

5. The procedures set forth in these Bid Conditions shall not apply to any contract which the head of the contracting or administering agency determines is essential to the national security and its award without following such procedures is necessary to the national security. Upon making such a determination, the agency head will notify, in writing the Director of Federal Contract Compliance Programs within thirty days.

6. Requests for exemptions from these Bid Conditions must be made in writing, with

justification to the Director, Office of Federal Contract Compliance Programs, U.S. Department of Labor, Washington, D.C. 20210, and shall be forwarded through and with the endorsement of the head of the contracting or administering agency.

7. Contractors must keep such records and file such reports relating to the provisions of these Bid Conditions as shall be required by the contracting or administering agency or the Office of Federal Contract Compliance Programs.

For the information of bidders, a copy of the Contra Costa Plan may be obtained from the contracting officer.

A list of trades which are currently participating in the Contra Costa Plan may be obtained from OFCCP, or the contracting or administering agency.

BID CONDITIONS
AFFIRMATIVE ACTION REQUIREMENTS
EQUAL EMPLOYMENT OPPORTUNITY

CONTRACTOR'S RESPONSIBILITIES

I. General Responsibilities of Contractors

A. General Obligations

Contractors bidding on non-exempt Federally involved construction contracts should carefully review the general requirements relative to affirmative action and non-discrimination stipulated in the Equal Employment Opportunity (EEO) Clause and the Federal EEO Bid Conditions, where applicable, which incorporate the voluntary minority utilization plan (Hometown Plan) and/or impose minimum minority utilization goals and timetables on contractors.

Upon award of the Federally involved construction contract the contractor will be bound by the requirements of the EEO Clause and applicable Federal EEO Bid Conditions and must be able to demonstrate compliance with those requirements, including the designation of a high level company official to assume the responsibility for the contractor's EEO Program.

B. Notification of Specific Responsibilities

Subsequent to award, but prior to the initiation of construction on a covered Federally funded or assisted contract, the prime contractor and all known subcontractors will be notified by the Department of Housing and Urban Development (HUD), San Francisco Area Office, which awards or administers the contact, of the specific reporting and record keeping requirements under the EEO Clause (See 60-1) and Bid Conditions.

C. Notification of Subcontractor

Each prime contractor and subcontractor shall include by reference the EEO Clause and applicable Bid Conditions in all advertisements or other solicitations for bids, and shall include verbatim the EEO Clause and applicable Bid Conditions in all contracts.

Each prime contractor and subcontractor must provide written notice to each subcontractor of the specific reporting and record keeping requirements under the EEO Clause and applicable Bid Conditions. Upon award of a subcontract, each contractor shall immediately notify the Fair Housing and Equal Opportunity Division, San Francisco Area Office, Department of Housing and Urban Development (or the Contracting Agency who in turn will notify FH & EO Division) of the contract number, the subcontractor's name, dollar amount of contract, estimated start and completion dates, and the crafts which will perform work under the subcontract.

II. Obligations Under Federal EEO Bid Conditions

A. Hometown Plans Part I (Voluntary)

Hometown Plans are Office of Federal Contract Compliance Programs (OFCCP) approved voluntary area-wide agreements between the construction industry and

representatives of the minority community establishing craft goals and timetables for minorities. The Plan and the signatory participating parties in the Plan are incorporated in Part I of the Bid Conditions for the Plan area.

Contractors signatory to and participating in Department of Labor approved Hometown Plans and utilizing a local craft under Part I of the Bid Conditions are required to comply with the provisions of the Plan and the EEO Clause.

Removal of contractors to Part II of the Bid Conditions and/or initiation of enforcement proceedings may be recommended to the OFCCP Regional Office by the Administrative Committee for a contractor's failure to meet Hometown Plan requirements. Such action may also be initiated directly by the OFCCP Regional Office for Violation of the EEO Clause.

B. Hometown Plan Part II, Appendix A (Imposed Plan) and Special Bid Conditions

Contractors subject to Part II of the Bid Conditions (including contractors participating in the voluntary plan but utilizing craft(s) subject to Part II requirements) and those affected by Appendix A of the Imposed Plan, or Special Bid Conditions are required to:

1. Comply with the EEO Clause:

2. Meet the minimum goals and timetables for aggregate workforce utilization specified in the Bid Conditions and/or Appendix A in each covered craft on all covered work in the area under the Bid Conditions/Appendix A or provide DOCUMENTARY EVIDENCE of good faith efforts to implement the minimum acceptable affirmative action program;

3. File monthly or as directed by the contracting or administering agency, beginning with the effective date of the contract, workforce utilization reports (Standard Form 257) reflecting the prime contractor's and each subcontractor's aggregate workforce in each covered craft within the area covered by the Bid Conditions and a one time listing of all Federally-funded or assisted contracts within the Bid Condition area by agency, contract number, location, dollar volume, percent completed, projected completion date, and a listing of all covered non-federal work. Monthly reports, thereafter, should only include a listing of new contracts received and current contracts completed.

4. Provide access to books, records, and accounts of all covered construction sites and documentary evidence of good faith efforts to the Compliance Agency and/or the Office of Federal Contract Compliance Programs (OFCCP) for the purpose of conducting a review.

When the Compliance Agency and the OFCCP have determined that the contractor has consistently met the minimum utilization goals in a covered craft over an entire construction season, reporting requirements will be changed from a monthly to a quarterly basis. However, if a contractor fails to meet the minimum utilization goals during any quarter, monthly reporting requirements will be reinstated.

III. Enforcement

A. Compliance Review

Contractors failing to meet the minimum utilization goals specified in the Bid Conditions, or subject to outstanding allegations of discrimination in violation of the E.E.O. Clause will be subject to a thorough review of their implementation of the Affirmative Action Program as specified in the Bid Conditions and, where required, a thorough review of their compliance with the E.E.O. Clause.

Contractors will be subject to general enforcement, as stipulated in Subpart B of CFR 60-1 at the discretion of the agency of the OFCCP.

A compliance review conducted by the Compliance Agency will consist of the Following:

1. A thorough review of the contractor's books, records and accounts and other relevant documents. (If a contractor has met the specified minimum utilization goals for the aggregate workforce the contractor will be presumed to be in compliance with the requirements of the Bid Conditions and the review concluded, unless an allegation of discrimination in violation of the E.E.O. Clause has been made.):

2. Validation of the information presented will be made through on-site reviews of a sample of all of the contractor's projects to determine whether the contractor has met its goals or has made a good faith effort to implement all of the affirmative action steps specified in the Bid Conditions, and has not violated the E.E.O. Clause.

B. Remedial Commitments

In the event that a contractor has failed to meet the minimum utilization goals and has failed to provide adequate documentary evidence of good faith efforts to implement the minimum affirmative action program as specified in the Bid Conditions, the contractor will be given an opportunity at the conclusion of the compliance review to make specific written commitments, which will be signed by an officer of the company, to remedy all deficiencies identified during the review, provided that the contractor has not otherwise been found to have violated the E.E.O. Clause.

If such commitments are made by the contractor and approved by the Compliance Agency, the Agency will find the contractor in compliance and initiate monitoring of the specific commitments.

C. Notice of Intent to Initiate Actions Leading to Sanctions

If the contractor fails to make, or having made, fails to implement adequate remedial commitments, and/or has been found to have otherwise violated the E.E.O. Clause, the Compliance Agency will issue a show cause notice to the contractor providing 30 days for the contractor to come forward with additional evidence of its efforts to comply or to make adequate remedial commitments, and, where required, to demonstrate that it has not violated the E.E.O. Clause.

If the contractor makes such demonstration(s) and/or commitments, the Compliance Agency will withdraw and show cause notice and place the contractor in compliance, provided that any violation of the commitments will cause the contracting agency to proceed with actions leading to sanctions.

D. Initiation of Actions Leading to Sanctions

If, during the 30-day period provided, the contractor, (a) fails to document adequate good faith effort to implement the minimum required affirmative action steps or fails to make adequate commitments to correct all deficiencies, or (b) where required, fails to demonstrate that the E.E.O. Clause has not been violated, the Compliance Agency will initiate actions leading to the imposition of sanctions against the contractor, pursuant to 41 CRF 60-1.26.

Upon such action by the Compliance Agency and approval by the OFCCP, the contractor will be notified that actions leading to sanctions have been initiated. The notice will state the reasons for the action and provide 14 calendar days for the contractor to request a hearing regarding the imposition of sanctions.

If no request for hearing is received within the 14-day period, the Compliance Agency and/or OFCCP will impose such sanctions as are deemed appropriate provisions of 41 CFR 60-1, including cancellation, termination, debarment or ineleigibility for further federally funded or federally assisted contracts.

Upon receipt of a request for hearing, the Compliance Agency and/or OFCCP will arrange for and conduct a hearing on the issues outlined in 41 CRF 60-1 and 41 CRF 60-30.

During the pendency of any such request for hearing, a contractor's other federally involved contracts may be suspended in whole or in part, pursuant to the provisions of 41 CRF 60-1. However, no sanctions or penalties specified in 41 CRF 60-1 or Executive Order 11246, as amended, may be imposed without the approval of the Director, OFCCP.

The hearing procedures (41 CRF 60-30) provide that any conciliation agreement or consent decree proposed as a settlement of the issues and the final decision on the imposition of sanctions must be approved by the Secretary of Labor or the Director, OFCCP.

IV. Technical Assistance

The Compliance Agency and OFCCP Regional Office staff will provide technical assistance regarding the implementation of the requirements of the E.E.O. Clause, Federal Bid Conditions and/or Appendix A upon receipt of a request for assistance from a contractor.

PART I

SECTION 7.
EXISTING UTILITIES

7-1 General - Unless otherwise required, at least 2 working days prior to starting work on the project, the Contractor shall notify in writing all affected public utility agencies of the approximate time that the work set forth in these specifications will start.

Unless previously given, such notifications shall be made at the time of execution of the agreement.

Attention is directed to the possible existence of underground main or trunk line facilities not indicated on the plans or in the special provisions and to the possibility that underground main or trunk lines may be in a location different from that which is indicated on the plans or in the special provisions. The Contractor shall ascertain the exact location of underground main or trunk lines whose presence is indicated on the plans or in the special provisions, the location of their service laterals or other appurtenances and of existing service lateral or appurtenances of any other underground facilities which can be inferred from the presence of visible facilities such as buildings, meters and junction boxes prior to doing work that may damage any of such facilities or interfere with their service.

If the Contractor discovers underground main or trunk lines not indicated on the plans or in the special provisions, he shall immediately give the Engineer and the Utility Company written notification of the existence of such facilities. Such main or trunk lines shall be located and protected from damage as directed by the Engineer.

Further attention is directed to Section 1540 (a) (1) of the Construction Safety Orders (Title 8 California Administration Code Section 1540), issued by the Occupational Safety and Health Standards Board pursuant to the California Occupational Safety and Health Act of 1973, which states in part:

(1) "Prior to opening an excavation, effort shall be made to determine whether underground installations; i.e., sewer, water fuel, electric lines, etc., will be encountered and, if so, where such underground installations are located. When the excavation approaches the approximate location of such an installation, the exact location shall be determined by careful probing or hand digging; and, when it is uncovered, adequate protection shall be provided for the existing installation. All known owners of underground facilities in the area concerned shall be advised of proposed work at least 48 hours prior to the start of actual excavation."

The foregoing is the responsibility of the Contractor.

7-2 Utility Relocation and Rearrangement - The right is reserved to the City and the owners of utilities or their authorized agents to enter upon the work area for the purpose of making such changes as are necessary for the rearrangement of their facilities or for making necessary connections or repairs to their properties. The Contractor shall cooperate with forces engaged in such work and shall conduct his operations in such a

manner as to avoid any unnecessary delay or hindrance to the work being performed by such forces, and shall allow the respective utilities time to relocate their facility.

The Contractor assumes responsibility for the removal, relocation, or protection of existing facilities wherein said facilities are identified by the plans or special provisions. It is the duty of the Contractor at all times to coordinate with the owner of utility facilities for the rearrangement of said facilities.

In the event that certain underground utilities not known to the City or in a different location than shown on the plans or special provisions are found to exist, the Contractor shall: (1) notify the City Engineer of the existence of said facilities immediately, and (2) take steps to ascertain the exact location of all underground facilities prior to doing work that may damage such facilities or interfere with their service.

Where it is determined by the Engineer that the rearrangement of an underground utility, the existence of which is not shown on the plans or in the special provisions, is essential in order to accommodate the contemplated improvement, the Engineer will provide for the rearrangement of such facility by other forces or such rearrangements shall be performed by the Contractor and will be paid for as extra work.

When the special provisions or plans indicate that a utility is to be relocated, altered or constructed by others, the City will conduct all negotiations with the owners and the work will be done at no additional cost to the Contractor.

The Contractor shall not be assessed liquidated damages for delay in completion of the project, when such delay was caused by the failure of the public agency or the owner of the utility to provide for removal or relocation of the existing facilties.

Temporary or permanent relocation or alteration of utilities desired by the Contractor for his own convenience shall be his responsibility, and he shall make arrangements and bear all costs.

7-3 Notification and Location - At least two (2) working days before performing any excavation work, the Contractor shall request the utility owners to mark or otherwise indicate the location of any utilities owned by East Bay Municipal Utility District, Contra Costa County Water District, Pacific Gas & Electric Company, Pacific Telephone & Telegraph, Viacom Cablevision, City of Pittsburg Water and Sewer Departments and any other utility owners as may be necessary.

It shall be the Contractor's responsibility to determine the exact location and depth of all utilities, including service connections, which have been marked by the respective owners and which he believes may affect or be affected by his operations. If no pay item is provided in the Contract for this work, full compensation for such work shall be considered as included in the prices bid for other items of work.

7-4 Utility Coordination and Contacts - There is in effect an "Underground Service Alert Plan" in this area. Prior to doing any underground work or excavation, the Contractor shall give the underground service coordinator, phone number 800-642-2444 forty-eight (48) hour notice, in addition to direct notification of all agencies providing utilities shall be made.

7-5 Coordination with Other City Projects - The Contractor shall coordinate his work with all other work as necessary to avoid conflicts.

All expenses incurred for coordination with others including the various public utility companies and the city shall be borne by the Contractor.

7-6 Water Valve Operation - Excepting fire hydrants the operation of any existing valve in the City water system, for any purpose, shall be by City personnel only.

Shutdowns shall be scheduled with the City Public Services Department.

No water shall be taken from the City without written permission from the City and the use of a hydrant meter.

7-7 Payment - Full compensation for conforming to all the provisions of this Section on Existing Utilities shall be considered as included in the prices bid for the various contract bid items of work and no additional compensation will be allowed therefor.

PART I

SECTION 8.
PROGRESS OF WORK

8-1 Beginning of Work - The Contractor shall begin work within ten (10) calendar days after the notice to proceed and shall diligently prosecute the same to completion within the time limit provided in the Contract Agreement.

Should the Contractor begin work in advance of the notice to proceed, any work performed by him in advance of the said date of approval shall be considered as having been done by him at his own risk and as a volunteer unless said contract is so approved.

8-2 Progress Schedule - Unless otherwise specified, the Contractor shall, within ten (10) calendar days after receiving the notice to proceed, submit to the Engineer a practicable schedule showing the order in which the Contractor proposes to carry out the work, the dates on which he will start the several salient features of the work (including procurement of materials, plant and equipment), and the contemplated dates for completing the said salient features. Contractor shall update schedule as required by the Engineer. The schedule shall be a bar chart or C.P.M.

8-3 Temporary Suspension of Work - In the event the Engineer shall determine that the work is not proceeding in accordance with the Contract Documents or any applicable rules and regulations, the Engineer may order the cessation of further work until the work proceeds in compliance with such requirements. All delays in the work occasioned by such stoppage shall not relieve the Contractor of any duty to perform the work or serve to extend the time for its completion. Any and all necessary corrective work done in order to comply with the plans and specifications shall be done at no cost to the City.

The Engineer shall also have authority to suspend the work wholly or in part for such period as he may deem necessary, due to unsuitable weather, or to such other conditions as are considered unfavorable for the suitable prosecution of the work. Such temporary suspension of work will be considered as justification for time extensions to the contract in an amont equal to the delay, as determined by the Engineer to the current controlling operation of work.

In the event that a suspension of work is ordered as provided in this section, the Contractor, at his expense, shall do all work necessary to provide a safe, smooth and unobstructed passageway through construction for use by public, pedestrian and vehicular traffic, during the period of such suspension. Should the Contractor fail to perform the work as specified, the City will perform such work and the cost thereof will be charged against the Contractor and will be deducted from moneys due or to become due the Contractor under the contract.

The Contractor shall not be entitled to any claim for additional time or compensation for any delays due to any suspension lawfully ordered by a duly authorized State, Federal or other officer having jurisdiction of safety, health, labor or environmental statute violation.

8-4 Termination of Contract - If at any time, in the opinion of the Engineer, the Contractor has failed to supply suitable equipment, an adequate working force, or material of proper quality, or has failed in any other respect to prosecute any work with the diligence and force specified and intended in and by the terms of the Contract, notice thereof in writing will be served upon him, and should he neglect or refuse to provide means for a satisfactory compliance with the Contract, as directed by the Engineer, within the time specified in such notice, the City in any such case shall have the power to terminate all or a portion of the Contract.

Upon receiving notice of such termination, the Contractor shall discontinue said work, or such parts of it as the City may designate. Upon such termination, the Contractor's control shall terminate and thereupon the City Council or its duly authorized representative may take possession of all or any part of the Contractor's materials, tools, equipment, and appliances, and plant, and buy such additional materials and supplies at the Contractor's expense as may be necessary for the proper conduct of the work and for the completion thereof; or may employ other parties to carry the contract to completion, employ the necessary workmen, substitute other machinery or materials and purchase the materials contracted for, in such manner as the City may deem proper; or the City Council may annul and cancel the contract and relet the work or any part thereof. Any excess of cost arising therefrom over and above the contract price will be charged against the Contractor and his sureties, who will be liable therefor.

In the event of such termination, all money due the Contractor or retained under the terms of his Contract shall be forfeited to the City; but such forfeiture will not release the Contractor or his sureties from liability or failure to fulfill the Contract. The Contractor and his sureties will be credited with the amount of money so forfeited toward any excess of cost over and above the contract price, arising from the suspension of the operations of the contract and the completion of the work by the City as above provided, and the Contractor will be so credited with any surplus remaining after all just claims for such completion have been paid.

In the determination of the question whether there has been any such noncompliance with the contract as to warrant the termination of annulment thereof, the decision of the City Council shall be binding on all parties to the contract.

8-5 Right of Way Delays - If through the failure of the City to acquire or clear rights of way, except for utility delays, the Contractor sustains loss, which could not have been avoided by the judicious handling of forces, equipment, supplies and plant, the Contractor shall be entitled to an amount as the Engineer may find to be fair and reasonable compensation for such part of the Contractor's actual loss as, in the opinion of the Engineer, was unavoidable. Any such compensation will be made as provided in Section 8-1.09 "Right of Way Delays" of the State Standard Specifications and Section 9-3 "Extra Work" of these General Provisions.

Actual loss shall be understood to include no items of expense other than idle time of equipment at prevailing rates in the area and necessary payments for idle time of men, cost of extra moving of equipment, cost of longer hauls, with no markup in any case for overhead or profit.

If performance of the Contractor's work on the current controlling operation is delayed as the result of the failure of the City to acquire or clear such right of way, an

extension of time determined pursuant to the provisions of these specifications will be granted.

Delays ordered by the City as a result of Archeological or other Cultural Resources Discoveries shall be covered as though it was a Right of Way Delay. The current controlling operation or operations as used in the above paragraph is to be construed to include any feature of the work considered at the time by the Engineer, which if delayed will delay the time of completion of the Contract.

8-6 Time of Completion - The Contractor shall complete the work called for under the contract in all parts and requirements within the number of days set forth in the Contact Documents.

8-7 Liquidated Damages - It is agreed by the parties to the Contract that time is of the essence in the completion of this work and that in case all the work called for under the Contract is not complied with before or upon the expiration of the time limit as set forth in the Contract, damage will be sustained by the City of Pittsburg, and that it is impracticable to determine the actual damage which the City will sustain in the event of and by reason of such delay; and it is, therefore, agreed that the Contractor will pay to the City of Pittsburg the sum set forth herein or in the special provisions per day for each and every day's delay beyond the time prescribed to complete the work; and the Contractor agrees to pay such liquidated damages as herein provided, and in case the same are not paid, agrees that the City may deduct the amount thereof from any money due or that may become due the Contractor under the Contract.

It is further agreed that in case the work called for under the Contract is not finished and completed in all parts and requirements within the number of Contract days specified, the City Engineer shall have the right to increase the number of Contract days or not, as he may deem best to serve the interests of the City, and if he decides to extend the said number of working days, he shall further have the right to charge to the Contractor, his heirs, assigns, or sureties and to deduct from the final payment for the work all or any part, as he may deem proper, of the actual cost of engineering, inspection, superintendence and other overhead expenses which are directly chargeable to the contract, and which accrue during the period of such extension, except that cost of final surveys and preparation of final estimate shall not be included in such charges.

Unless such liquidated damages are specified in the Special Provisions differently, the amount per Contract day shall be as follows:

Amount of Contract	Amount of Liquidated Damages (Per Day)
Less than $100,000	$250.00
$100,000 and less than $1,000,000	500.00
$1,000,000 and over	750.00

The Contractor will be granted an extension of time and will not be assessed with liquidated damages or the cost of engineering and inspection for any portion of the delay in completion of the work beyond the time named in the Contract for the completion of the work caused by acts of God or of the public enemy, fire or flood not caused or preventable by the Contractor, epidemics, quarantine restrictions, strikes, labor disputes,

shortage of materials and freight embargoes, provided that the Contractor shall notify the Engineer in writing of the causes of the delay within 10 calendar days form the beginning of any such delay. The Engineer shall ascertain the facts and the extent of the delay, and his findings thereon shall be final and conclusive.

No extension of time will be granted for a delay caused by a shortage of materials unless the Contractor furnishes to the Engineer documentary proof that he has diligently made every effort to obtain such materials from all known sources within reason and further proof in the form of supplementary progress schedules, that the inability to obtain such materials when originally planned, did in fact cause a delay in final completion of the entire work which could not be compensated for by revising the sequence of the Contractor's operations. Only the physical shortage of material will be considered under these provisions as a cause for extension of time and no consideration will be given to any claim that material could not be obtained at a reasonable, practical, or economical cost or price, unless it is shown to the satisfaction of the Engineer that such material could have been obtained only at exorbitant prices entirely out of line with current rates taking into account the quantities involved and the usual practices in obtaining such quantities.

If the Contractor is delayed in completion of the work by reason of changes made by any act of the Engineer not contemplated by the contract, an extension of time commensurate with the delay in completion of the work thus caused will be granted and the Contractor shall be relieved from any claim for liquidated damages, or engineering and inspection charges or other penalties for the period covered by such extension of time; provided that the Contractor shall notify the Engineer in writing of the causes of dely within 10 calendar days from the beginning of any such delay. The Engineer shall ascertain the facts and the extent of the delay, and his findings thereon shall be final and conclusive.

The Contractor shall have no claim for damage or compensation for any delay or hindrance whether or not contemplated by the Contract.

8-8 Completion of Work - When the City Engineer or his authorized representative has made the final inspection and determines that the Contract has been completed in all respects in accordance with the plans and specifications, and other Contract Documents, he will recommend that the City Council formally accept the work, and immediately upon and after such acceptance by the Council, the Contractor will be relieved of the duty of maintaining and protecting the work as a whole, and he will not be required to perform any further work thereon; and the Contractor shall be relieved of his responsibility for injury to persons or property or damage to the work which occurs after the formal acceptance by the Council; except as provided pertaining to such guaranties of the work as may be required or resulting from Contractor's defects or faulty work not discovered prior to such acceptance.

PART I

SECTION 9.
MEASUREMENT AND PAYMENT

9-1 Measurement of Quantities - Measurements of the completed work shall be in accordance with, and by instruments and devices calibrated to, United States Standard Measures or Metric System of Measurement, and the units of measurement for payment, and the limits thereof, shall be as shown on the plans or the special provisions or in the absence thereof, as set forth in these specifications.

In determining quantities, all measurements shall be made in horizontal or vertical planes unless otherwise specified.

9-1.1 Methods of Measurement - Materials and items of work which are to be paid for on the basis of measurement shall be measured in accordance with the methods stipulated in the particular sections involved.

9-1.2 Certified Weights - When payment is to be made on the basis of weight, the weighing shall be done on certified platform scales or, when approved by the Engineer, on a completely automated weighing and recording system. The Contractor shall furnish the Engineer with duplicate licensed weighmaster's certificates showing the actual net weights. The City will accept the certificates as evidence of the weights delivered.

9-1.3 Units of Measurement - Measurements, conversions, multiples and fractions thereof shall be in accordance with U.S. Standard Measures. A pound is an avoirdupois pound. A ton is 2,000 pounds. The unit of liquid measure is the U.S. gallon. The units of area are square feet and square yards and the unit of volume is cubic yards. Unit of length is linear feet.

Material not used from a transporting vehicle shall be determined by the Engineer and deducted from the certified tag.

When materials are to be measured and paid for on a volume basis, and it would be impractical to determine the volume, or when requested by the Contractor in writing and approved by the Engineer in writing, the material will be weighed and converted to volume measurement for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities will be adopted.

Unless otherwise specified, units of measurement are as determined in place based on neat lines without regard to expansion or compaction.

Full compensation for all expense involved in conforming to the requirements for measuring and weighing materials shall be considered as included in the unit prices bid for the materials being measured or weighed and no additional allowance will be made therefor.

Quantities of material wasted or disposed of in a manner not called for under the Contract; or rejected loads of material, including material rejected after it has been placed by reason of the failure of the Contractor to conform to the provisions of the contract; or material not unloaded from the transporting vehicle; or material placed outside the lines indicated on the plans or given by the Engineer; or material remaining on hand after completion of the contract, will not be paid for and such quantities will be deducted from the final total quantities. No compensation will be allowed for hauling rejected materials.

9-2 Scope of Payment - The Contractor shall accept the compensation, as herein provided, as full payment for furnishing all labor, materials, tools, equipment and incidentals necessary to the completed work and for performing all work contemplated and embraced under the Contract; also for loss or damage arising from the nature of the work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work, also for all expenses incurred in consequence of the suspension or discontinuance of the work as herein specified; and for completing the work according to the Contract Documents. Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material.

This Section shall apply to all bid items as if repeated and contained separately therein.

Compensation for all work performed under the Contract shall be included in the bid prices listed in the Bid Proposal and include the full compensation for all of the costs, overhead, profit and expenses in connection therewith, including furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in completing each item as shown and specified. Principal features of the work to be included under the various payment items are noted. Work not specifically mentioned shall be included in the prices bid under the items to which such work is applicable. Quantities of work to be paid shall be based on the number or amount of the item acceptably installed complete in place, as measured by the Engineer. In the case of item limits of payment designated on the plans, such limits shall control and no separate measurement or payment will be made beyond such limits for the items.

The work of this project is designated in the Bid Proposal by size, type, quantity or whatever information is necessary for identification. The Contractor shall accept the compensation provided in the contract as full payment for furnishing all bonds, licenses, permits, fees and insurances, supervision, labor materials, tools, equipment, testing, corrections, repair, field construction survey, and incidentals necessary to the completed work and for performing all work contemplated and embraced under the Contract. Also for loss or damage arising from the nature of the work or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the acceptance by the City and for all risks of every description connected with the prosecution of the work, also for all expenses incurred in consequence of the suspension or discontinuance of the work as provided in the Contract; and for completing the work in accordance with the Contract Documents. Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective or damaged work or material.

No compensation will be made in case of loss of anticipated profits. Increased or decreased work involving Contract Change Orders or supplemental agreements will be paid for as provided in such Contract Change Orders or agreements.

Payments for materials and supplies stored or not installed in their final positions will not be allowed.

Unless specifically provided differently, references to Contractor's cost, borne by Contractor, paid by Contractor and phrases of like import shall be deemed to be accompanied with the phrase "at no additional cost to Owner."

It is mutually agreed between the parties hereto that no certificate given or payments made under this Contract, except the final certificate of payment, shall be conclusive evidence of the performance of this Contract, either wholly or in part, against any claim of the City, and no payments shall be construed as an acceptance of any defective work or improper materials. The Contractor hereby further agrees that the payment of the final amount due under the Contract, and the adjustment and payment for any work done in accordance with any alterations of the same, shall release the Owner, Engineer, and their authorized representatives from any and all claims or liability on account of work performed under this contract or any alterations thereof.

The Contractor shall submit an estimated progress payment request to the City for the work constructed during the preceding calendar month. The City will review the progress payment request to determine that it represents the total amount of work done and, if required, will adjust the request to represent the total amount of the work done. Copies of such adjustments will be delivered to the Contractor by the City. Such progress payment requests shall be on a form provided or approved by the City.

No payment or partial payment will be made for any work or portions thereof which work or portions are not incorporated and installed as a completed part of the work.

The unit and lump sum prices bid shall cover all work required by the Contract Documents. All costs in connecton with the proper and successful completion of the work, including furnishing all materials, supplies, and appurtenances; providing all construction plant, equipment, and tools; performing all necessary labor and supervision to fully complete the work; and restoration of existing improvements and utilities, shall be included in the prices bid. All concomitant work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of Contractor and all costs in connection therewith shall be included in the prices bid.

All estimated quantities stipulated in the Bidders Proposal or other Contract Documents are approximate and are to be used only as a basis for estimating the probable cost of the work and for the purpose of comparing the bids submitted for the work. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. Contractor agrees that he will make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts therefor.

9-3 Extra Work

9-3.1 General - New or unforeseen work will be classed as "extra work" when the Engineer determines that it is not covered by contract unit prices or stipulated unit prices. Payment for Extra Work shall be in accordance with Section 9-1.03 "Force Account Payment" of the State Standard Specifications and as modified herein.

9-3.2 Payment - When the price for the extra work cannot be agreed upon, the City will pay for the extra work based on the accumulation of costs as provided herein.

9-3.3 Daily Reports by Contractor - At the close of each working day, the Contractor shall submit a daily report to the Engineer, on forms approved by the City, together with applicable delivery tickets, listing all labor, materials and equipment involved for that day, and for other services and expenditures when authorized. An attempt shall be made to reconcile the report daily, and it shall be signed by the Engineer and the Contractor. In the event of disagreement, pertinent notes shall be entered by each party to explain points which cannot be resolved immediately. Each party shall retain a signed copy of the report. Reports by subconractors or others shall be submitted through the prime contractor. The Daily Reports shall show the following:

(a) Labor - The report shall show names of workers, classification and hours worked.

(b) Material - The report shall describe and list quantities of materials used.

(c) Equipment - The report shall show type of equipment, size, identification number and hours of operation, including loading and transportation, if applicable.

(d) Other Services and Expenditures - Other services and expenditures shall be described in such detail as the City may require.

9-3.4 Basis for Establishing Costs

9-3.4.1 Labor - The costs of labor will be the actual cost for wages prevailing locally for each craft or type of workman at the time the extra work is done, plus employer payments of payroll taxes and insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. The use of labor classification which would increase the extra work cost will not be permitteed unless the Contractor establishes the necessity for such additional costs. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.

9-3.4.2 Materials - The cost of materials reported shall be at invoice or lowest current price at which such materials are locally available and delivered to the job site in the quantities involved, plus sales tax, freight and delivery.

The City reserves the right to approve materials and sources of supply, or to supply materials to the Contractor if necessary for the progress of the work. No charge or markup shall be applied to any material provided by the City.

9-3.4.3 Tool and Equipment Rental - No payment will be made for the use of tools which are not listed on the current State Equipment Rental Rate List.

The rates to be used in determining equipment rental costs shall not exceed those determined using the latest State Department of Transportation Manual of Equipment Rental Rates and General Prevailing Wage Rates.

The rental rates paid shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance and all incidentals.

Necessary loading and transportation costs for equipment used on the extra work shall be included.

If equipment is used intermittently and, when not in use, could be returned to its rental source and less expense to the City than holding it at the work site, it shall be returned, unless the Contractor elects to keep it at the work site at no expense to the City.

All equipment shall be acceptable to the Engineer, in good working condition, and suitable for the purpose for which it is to be used. Manufacturer's ratings and manufacturer's approved modifications shall be used to classify equipment and it shall be powered by a unit of at least the minimum rating recommended by the manufacturer.

The reported rental time for equipment already at the job site shall be the duration of its use on the extra work, commencing at the time it is first put into actual operation on the extra work, plus the time required to move it from its previous site and back or to a closer site.

9-3.4.4 Other Items - The City may authorize other items which may be required on the extra work. Such items include labor, services, material and equipment which are different in their nature from those required for the work specified in the contract and which are of a type not ordinarily available from the Contractor or any of his subcontractors.

Invoices covering all such items in detail shall be submitted with the request for payment.

9-3.4.5 Invoices - Vendors' invoices for material, equipment rental, and other expenditures shall be submitted with the request for payment. If the request for payment is not substantiated by invoices or other documentation, the City may establish the cost of the item involved at the lowest price which was current at the time of the work involved.

9-3.4.6 Markup - The following percentage shall be added to the Contractor's costs and shall constitute the markup for all overhead and profits.

On Labor,	20%;
On Materials,	15%;
On Equipment Rental,	15%;
On Other Items and Expenditures,	15%.

To the sum of the costs and appropriate markups provided for in this subsection, one percent shall be added as compensation for bond and liability insurance.

No additional markup shall be made by reason of the performance of extra work by a subcontractor or other forces.

9-4 Partial Payments - The Engineer shall, once each month, prepare an estimate of the total amount of work done. The Contractor shall review and sign the Engineer's monthly estimate. Upon the Engineer's approval of the monthly estimate, the City of Pittsburg shall retain 10% of such estimated value of the work done and shall monthly pay to the Contractor, while carrying on the work, the balance not retained, as aforesaid, after deducting therefrom all previous payments and all sums to be kept or retained under the provisions of the Contract. No such estimate or payment shall be required to be made, when, in the judgment of the Engineer, the work is not proceeding in accordance with the provisions of the Contract, or when in his judgment the total value of the work done since the last estimate amounts to less than One Thousand Dollars ($1,000).

In lieu of the above described retention, at the request and expense of the Contractor, the City will make payment of funds withheld from progress or partial payments pursuant to the requirements of Government Code Section 14402 if the Contractor deposits in escrow with a bank acceptable to the City, securities eligible for the investment of State funds under Government Code Section 16430 or bank certificates of deposit, upon the following conditions.

(a) The Contractor shall bear the expense of the City and the escrow agent, either the City Treasurer or the bank, in connection with the escrow deposit made.

(b) Securities or certificates of deposit to be placed in escrow shall be subject to approval of the Department and unless otherwise permitted by the escrow agreement, shall be of a value of at least 110 percent of the amounts of retention to be paid to the Contractor pursuant to this section.

(c) The Contractor shall enter into an escrow agreement satisfactory to the City, which agreement shall include provisions governing inter alia:

(1) the amount of securities to be deposited,

(2) the providing of powers of attorney or other documents necessary for the transfer of the securities to be deposited,

(3) conversion to cash to provide funds to meet defaults by the Contractor including, but not limited to, termination of the Contractor's control over the work, stop notices filed pursuant to law, assessment of liquidated damages or other amounts to be kept or retained under the provisions of the contract,

(4) decrease in value of securities on deposit,

(5) the termination of the escrow upon completion of the contract.

(d) The Contractor shall obtain the written consent of the surety to such agreement.

9-5 Delivered Material - When provided for in the Special Provisions, subject to limitations and conditions therein, the cost of materials and equipment delivered but not incorporated in the work will be included in the progress estimate.

9-6 Payments Withheld - The City may withhold, or on account of later discovered evidence, nullify all or part of any certification made to the Contractor by the City as to the amount determined to be due the Contractor, to such extent and period of time only as may be necessary to protect the City from loss on account of:

(a) Defective work not remedied;

(b) Claims filed or reasonable evidence indicating probable filing;

(c) Failure to properly pay Subcontractors or for material or labor;

(d) Reasonable doubt that the work can be completed for the balance then unpaid; or

(e) Damage to City, another Contractor, or third party.

9-7 Acceptance, Final Estimate and Payment - Whenever the Contractor shall, in the opinion of the Engineer, have completed his Contract, the Engineer shall so certify in writing to the City Council, and shall make a final estimate of the amount of the work done by the Contractor and also the value of his work according to the terms of the Contract.

Upon acceptance of the work by the City Council, the final payment of the work will be made to the Contractor. The payment due the Contractor for work performed and materials furnished shall be determined from the final measurements made by the Engineer and the unit prices bid by the Contractor, including such extra work as may have been properly authorized. All prior partial quantities and payments shall be subject to correction in the final payment, and no payment shall be construed to be an acceptance of any defective work or improper materials.

From the total amount of the work, a deduction of ten (10) percent will be made and from the remainder will be deducted all amounts due to the City from the Contractor in accordance with the terms of the contract.

CITY OF PITTSBURG

STANDARD SPECIFICATIONS

PART 2

TECHNICAL PROVISIONS

CITY OF PITTSBURG

COMMUNITY DEVELOPMENT DEPARTMENT

ENGINEERING DIVISION

STANDARD SPECIFICATIONS

PART 2 - TECHNICAL PROVISIONS

TABLE OF SECTIONS

PART 2

TABLE OF CONTENTS

(continued)

PART 2

TABLE OF CONTENTS

(continued)

PART 2

TABLE OF CONTENTS

(continued)

PART 2

TABLE OF CONTENTS

(continued)

PART 2

SECTION 1
MOBILIZATION

1-1 General - Mobilization shall consist of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for the establishment of all offices, buildings and other facilities necessary for work on the project; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various contract items on the project site except costs included in items of work. Project field offices; facilities, facility control and cleanup, storage yard fencing or other items falling within the scope of Section 11-1.01, "Mobilization - Description," and 4-1.02, "Final Cleaning Up," of the State Specifications and the Special Provisions is classified as mobilization.

If a contract bid item is included for this category, a separate list shall be submitted, prior to award, by the low bidder, itemizing the salient items, costs and activities involved in the item. The item shall also include maintenance of such facilities and removal and cleanup costs.

1-2 Measurement and Payment - When mobilization is included as a bid item, measurement will be made as a percentage of the costs incurred according to the list submitted except that not more than 75% of the bid price shall be paid prior to the final estimate for payment being due, said remaining 25% paid upon completion of cleanup and removal with final payment.

When the contract does not include a contract pay item for mobilization, full compensation for any necessary mobilization required shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

PART 2

SECTION 2.
EARTHWORK AND SOILS

2-1 Clearing and Grubbing

2-1.1 General - This work shall consist of removing all objectionable material from within the limits of the project as specified. The limits of clearing and grubbing shall be of sufficient area and depth to complete the work shown on the plans or described herein and in the appropriate provisions of Section 16, "Clearing and Grubbing," of the State Specifications and the Special Provisions.

2-1.2 Construction - The area above and below the natural ground surface shall be cleared of all vegetable growth and deleterious material such as trees, logs, upturned stumps, roots of down trees, brush, grass, weeds, rocks, concrete, pavement, and all other objectional material which would interfere with the work to a minimum depth of 6" below subgrade or 6" below natural ground, whichever is lower.

All trees, existing stumps and large roots within embankment areas where the grading plane is two feet or more above the natural ground or where scheduled for removal shall be cut off flush with the natural ground at any point and need not be completely removed except where a structure is to be built or piles are to be placed or driven.

2-1.3 Removal and Disposal of Materials - All materials removed shall be disposed of in accordance with Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the State Specifications and Section 6-18, "Disposal Outside Project Limits," of Part 1 - General Provisions, City of Pittsburg Standard Specifications at no extra cost to the City. The contract work area shall be left with a neat and finished appearance.

2-1.4 Salvaging of Materials - All existing materials that are designated to be salvaged shall be removed, cleaned and hauled to the City Corporation Yard, unloaded and stockpiled, by the Contractor unless otherwise directed by the Engineer.

2-1.5 Abandoning of Pipes and Structures - Existing pipes to be abandoned shall be plugged with a wall of concrete not less than 0.5 foot thick.

Existing structures, pavement slabs and structural sections to be abandoned shall be demolished to an elevation three feet below finished grade. Their bottoms (if any remain) shall be broken thoroughly to prevent entrapment of water and all voids backfilled with suitable backfill.

2-1.6 Measurement - Quantities of clearing and grubbing will be measured on a lump sum basis or the basis of the type of units shown in the Proposal.

2-1.7 Payment - Clearing and grubbing shall be paid for at the contract lump sum price, or unit price which price and payment shall constitute full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in clearing and grubbing as shown on the plans, as specified and as directed by the Engineer, including the removal and disposal of all the resulting material.

When the Contract does not include a pay item for clearing and removal work, as above specified, and unless noted otherwise in the Special Provisions, full compensation for any necessary clearing and removal work shall be considered as being included in the unit price paid for the type of earthwork involved, and no additional compensation will be allowed therefor.

2-2 Earthwork

2-2.1 Scope - Work under this section shall consist of performing all operations necessary to excavate earth and rock, regardless of character and subsurface conditions, from the roadway prism or adjacent thereto; to excavate all materials, of whatever nature, necessary for the construction of foundations for structures and other facilities; to excavate drainage and irrigation ditches; to excavate drainage channels; to excavate selected material and borrow material for use as specified; to construct embankments including the placing of selected material in connection therewith as specified; to place backfill for structures, and other facilities; to backfill trenches and depressions resulting from the removal of obstructions; to backfill holes, pits and other depressions; to remove and replace unsuitable material; to excavate and grade road appraoches, driveways, and connections; to construct protection dikes; to remove unstable material, slide material which has come into the graded area, and material which has slipped from embankments; all as shown on the plans and as specified in these Specifications and the Special Provisions and as directed by the Designated Authority; and furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work that may be required to construct and maintain the project facilities, except excavation, trenching and backfilling for pipe, culverts, utility systems, and other subsurface pipes. Excavation trenching and backfilling for pipe, culverts, utility systems, and other subsurface pipes is specified in Section 6, "Underground Conduit Construction," Part 2, Technical Provisions of the Standard Specifications.

Whenever reference to finished grade is made, it shall be considered to be the finished surface of the completed facility. When the work covered by the Contract is stage construction, the relation between finished grade and the work covered by the Contract will be shown on the plans.

Unless otherwise specified, quantities of all types of existing subbase, base, surfacing, or pavement removed will be included in the quantities of the type of excavation in which they are located, and no separate payment will be made therefor.

2-3 Preservation of Property - Attention is directed to Section 6-17, "Preservation of Property," Part 1 - General Provisions of the Standard Specifications. Operations shall be conducted in such a manner that existing street facilities, utilities, railroad tracks and other non-street facilities which are to remain in place will not be damaged. The Contractor, at his expense, shall furnish and install sheet piling, cribbing, bulkheads, shores or whatever means may be necessary to adequately support material carrying such facilities, or to support the facilities themselves, and shall maintain such supports until they are no longer needed. Temporary pavements, facilities, utilities and installations shall also be protected until they are no longer required. When temporary supports and other protective means are no longer required, they shall become the property of the Contractor and shall be removed and disposed of off the project site.

When hauling is done over highways or City streets, and when directed by the Designated Authority the loads shall be trimmed and all material removed from shelf areas of vehicles in order to eliminate spilling of material. If directed by the Designated Authority, the loads shall be watered after trimming to eliminate dust.

2-4 Materials

2-4.1 Selected Materials - Shall be defined as materials which are excavated from the project site and which are satisfactory for use in fills, embankments, as backfill or other uses as specified or directed, insofar as such material is suitable for compaction, contains no cemented lumps or rock larger than 3 inches in greatest dimension, is free of topsoil, organic and other deleterious materials, and is approved by the Designated Authority.

2.4.2 Local Borrow Materials - Shall be defined as materials excavated and used in the construction of fills and embankments, or for use as selected material, or for other construction purposes obtained from sources within the project site as directed by the Designated Authority or as specified in the Special Provisions. The Contractor will have no choice or selection of the source.

2-4.3 Imported Borrow Materials - Shall be defined as materials which are obtained from sources outside the project site. Such materials shall be subject to the approval of the Designated Authority. Unless otherwise stipulated in the Special Provisions, the Contractor shall make his own arrangements for obtaining imported material and shall pay all costs involved.

2-4.4 Topsoil - When so specified in the Special Provisions or directed by the Designated Authority, topsoil shall be stripped to a depth of 4 to 6 inches and shall be either spread on areas indicated or shall be transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later. Topsoil shall be kept separate from other excavated materials and stockpiled free of roots, stones, and other undesirable materials.

2-5 Classification of Excavation - Unless otherwise specified in the Special Provisions all excavation shall be unclassified. When excavation is classified in the Special Provisions as rock or common excavation and separate payment items have been established for same, then all excavation shall be done on a classified basis.

2-5.1 Classified Excavation - Separate consideration will be given to the nature of the materials excavated, in accordance with the following designations and classifications.

2-5.1.1 - Rock excavation shall include blasting, excavating, grading, and disposing of materials classified as rock and shall include the satisfactory removal and disposition of boulders 1/2 cubic yard or more in volume; solid rock; rock material that is in ledges, bedded deposits, and unstratified masses, which cannot be removed without systematic drilling and blasting; and conglomerate desposits that are so firmly cemented as to possess the characteristics of solid rock that is impossible to remove without systematic drilling and blasting.

2-5.1.2 - Common excavation shall include the satisfactory removal and disposition of all materials not classified as rock excavation.

2-5.2 Unclassified Excavation - No consideration will be given to the nature of the materials under the designation of unclassified excavation. Earth and rock, regardless of character and subsurface conditions, shall be excavated to the lines and grades as established by the plans.

2-6 Blasting - Where explosives are used in rock excavation, the charges shall be so proportioned and placed that they will not loosen the rock outside of the excavation lines shown on the plans or as specified herein. The Contractor shall remove, at no expense to the Owner, any material outside the authorized cross section that may be shattered or loosened by blasting.

The Contractor shall obtain any required blasting permits and authorization, and when so authorized, the blasting procedures shall conform to all applicable requirements of Local, State, and Federal laws and regulations. Where such laws and regulations do not apply, the blasting work shall conform to the applicable requirements of the Associated General Contractor's Accident Prevention Manual.

2-7 Selection of Borrow Material - Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Local borrow material shall be obtained from the borrow areas shown on the plans or specified in the Special Provisions. Imported borrow material shall be obtained from sources selected by the Contractor and approved by the Designated Authority. Unless otherwise specified, the Contractor shall obtain from the owners the right to procure material, pay all royalties and other charges involved, and bear all expense of developing the sources, including rights of way for hauling.

No imported borrow material shall be delivered to the site until approved by the Designated Authority. Approval of borrow material shall be based on the Designated Authority's inspection of the borrow source and the testing of representative samples submitted by the Contractor. Such representative samples shall be submitted to the Designated Authority not less than 15 days prior to commencing the work.

Imported borrow, delivered to the site, that significantly differs from the submitted samples shall be subject to rejection. Rejected materials shall be removed from the site at the Contractor's expense. Approval of a particular borrow material shall constitute approval of only that portion of the proposed borrow source represented by the submitted sample.

Unless specifically provided, no local borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of local borrow pits and the disposal of debris thereon shall be considered incidental operations to the borrow excavation and shall be performed by the Contractor at no additional cost to the Owner.

2-8 Opening and Drainage of Excavation and Local Borrow Pits - The Contractor shall notify the Designated Authority sufficiently in advance of the opening of any excavation or local borrow pit to permit elevations and measurements of the undisturbed ground surface to be taken.

Except as otherwise permitted, borrow pits and other excavation areas shall be excavated in such manner as will afford adequate drainage. Overburden and other spoil material shall be transported to designated spoil areas or otherwise disposed of as directed. Local borrow pits shall be neatly trimmed and left in such shape as will facilitate accurate measurement after the excavation is completed.

2-9 Excavation - Shall consist of all excavation grading and construction, except structure excavation and any excavation separately designated and paid for as a separate item.

2-9.1 Unsuitable Material - Material below the natural ground surface in embankment areas and basement material in excavation areas below the limits specified in Article "Compaction" herein, that is unsuitable for the planned use, shall be excavated and disposed of as directed by the Designated Authority.

The removal and disposal of such unsuitable material will be paid for as roadway excavation for the quantities involved if the removal of such material is shown on the plans or specified in the Special Provisions.

If the removal of such unsuitable material is not shown on the plans or specified in the Special Provisions, the removal and disposal of such unsuitable material will be paid for at the contract prices for roadway excavation for the quantities involved unless either the Designated Authority, prior to removal of any such material, orders the unsuitable material to be removed and disposed of and paid for as extra work as provided in Section 2-3, "Extra Work," Part I - General Provisions of the Standard Specifications, or the Contractor, prior to performing any such work, requests in writing that the removal and disposal of such unsuitable material be paid for as extra work as provided in Section 9-3, "Extra Work," Part I - General Provisions of the Standard Specifications.

When unsuitable material is removed and disposed of, the resulting space shall be filled with material suitable for the planned use. Such suitable material shall be placed and compacted in layers as hereinafter specified for constructing embankments.

2-9.2 Slides and Slipouts - Material outside the planned roadway or ditch slope which is unstable and constitutes a potential slide in the opinion of the Designated Authority, material which has come into the roadway or ditch, and material which has slipped out of new or old embankments shall be excavated and removed. The material shall be excavated to designated lines or slopes either by benching or in such manner as directed by the Designated Authority. Such material may be used in the construction of the embankments or disposed of as directed by the Designated Authority.

The removal and disposal of slide and slipout material as above specified, not resulting from overshooting as specified in Article 2-6, "Blasting," and not resulting from any act or failure to act on the part of the Contractor, will be paid for at the contract prices for roadway excavation for the quantities involved.

However, if due to the character of the work the removal and disposal of such material is not properly compensable at the contract prices for roadway excavation, the work may be paid for as extra work as provided in Section 9.3, "Extra Work," Part I - General Provisions of the Standard Specifications, provided the Contractor requests in writing such payment prior to performing any such work.

Only those quantities of slide or slipout material will be paid for which are actually removed as ordered by the Designated Authority.

2-9.3 Slopes - Excavation slopes shall be finished in conformance with the lines and grades shown on the plans. All debris and loose material shall be removed. When completed, the average plane of the slopes shall conform to the slopes indicated on the plans and no point on the completed slopes shall vary from the designated plane by more than 6 inches measured at right angles to the slope. Where excavation is in rock, no point shall vary more than 2 feet from the designated plane of the slope. In no case shall any portion of the slope encroach on the roadbed.

The tops of excavation slopes and the ends of excavations shall be rounded where shown on the plans, and these quantities will not be included in the quantities of excavation to be paid for. Such work will be considered as a part of the work of slopes excavation and no additional compensation will be allowed therefor.

Embankment slopes shall be finished in conformance with the lines and grades shown on the plans. When completed the average plane of the slopes shall conform to the slopes indicated on the plans and no point on the completed slopes shall vary from the designated plane by more than 6 inches measured at right angles to the slope.

2-9.4 Surplus Material: Unless otherwise shown on the plans or specified in the Special Provisions, no surplus excavated material may be disposed of within the right of way or adjacent property within the project site. Unless otherwise specified in the Special Provisions, surplus excavated material to be disposed of shall become the property of the Contractor and shall be disposed of off the project site at the Contractor's expense and responsibility.

Quantities of surplus material, if shown on the plans or in the Special Provisions, are approximate only. The Contractor shall satisfy himself that there is sufficient material available for the completion of the embankments before disposing of any indicated surplus material. Any shortage of material, caused by premature disposal of the indicated surplus material by the Contractor, shall be replaced by him and no compensaton will be allowed for such replacement.

2-9.5 Deficiency Material - If the quantity of acceptable material from excavation is not sufficient to construct the fills or embankments required by the work, the quantity of material needed to complete the fills or embankments shall consist of local borrow or imported borrow, as determined by the Designated Authority.

The Contractor shall obtain the local borrow or imported borrow in accordance with the provisions in Article 2-2.6 herein. If the contract does not include an item for imported borrow, payment for the required imported borrow will be made by extra work as provided in Section 9-3, "Extra Work," Part I - General Provisions of the Standard Specifications.

2-9.6 Selected Material - Selected material encountered in excavation within the right of way shall be used for finishing the top portion of the roadbed, constructing shoulders, structure backfill; as shown on the plans; as specified in the Special Provisions, or as directed by the Designated Authority. Topsoil excavated within the limits of the project may be considered as a selected material only for the purpose of backfilling areas to be planted.

When practicable, selected material shall be hauled directly from excavation to its final position in the roadway prism and compacted in place and such work will be paid for at the contract prices for roadway excavation.

Selected material shall remain in place until it can be placed in final position as provided above. No additional compensation will be allowed for any delay in excavation operations, except that if ordered in writing by the Designated Authority, selected material may be excavated and stockpiled at locations designated by him and later placed in final position in the roadway prism.

Excavating selected material and stockpiling, if required, will be paid for at the contract prices for roadway excavation. Removing the selected material from stockpiles and placing it in final position in the roadway prism will again be paid for at the contract prices for roadway excavation, except that the quantities to be paid for will be determined from measurements of the material in the stockpiles prior to removal. No payment for stockpiling of selected material will be made, unless such stockpiling is ordered by the Designated Authority.

When determining quantities of earthwork to be paid for, topsoil placed along the tops of slopes in connection with erosion control work will not be considered as stockpiled material.

2-9.7 Measurement

2-9.7.1 - Roadway excavation to be paid for will be the number of cubic yards of material excavated as classified or unclassified excavation, as defined in Article 2-5, "Classification of Excavation," of these Technical Provisions measured in the original position and computed by the average end area method. The following earthwork operations will be measured as roadway excavation for the quantities of material involved; excavating the roadway prism including public and private road approaches; connections and driveways; excavating unsuitable material when shown on the plans or specified in the Special Provisions; excavating slides and slipouts not resulting from overshooting; excavating surplus material; excavating selected material and topsoil from within the limits of project and removing such materials from stockpiles when stockpiling is ordered; excavating channels; and excavating local borrow.

Excavation in excess of the planned or authorized cross section will not be paid for, except as provided in Articles 2-2.8.1 and 2-2.8.2 herein. The Contractor shall backfill and compact unauthorized excavated areas to the original ground elevation or authorized section at his expense.

The measurement will not include the yardage of subgrade material or other material that is scarified or plowed and reused in place by road mixing or other similar in place method of operation.

Care shall be exercised to prevent excavating below grade. Areas excavated below grade shall be filled with suitable material and compacted by the Contractor at his expense.

Where due to changed conditions or the nature of a particular operation or for any other reason, it is impossible or impractical to measure quantities of common excavation

by means of average areas, the Designated Authority will compute the quantities of material excavated by a method which in his opinion is best suited to obtain an accurate determination.

When quantities of roadway excavation are computed by means of average end areas and centerline distances, a correction for curvature will not be applied to quantities within the roadway prism. In computing the quantity of material outside the original roadway prism, where the roadway centerline is used as a base, correction will be made for curvature if the centerline radius is 1,000 feet or less.

The final estimate of roadway excavation quantities shall be the quantities included within the planned or authorized cross section, excluding the rounding of the tops of excavation slopes and the ends of excavations, and the quantities involved in the removal of slides and slipouts.

2-9.7.2 Local Borrow - The quantity of local borrow to be paid for will be the number of cubic yards of common borrow, rock borrow, or unclassified borrow excavated and satisfactory placed in embankments or as otherwise directed, measured in the original position and computed by the average end area method. The yardage of overburden stripped from borrow pits and the yardage of excavation for ditches for drainage of borrow pits, unless used as borrow material, will not be included in the yardage to be paid for. The measurement will not include the yardage of excavation performed prior to taking of elevations and measurements of the undisturbed ground. Local borrow will be classified as specified for excavation.

2-9.7.3 Imported Borrow - The quantity of imported borrow material will be measured either by the ton (2,000 lbs.), or by the cubic yard of truck measure, as indicated in the bid schedule. When measured by the ton, the Contractor shall furnish certified weight slips to the Designated Authority for each load delivered. A weight deduction will be made for any moisture content in excess of 6 percent of the dry weight of the material. When truck measure is used, each type of truck shall be accurately measured for its cubic yard, "water level", capacity; and said yardage figures shall be mutually agreed upon before hauling commences. All such vehicles shall be loaded to at least their "water level" capacity; and the Contractor shall furnish certified yardage slips to the Designated Authority for each load delivered.

2-9.8 Payment

2-9.8.1 Roadway Excavation - Quantities of classified or unclassified roadway excavation will be paid for at the contract unit price per cubic yard for the respective classification. Such price shall include excavating, sloping, rounding tops and ends of excavations, loading, depositing, conditioning, spreading, watering, and compacting the material complete in place and disposal of surplus material.

2-9.8.2 Imported Borrow - Imported borrow and classified or unclassified local borrow, measured as stated above and accepted, will be paid for at the contract unit prices per cubic yard or ton for borrow, which prices and payment shall constitute full compensation for furnishing all labor, materials, equipment, tools, supplies, and incidentals necessary to clear and strip the borrow sites, excavating, loading, hauling, depositing, spreading, watering and compacting the material complete in place, and disposing of cleared and stripped material.

2-10 Structure Excavation and Backfill - Shall consist of the removal of material for the construction of foundations for bridges, box culverts, retaining walls, headwalls and endwalls for culverts, reservoirs, buildings, and other structures, and other excavation designated on the plans or in these Specifications, or in the Special Provisions as structure excavation.

Structure backfill shall consist of furnishing, placing and compacting backfill material around structures to the lines designated on the plans or specified or directed by the Designated Authority.

Structure excavation and structure backfill shall include the furnishing of all materials and equipment and the construction or installation of all shoring, cofferdams and sheeting and/or other facilities which may be necessary to perform the excavations and place and compact the backfill, and the subsequent removal of such facilities, except where they are required or permitted by the plans or Specifications to remain in place.

When shown on the plans or directed by the Designated Authority, recesses at culvert inlets shall be excavated in excavation slopes to the dimensions designated and the resulting material disposed of in embankments as directed, and such work will be paid for as structure excavation for the quantities involved.

Surplus material from structure excavation shall be desposited in embankments as provided in Article "Embankment Construction," or disposed of as provided in Article "Surplus Material," all as directed by the Designated Authority, and no additional compensation will be allowed for such work.

2-10.1 Cofferdams - Cofferdams for foundation construction shall be carried well below the bottom of the footings and shall be well-braced and reasonably watertight. The interior dimensions of cofferdams shall provide sufficient clearance inside the walls for constructing forms and driving piles and to permit pumping outside the forms.

If in the judgment of the Contractor, the clearance provided on the plans between the outside line of the footing and any pile or interior wall or surface is not sufficient to permit the driving of piles or building of forms, he may provide such necessary clearance by constructing the cofferdam sufficiently large to provide such clearances as he may deem necessary. Any such enlargement in excess of one foot outside the dimensions of the footing as shown on the plans shall be considered as being for the sole purpose of expediting the work of the Contractor and such excavation and backfill shall be at the Contractor's expense.

Cofferdams which are tilted or moved out of position by any cause during the process of sinking shall be plumbed or enlarged so as to provide the necessary clearance and proper pier location and such work shall be at the Contractor's expense.

In tidal waters or in streams at a time of probable flood, cofferdam walls shall be vented at low water elevation to ensure equal hydrostatic head both inside and outside of the cofferdam during the period of pouring and setting of seals.

No shoring will be permitted in cofferdams which will include stress, shock, or vibration in the permanent structure.

When permitted by the Designated Authority, cross struts or bracing may extend through foundation concrete. Such struts or bracing below low water will be permitted to remain in place, except in navigable streams or, when specified in the Special Provisions or shown on the plans, to be removed. Struts or bracing above low water shall be removed and the resulting space filled with concrete of the same mix as that specified for the surrounding concrete.

For substructure work, the Contractor shall submit drawings showing his proposed method of cofferdam construction and other details left open to his choice or not fully shown on the plans. The type and clearance of cofferdams, insofar as such details affect the charcter of the finished work, will be subject to the approval of the Designated Authority, but other details of design will be left to the Contractor who will be responsible for the successful construction of the work.

After completion of the substructure, the cofferdams with all sheeting and bracing shall be removed at least to 2 feet below the level of the stream bed, by the Contractor at his expense, and such removal shall be performed in a manner that will not disturb or mar the finished concrete or masonry.

2-10.2 Foundation Material Treatment - When footing concrete or masonry is to rest upon rock, the rock shall be fully uncovered and the surface thereof shall be removed to a depth sufficient to expose sound rock. The rock shall be roughly leveled off or cut to approximate horizontal and vertical steps, and shall be roughened. Seams in the rock shall be grouted under pressure or treated as the Designated Authority may direct and the cost thereof will be paid for as extra work.

When no piles are used and footing concrete or masonry is to rest on an excavated surface other than rock, care shall be taken not to disturb the bottom of the excavation and final removal of the foundation material to grade shall not be made until just before the concrete or masonry is placed. Except when over-excavation is directed by the Designated Authority, excavation below grade shall be replaced at the Contractor's expense with the same class of concrete specified for the structure and at the time the concrete for the structure is being placed.

The excavation for piers and abutments shall be completed to the bottom of the footings before any piles are driven therein, and excess material remaining in the excavation after pile driving shall be removed to the elevation of the bottom of the footings.

When piles are used and ground displacement results from pile driving operations, the Contractor shall at his expense excavate or backfill the footing areas to the grade of the bottom of the footing as shown on the plans with structure backfill material.

2-10.3 Construction Review - Whenever any structure excavation is completed, the Contractor shall notify the Designated Authority who will conduct a construction review of the foundation. No concrete or masonry shall be placed until the foundation has been approved by the Designated Authority.

2-10.4 Structure Backfill - Shall not be placed until the structure footings or other portions of the structure or facility have been reviewed by the Designated Authority and approved for backfilling. No backfill material shall be deposited against the back of

concrete abutments, concrete retaining walls, foundation walls, or the outside walls of cast-in-place concrete culverts until the concrete has developed a strength of not less than 2,500 psi in compression as determined by test cylinders cured under conditions similar to those prevailing at the site.

Unless otherwise specified in the Special Provisions, structure backfill shall consist of approved selected material from excavation, free from stones or lumps exceeding 3 inches in greatest dimension, vegetable matter, or other unsatisfactory material. When the material from excavation is unsuitable for use as backfill, it shall be disposed of as directed by the Designated Authority and suitable material approved by the Designated Authority shall be furnished by the Contractor for the backfill.

Backfill material shall be placed in horizontal, uniform layers not exceeding 8 inches in thickness before compaction, and shall be brought up uniformly on all sides of the structure or facility. Unless otherwise specified in the Special Provisions, each layer of backfill shall be compacted to a relative compaction of not less than 95 percent.

Consolidation of structure backfill by ponding and jetting will be permitted when, as determined by the Designated Authority, the backfill material is of such character that it will be self-draining when compacted and that foundation materials will not soften or be otherwise damaged by the applied water, and no damage to the structure from hydrostatic pressure will result. Ponding and jetting of the upper 2 feet below finish subgrade will not be permitted in roadway areas. When ponding and jetting is permitted, material for use as structure backfill shall be placed and compacted in layers not exceeding 4 feet in thickness. The work shall be performed without damage to the structure or softening of the embankment, and in such a manner that excess water will not be impounded. Ponding and jetting methods shall be supplemented by the use of vibratory or other consolidation equipment when necessary to obtain the required consolidation.

2-10.5 Payment - Unless otherwise provided in the Special Provisions no payment will be made for structure excavation or backfill as such; the cost thereof shall be considered as included in the price bid for the construction or installation of the items to which such excavation or backfill is incidental or appurtenant. Separate payment for such excavation or backfill will be made only when the Special Provisions provide, and then, only for the volume included within vertical faces one foot beyond and parallel with the outermost horizontal dimensions of that portion of the structure to be constructed within the limits of the excavated space.

2-11 Ditch Excavation - shall consist of excavating ditches within or outside the right of way, including channels for changing the course of streams, all as shown on the plans or specified or directed by the Designated Authority.

The excavation required to construct a ditch or channel designated with a bottom width of less than 12 feet will be classed as ditch excavation.

The excavation required to construct a ditch or channel designated with a bottom width of 12 feet or more will be classed as roadway excavation.

Material resulting from excavating ditches or channels shall be used to construct roadway embankments, dikes, or for other purposes, or disposed of, all as directed by the Designated Authority.

Care shall be exercised to prevent excavating below the grade for the bottom of the ditch or water channel, and areas excavated below grade shall be filled with suitable material and thoroughly compacted by the Contractor at his expense.

2-11.1 Measurement - Quantities of ditch excavation to be paid for will be computed by means of average end areas and the distances between these areas.

2-11.2 Payment - The excavation of ditches and channels which have a bottom width of less than 12 feet, as shown on the plans, except as hereinafter provided, will be paid for at the contract price per cubic yard for ditch excavation.

The above price and payment shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in excavating ditches completely, as shown on the plans, and as specified in these Specifications and the Special Provisions.

The excavation of gutters within the median areas of a divided roadway and gutters between the roadbed shoulder and an adjacent excavation slope, and gutters in excavation benches, and side gutters contiguous to embankment slopes, and inlet and outlet ditches to storm drain structures, all as shown on the plans, will be paid for as roadway excavation and payment will not be made as ditch excavation for such work.

2-12 Embankment Construction - Shall consist of constructing embankments and fills, including the preparation of the areas upon which they are to be placed; buttress fills; dikes; the placing and compacting of approved material within areas where unsuitable material has been removed; and the placing and compacting of material in holes, pits and other depressions.

Areas over which fills are to be placed shall be cleared and scarified to provide a bond between the existing ground and the material to be deposited thereon. When fills are to be placed over existing surface improvements which are to remain in place, such clearing and scarifying will not be required. Whenever a fill is constructed upon an existing structure or pavement, 4 inch drainage holes shall be drilled through the structure on 5 foot centers each way or the pavement shall be broken by stompoing in a grid pattern of 5 feet each way.

Rocks, broken concrete, or other solid materials, which are larger than 4 inches in greatest dimension shall not be placed in fill areas where piles are to be placed or driven.

When fill is to be made and compacted on hillsides or where new fill is to be compacted against existing fill or where embankment is built one-half width at a time, the slopes of original hillsides and old or new fills shall be benched a minimum of 4 feet horizontally as the fill is placed. A new bench shall be started where the vertical cut for the next lower bench intersects the existing ground.

Material thus cut out shall be recompacted along with the new embankment material at the Contractor's expense unless the width of the bench required by the Designated Authority exceeds 4 feet, in which case the excavated material in excess of 4 feet will be measured and paid for as excavation.

Clods or hard lumps of earth of 6 inches in greatest dimensions shall be broken up before compacting the materials in embankment, with the following exception:

When the fill materials contain large rocks, boulders, or hard lumps, such as hardpan or cemented gravel which cannot be broken readily over 12 inches in greatest dimension, such materials may be incorporated in the fill only when authorized by the Designated Authority with respect to the acceptability of the material, the location and depth of its placement in the fill, and the method to be used. When the embankment material consists of large rocky material, or hard lumps, such as hardpan or cemented gravel, 12 inches and less in greatest dimension, which cannot be broken readily, such material shall be well distributed throughout the embankment. Sufficient earth or other fine material shall be placed around the large material as it is deposited so as to fill the interstices and produce a dense, compact embankment.

When bridge footings are to be constructed in embankment, the embankment shall be constructed to the elevation of the grading plane before excavating for the footing, or when foundation piling is shown on the plans, before driving the piles or excavating for the footing.

Embankments shall not be constructed when material is frozen or a blanket of snow prevents proper compaction.

2-12.1 Compacting - Embankment shall be constructed in compacted layers of uniform thickness and each layer shall be compacted in accordance with the requirements herein specified with the following exception: where embankments are to be constructed across low, swampy ground which will not support the weight of hauling equipment, the lower part of the embankment may be constructed by dumping successive loads in a uniformly distributed layer of a thickness not greater than that necessary to support the equipment while placing subsequent layers. The remainder of the embankment shall be constructed in layers and compacted as specified.

The construction of dikes, the placing and compacting of approved material where unsuitable material has been removed, and the filling of holes, pits and other depressions shall conform to all of the requirements specified herein for compacting embankments. Trenches, holes, depressions and pits outside of areas where embankments are to be constructed shall be graded to provide a presentable and well-drained area.

Embankments shall be constructed so that each layer shall have a cross fall of at least 2% but no more than 5%.

The loose thickness of each lift of embankment materials shall not exceed that which will provide the specified relative compaction through the full depth of the lift by the specific compaction equipment being utilized. Each lift shall be compacted in accordance with the requirements of Article "Compaction" herein.

When embankment material contains by volume over 25% of rock larger than 6 inches in greatest dimension, the embankment below a plane 3 feet from finished grade may be constructed in layers of a loose thickness before compaction not exceeding the maximum size of rock in the material but not exceeding 3 feet in thickness.

The interstices around the rock in each layer shall be filled with earth or other fine material and compacted. Broken Portland cement concrete and bituminous type pavement obtained from the project excavations will be permitted in the embankment with the following limitations:

1. The maximum dimension of any piece used shall be six inches.

2. Pieces larger than 4 inches shall not be placed within 12 inches of any structure.

3. Pieces larger than 3 inches shall not be placed within 12 inches of the subgrade for paving.

4. "Nesting" of pieces will not be permitted.

At locations where it would be impracticable to use mobile power compacting equipment, embankment layers shall be compacted to the specified requirements by any approved method that will obtain the specified relative compaction.

At the time of compaction, the moisture content of embankment material shall be such that the specified relative compaction will be obtained and the embankment will be firm, hard and unyielding. Embankment material which contains excessive moisture shall not be compacted until the material is dry enough to obtain the required relative compaction. Full compensation for any additional work involved in drying embankment material to the required moisture content shall be considered as included in the contract price paid and no additional compensation will be allowed therefor.

2-12.2 Payment - Full compensation for constructing embankments; preparing subgrade at the grading plane; doing necessary plowing or benching; constructing all dikes; placing and compacting approved material where unsuitable and unstable embankment foundation material has been removed; filling and compacting holes, pits, and other depressions; backfilling excavations resulting from the removal of structures and other facilities; placing selected material where required; placing; topsoil excavated from within the project limits on slopes; placing selected material and topsoil in stockpiles; all as shown on the plan, and as specified in these Specifications and the Special Provisions, shall be considered as included in the contract price paid per cubic yard for excavating the material or the contract price paid for furnishing and placing the material, as the case may be, and no additional compensation will be allowed for such work.

Where embankment is specified in the bid schedule or in the Special Provisions, full compensation for constructing such embankments shall include the cost of all the necessary excavation in connection therewith, both within the limits of the project or otherwise, together with the cost of all grading, shaping, and other work that is required under this Article "Embankment Construction." The quantities used in determining payment for embankment bid items shall be those of the completed embankments in place within the limits of dimensions shown on the plans.

2-13. Compaction - Earthwork compaction consists of obtaining the required compaction in all earthwork described in these Specifications or the Special Provisions, except structure backfill.

Embankments shall be constructed in layers. The loose thickness of each layer of embankment material before compaction shall not exceed 0.67 foot, except as provided in Article 11.1, for rocky material.

2-13.1 Relative Compaction (95 Percent) - Unless otherwise specified in the Special Provisions, whether in excavation or embankment, when subbase, base, pavement, or curb and gutter is to be placed directly on subgrade material, the top 6 inches of subgrade material shall be compacted to a relative compaction of 95 percent. When driveways, sidewalks or other roadway structures are to be placed on the subgrade material, the top 6 inches of such subgrade material shall be compacted to a relative compaction of 90 percent. After compaction and trimming, the subgrade shall be firm, hard, and unyielding. Where expansive soils are encountered, the Engineer may require that 6 inches of expansive soils be removed and replaced with either aggregate base or subbase, this in lieu of the 95 percent compaction requirement. This provision does not waive the requirement set forth in Section 2-2.8.1, "Unsuitable Material".

In addition, relative compaction of not less than 95 percent shall be obtained under subbase, base, pavement, and curbs and gutters for a minimum depth of 2.5 feet below finished grade, whether in excavation or in embankment, except under driveways, sidewalks or other roadway structures.

Relative compaction of not less than 95 percent shall be obtained for embankment under wall footings without pile foundations within the limits established by inclined planes sloping 1-1/2:1 out and down from lines one foot outside the bottom edges of the footing.

2-13.2 Relative Compaction (90 Percent) - Relative compaction of not less than 90 percent shall be obtained in all layers of material in embankment, except as specified herein to be 95 percent; and under driveways, sidewalks, and other roadways structures, except curbs and gutters, for a minimum depth of 2.5 feet below finished grade.

2-13.3 Payment - for earthwork compaction will be considered as included in the various contract items of work requiring compaction of earthwork and no separate payment will be made therefor. If the Contractor elects to excavate and replace basement material to facilitate compaction, the cost of such work will be considered as included in the contract items of work requiring the compaction of earthwork and no separate payment will be made therefor. If such basement material is placed in embankment or used in other planned or authorized work, and is replaced with planned excavated material or imported borrow, payment will be made for the quantity of replacement material used at the contract unit price for the type of excavation involved or imported borrow, as the case may be.

2-14 Finish and Tolerance - The surface of all excavations, fills, embankments, and subgrades shall be finished to a reasonably smooth and compact surface substantially in accordance with the lines, grades, and cross sections or elevations shown.

2-14.1 Roadway and Other Paved Areas - When the pavements for roadways, parking areas, sidewalks, and other paved areas are to be constructed under this Contract, the finished subgrades of such areas shall not vary more than 0.05 foot above nor 0.10 foot below the planned grade.

When the subbase, base or pavement for roadways, parking areas, sidewalks, and other paved areas are not to be constructed under this Contract, the subgrades of such areas shall be finished within a tolerance of plus or minus 0.2 foot.

2-14.2 Other Site Areas - All other site areas that have been excavated, or that have received fills or embankments (excluding roadways and other paved areas) shall be finished within a tolerance of plus or minus 0.2 foot.

2-15 Placing Topsoil - On areas that are to receive topsoil, the compacted subgrade shall be scarified to a depth of 2 inches for the bonding of topsoil with the subsoil. Topsoil shall then be evenly spread, compacted and graded to the thickness indicated or specified, and to the elevations and slopes shown.

2-16 Protection of Construction - The Contractor shall provide and maintain slopes, crowns, and ditches on all excavations, fills and embankments to ensure satisfactory drainage at all times during the construction period. He shall be responsible for the construction of temporary dams, silting basins, and other facilities as required to prevent damage to the work, and eroded earth and silt from being deposited in streams or on adjacent properties. The finished subgrade shall not be disturbed by traffic or other operations and shall be protected and maintained by the Contractor in a satisfactory condition until subbase, base, or pavement is placed. No separate payment will be made for this work, but it shall be considered as being included in the unit bid price for the earthwork involved. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base or pavement shall be laid until the subgrade has been checked and approved.

2-17 Dust Control - The Contractor shall be responsible for the alleviation or prevention of any dust nuisance arising from the work on this project, by the use of water or dust palliatives as required, and as directed by the Designated Authority. No separate payment will be made for this work, but it shall be considered as being included in the unit bid price for the earthwork involved.

2-18 Control of Water - The Contractor shall take such measures as may be required, and shall furnish, install and operate such pumps or other devices as may be necessary to remove any seepage, storm water or sewage that may be found or may accumulate in the excavations during the progress of the work. The Contractor shall keep all excavations entirely free from water at all times during the construction of the work, and until the Designated Authority gives permission to cease pumping.

PART 2

SECTION 3.
SUBGRADE BASE CONSTRUCTION

3-1 Subgrade

3-1.1 General - The work specified in this section includes the preparation of the ground on which the subbase, base, pavement or other surfacing materials is to be placed, as specified. The finished subgrade plane lies between the subgrade and the lowest element of any other surfacing material placed on it. All relative compaction shall be not less than 95 percent, for a depth of 0.5 ft. regardless of location. All subsequent material placed thereon shall have a relative compaction of 95 percent throughout unless otherwise specified herein. The top six inches of subgrade material and all subsequent material under gutter, driveways, sidewalks and curbs shall be compacted to a relative compaction of at least 95 percent unless otherwise specified. All work and materials to be in conformance with applicable portions of Sections 25 and 26 of the State Specifications except as modified herein.

After compaction and trimming, the subgrade shall be firm, hard, and unyielding.

Unsuitable subgrade material as determined by the Engineer shall be removed to a depth specified by the Engineer and disposed of as directed by the Engineer. Soft material as determined by the Engineer may be allowed to dry and be reprocessed at no cost to the City. Any removed material shall be replaced with suitable material approved by the Engineer and shall be compacted to a relative compaction of not less than 95 percent. Any such work, including the removal, disposal, and replacement of said material, shall be paid for as extra work less the cost of processing the top six inches unless otherwise specified.

Applied water when directed by the Engineer, in connection with subgrade preparation, will not be measured and paid for separately.

The Contractor shall repair at his expense any damage to prepared subgrade caused by his operation or by use of public traffic. No material shall be placed upon the prepared subgrade until the subgrade is in the condition meeting the requirements specified.

In order to facilitate the preparation of subgrade, the Contractor may, if he elects, remove rocks, lumps, break up hardened material or temporarily construct a rough grading plane below the subgrade elevation, provided he subsequently brings such rough grading plane up to subgrade elevation with suitable material approved by the Engineer and that said material is compacted to a relative compation of not less than 95 percent. Any such work shall be at the expense of the Contractor and no separate payment will be made therefor.

3-1.2 Subgrade Tolerance - Subgrade for asphalt concrete, concrete, or other roadway structures shall not vary more than 0.03 ft. from the specified grade and cross-section. Variations within the specified tolerances shall be compensated so that the average grade and cross-section specified are met.

3-1.3 Payment - No separate measurement or payment will be made for preparing subgrade, and full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing subgrade as specified, shall be included in the contract price paid for the various contract items of work. No additional payment shall be made.

3-2 Aggregate Subbase

3-2.1 General - The work specified in this section includes furnishing, spreading, and compacting mineral aggregate subbase and aggregate base in accordance with these specifications.

3-2.2 Aggregate Subbase

A. General - Aggregate subbase shall be mineral aggregate conforming to Section 25 of the State Standard Specifications for Class 2 Aggregate Subbase and as modified herein.

B. Materials - Mineral aggregate for the aggregate subbases, at the time it is deposited, shall conform to the following requirements:

C. Quality - Aggregate for aggregate subbase shall be clean and free from vegetable matter and other deleterious substances and shall be of such quality that it will bind readily to form a firm, stable subbase.

D. Gradation - The percentage composition by weight of aggregate subbase shall conform to the following grading when determined by Test Method No. Calif. 202. (From Section 25-1.02A of the State Standards for Class 2 moving average).

Sieve Sizes	Percentage Passing Sieves
3"	100
2 1/2"	90 - 100
#4	40 - 90
#200	0 - 25
#200	0 - 25

E. Recycled Aggregate Sub-Base - Existing uncontaminated asphalt concrete and aggregate base, where practicable, may be removed and recycled as aggregate subbase.

The existing asphalt concrete and aggregate base shall be broken up to size conforming to Section 3-2.2, "Aggregate Subbase," of these Specifications as hereinafter modified. Recycled materials shall be mixed to a uniform gradation prior to spreading and compaction.

Recycled aggregate base shall be measured for payment by the cubic yard based on theoretical cross section measured in place and payment shall be made therefor in conformance with the contract price paid for the bid item aggregate subbase.

When the subbase is placed in layers of three (3) inches thickness or less, the maximum size of aggregate shall be one (1) inch less than the compacted thickness of the layer of subbase in which it is placed.

3-2.3 Tests - The aggregate subbase shall conform to the following tests:

	Test Method No. Calif.	Requirements
Resistance (R-Value)	301	50 minimum
Sand Equivalent	217	20 Minimum

The R-Value requirements may be waived provided that the aggregate subbase conforms to the specified grading and has a sand equivalent value of 25 or more.

3-3 Aggregate Base

3-3.1 General - Aggregate base shall consist of a crushed material aggregate forming, conforming to Section 26 of the State Standard Specifications for Class 2, Aggregate Base as modified herein.

3-3.2 Materials

A. Quality - Aggregate furnished for the base shall be free from vegetable matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm stable base. Aggregate may be delivered with water added.

The Coarse Aggregate (material retained on the No. 4 sieve) shall consist of material of which at least 25 percent, by weight, shall be crushed particles as determined by Test Method No. Calif. 205.

B. Gradation - The percentage composition by weight of aggregate base shall conform to the following grading when determined by Test Method No. Calif. 202, modified by Test Method No. Calif. 905 where there is a difference in specific gravity of 0.2 or more between the coarse and fine portion of the aggregate or between blends of different aggregates. (From Section 26-1.02B of the State Specification for Class 2 Aggregate Base).

Sieve Size	1-1/2" Maximum Percentage Passing Sieve	3/4" Maximum Percentage Passing Sieve
2"	100	
1-1/2"	90-100	
1"	---	100
3/4"	50-85	90-100
#4	25-45	35-55
#30	10-25	10-30
#200	2-9	2-9

3-3.3 Tests - The aggregate base shall conform to the following tests:

	Test Method No. Calif.	Requirements
Resistance (R-Value)	301	78 Minimum
Sand Equivalent	217	30 Minimum

3-4 Preparation

3-4.1 Subbase and Base Preparation - Aggregates for subbase and base shall be delivered to the roadbed as uniform mixtures and shall be spread in layers or windrows. Segregation of aggregates shall be avoided and material as spead shall be free from pockets of large or fine material. Segregated materials shall be remixed until uniform.

Where the required thickness is 0.5 foot or less, the aggregate subbase or base may be spread and compacted in one layer. Where the required thickness is more than 0.5 foot, the subbase or base aggregate shall be spread and compacted in two or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 0.5 foot. Each layer shall be spread and compacted in a similar manner.

At locations where the aggregate subbase or base is to be placed over areas inaccessible to the spreading equipment, the aggregate subbase or base may be spread and compacted by any means to obtain the specified results.

3-4.2 Compacting and Tolerance - The relative compaction of each layer of compacted aggregate subbase or base shall not be less than 95 percent as determined by Test Method No. Calif. 216 or 231. The finished surface of the aggregate base shall not vary more than 0.05 foot from the specified grade and cross section. Variations within the above specified tolerances shall be compensating so that the average grade and cross sections specified are met.

3-4.3 Measurement - Quantities of aggregate subbase or aggregate base will be measured by the ton or cubic yard. If measured by the ton, water content in excess of optimum moisture content shall be deducted from the total weight of aggregate. If measured by the cubic yard, quantities of aggregates will be calculated on the basis of dimensions shown on the plans adjusted by the amount of change that may be ordered by the Engineer. No allowance will be made for aggregate rejected or placed outside said dimensions unless otherwise ordered by the Engineer.

Payment will be at the price bid which price and payment includes full compensation for furnishing all labor materials, tools, equipment and incidentals and installing the items, complete as specified including subgrade preparation, reprocessing, watering, dust palliative, leveling, compacting and any and all costs to complete the item.

3-5 Treated Subgrade or Bases

3-5.1 General - Cement or lime treatment, if required, shall be in conformance with the applicable provisions of Section 24 or 27 of the State Specifications. The type, class, grade and amount of treatment shall be as specified or directed by the Engineer.

3-5.2 Measurement and Payment - Measurement shall be the square yard of treated surface meeting requirements specified and directed. Payment shall be at the unit price bid which includes all matrerials, equipment, labor and costs to perform the work except costs in other items. In the event there is no bid item for such treatment, it shall be measured and paid for as extra work according to provisions of approved change order.

PART 2

SECTION 4.
ROADWAY SURFACING

4-1 Asphalt Concrete

4-1.1 General - This work shall consist of furnishing and placing asphalt concrete as specified in Section 39, "Asphalt Concrete", of the State of California Standard Specifications.

Unless otherwise specified in the plans or in the Special Provisions, and as modified herein, asphalt concrete shall be Type B, half-inch maximum for surface course and Type B, three-quarter inch maximum, medium grading, for base course. Asphalt binder shall be paving asphalt, Grade AR 4000.

4-1.2 Temperature - At the time of delivery to the site of the work, the temperature of the mixture shall not be lower than 250 degrees F. or higher than 320 degrees F. Asphalt concrete shall not be placed when the atmospheric temperature is below 40 degrees F. or during unsuitable weather. When feather-edging asphalt concrete between atmospheric temperatures of 40 degrees F. to 65 degrees F., any combination of the following methods may be required by the Engineer:

A. Heat existing asphalt;
B. Use 1/4 to 3/8-inch maximum aggregate asphalt;
C. Change paving asphalt viscosity grade;
D. Prohibit traffic on the feather edge to prevent damage.
E. Other method as directed.

4-1.3 Tolerances - The asphalt concrete shall be evenly spread upon the subgrade or base to such a depth that, after rolling, it will be specified cross section and grade of the course being constructed. Upon completion, the pavement shall be true to grade and cross section. When a 10-foot straightedge is laid on the finished surface parallel to the center line of the roadway, the surface shall not vary from the edge of the straightedge more than one-eight inch, except at intersections or at changes of grade. Any areas that are not within this tolerance shall be brought to grade immediately following the initial rolling.

However, if the paving material has been cooled below the lower limits of the spreading temperatures specified, the surface of the pavement shall be brought to a true grade and cross sectioned by removing the paving material in the area to be repaired, by an approved method to provide a minimum laying depth of one inch or new pavement material at the join line. Repairs shall not be made to pavement surfaces by feather edging at the joining. Cost of this work shall be entirely at the Contractor's expense.

Asphalt binder to be mixed with aggregate shall have a paving asphalt viscosity of AR 4000 and conform to the applicable provisions of Sections 39 and 92 of the State of California Standard Specifications.

4-1.4 Grading - Mineral Aggregate shall conform to the following grading requirements:

Sieve Size	Percentage Passing Sieve 3/4" Maximum	1/2" Maximum
1"	100	
3/4"	95-100	100
1/2"	---	95-100
3/8"	65-80	80-95
No. 4	45-60	55-72
No. 8	30-45	38-55
No. 30	15-25	18-33
No. 200	3-7	4-8

Note: The amount of asphalt shall be the optimum as determined by Calif. Test No. 367. The exact proportions of asphalt binder and mineral aggregates shall be approved by the Engineer.

4-2 Prime Coat - The prime coat shall be liquid asphalt grade MC-70 in conformance with Sections 38-4 and 93 of the State Specifications. A prime coat shall be applied to all aggregate base at a rate of 0.25 gallons per square yard prior to asphalt concrete pavement construction.

4-3 Tack Coat - The tack coat shall be asphalt grade RS-1 in accordance with the State of California Standard Specifications, unless otherwise directed by the Engineer. A tack coat shall be applied to all vertical surfaces abutting the asphalt concrete paving, to all surfaces upon which asphalt concrete overlay or resurfacing is to be constructed and to such other areas as may be directed by the City Engineer.

4-4 Fog Seal - A fog seal, if required, shall be mixed and placed in accordance with Sections 37-1 and 38-4.09 of the State Specifications.

4-5 Structure Adjustment - All storm drain manholes and sanitary manhole structures shall be brought to grade after the final asphalt concrete but before fog seal is applied.

4-6 Measurement and Payment - Measurement of Asphalt Concrete surfacing shall be measured by the ton or square foot, depending on the unit shown in the bid items, to the nearest ton or square foot for such surfacing furnished and placed in conformance with the plans and specifications. Measurement by tons will be based on certified weighmeters certificates showing gross, tare and net weight and the type and grading of the mix for each load. Surfacing measured by the square foot shall be based on surface measurement to the neat lines shown on the plans. Certificates shall be required showning type, grade and plant source of each load regardless of unit of measurement. No measurement shall be made, regardless of acceptance of certificates for any surfacing not meeting requirements, placed outside the lines shown or rejected for any reason. Payment shall be at the unit price bid which price and payment shall be full compensation for furnishing and installing the surfacing, complete in place, in accordance with the plans and specifications, including all labor, materials, equipment, compacting, prime coat, tack coat, fog seal and incidentals and no additional compensation shall be made therefor.

4-7 Slurry Seal

4-7.1 General - Slurry seal shall be Type II conforming to Section 37-2, "Slurry Seal," of the State Specifications and as specified herein.

An emulsified asphalt slurry seal surface shall be applied at all locations designated on the Plans.

All incidental work such as surfacing returns, shall be done concurrently with surfacing of the street proper, and shall not be postponed for completion at a later date. All covers for utility structures and monuments shall be protected with plastic sheeting before the slurry seal is applied.

The slurry seal surface shall consist of a mixture of emulsified asphalt, mineral aggregate and water, properly proportioned, mixed and spread evenly on the surface as specified herein and as directed by the Engineer. The cured slurry shall have a homogenous appearance, fill all cracks, adhere firmly to the surface and have skid resistant texture.

4-7.2 Materials - Emulsion-aggregate slurry shall be a stable mixture of emulsified asphalt, mineral aggregate and water. It is intended for surface sealing of bituminous pavements.

Mixing and spreading of emlusion-aggregate slurry shall be as described in Section 37-2 of the State Specifications.

4-7.3 Asphalt Emulsion - The emlusified asphalt shall conform to the requirement of Section 94 of the State Specifications using CRSI Cationic Asphaltic Emulsion.

4-7.4 Aggregate - The mineral aggregate shall consist of natural or manufactured sand, slag, crusher fines, and others, or a combination thereof. Smooth-textured sand of less than 1.25 percent water absorption shall not exceed 50 percent of the total combined aggregate. The aggregate shall be clean and free from vegetable matter and other deleterious substances.

Mineral fillers such as portland cement, limestone dust, aluminum sulphate fly ash and others shall be considered as part of the blended aggregate and shall be used in minimum required amounts. Mineral fillers shall only be used if needed to improve the workability of the mix or gradation of the aggregate.

4-7.5 Gradation of Aggregate - The combined mineral aggregate shall conform to the following gradation.

Sieve Size	Type II Percent Passing
3/8	100
No. 4	90-100
No. 8	65-90
No. 16	45-70
No. 30	30-50
No. 50	18-36
No. 100	10-24
No. 200	5-15

4-7.6 Equipment - All equipment, tools, and machines used in the performance of this work shall be maintained in satisfactory working order at all times.

4-7.7 Slurry Mixing Equipment - The slurry mixing machine shall be a continuous flow mixing unit and be capable of delivering accurately a predetermined proportion of aggregate, water, accelerator, retardant, and asphalt emulsion to the mixing chamber and to discharge the thoroughly mixed product on a continuous basis. The aggregate shall be prewetted immediately prior to mixing with the emulsion. The mixing unit of the mixing chamber shall be capable of thoroughly blending all ingredients together. No violent mixing shall be permitted.

The mixing machine shall be equipped with an approved fines feeder that provides an accurate metering device or method to introduce a predetermined proportion of mineral filler into the mixer whenever added mineral filler is a part of the aggregate blend. The mixing machine shall be equipped with a water pressure system and fog-type spray bar adequate for complete fogging the surface preceding spreading equipment.

4-7.8 Slurry Spreading Equipment - Attached to the mixer machine shall be a mechanical-type squeegee distributor equipped with flexible material in contact with the surface to prevent loss of slurry from the distributor. It shall be maintained so as to prevent loss of slurry on varying grades and crown by adjustments to assure uniform spread. There shall be a steering device and a flexible strike-off. Spreader box shall have an adjustable width. The box shall be kept clean, and buildup of excess asphalt and aggregate on or in the box shall not be permitted.

4-7.9 Composition and Rate of Application of the Slurry Mix - The amount of asphalt emulsion, aggregate and water shall be proportioned according to Section 37-2.03 of the State Specifications. The Engineer shall give final approval to the design and rate of application used.

4-7.10 Weather Limitations - The slurry seal surface shall not be applied if either the pavement or air temperature is 65 degrees F. or below or during unsuitable weather.

4-8 Site Preparation and Traffic Control - The Contractor shall arrange for, and coordinate the notification of the neighborhoods and individuals as necessary to accomplish the removal and general clearing of parked vehicles from the area of work to the extent he shall require to execute his work in a reasonable and efficient manner. The Contractor shall notify residents in advance of all paving operations or other operations that would restrict parking. This will include, but not be limited to, placing a notification at each residence or business, and on each parked car approximately twenty-four hours prior to paving operations.

Prior to beginning overlay operations, the Contractor shall submit a plan for maintaining traffic movements during all of his operations. Said traffic plan shall be approved by the Engineer prior to commencement of any paving work.

The Contractor shall execute his work in a safe, orderly and expeditious manner and shall specifically exercise due care and consideration to minimize inconvenience to residents and businesses of the project areas relative to parking of vehicles, access to properties, and the movement of vehicles and persons through the work areas. To that end, general clean-up and debris removal shall be scheduled to precede surface preparation and paving work by the least feasible period of time.

Site preparation and traffic control shall be measured as a lump sum unit for this project. The lump sum price paid for this item shall include full compensation for all labor, tools, equipment, materials and other expenses incurred or relative to work under this item and no additional compensation will be allowed therefor. In addition to the work described above, the following shall be considered and included in the contract bid price for site preparation and traffic control:

1. Cleaning surface to be overlayed,
2. Cleaning surface to be slurry sealed,
3. Removing existing pavement markers,
4. Protecting all covers and other facilities during slurry seal operations,
5. Removing all interfering driveway steel plates.
6. Removal of all vegetation and applying weed killer as approved by the Engineer.

4-9 Surface Application

4-9.1 General - The surface shall be prewetted by fogging ahead of the slurry box if required by the Engineer depending on local conditions. Water used in prewetting the surface shall be applied at such a rate that the entire surface is damp with no apparent flowing water in front of the slurry box. The slurry mixture shall be of the desired consistency when deposited on the surface and no additional elements shall be added. No lumping, balling, or unmixed aggregate shall be permitted. No segregation of the emulsion and aggregate fines from the coarse aggregate will be permitted.

4-9.2 Joints - No excessive build-up nor unsightly appearance shall be permitted on longitudinal or transverse joints.

4-9.3 Hand Work - Hand squeegees shall be used to spread slurry in non-accessible areas to the slurry mixer.

4-9.4 Curing - Treated areas will be allowed to cure until such time as necessary to prevent damage from traffic.

4-9.5 Clean-up - Care shall be exercised to prevent slurry from being deposited on concrete surfaces. The Contractor shall clean any such deposits and clean manholes, valves and other covers.

4-9.6 Access - Where necessary to provide vehicular or pedestrian crossings over the fresh slurry, the Engineer shall direct the spreading of sufficient sand to eliminate tracking or damage to the slurry mixture. Otherwise, Contractor shall provide barricades and flagmen to keep traffic off the fresh slurry.

4-10 Measurement and Payment - Measurement for slurry seal shall be at the square foot of surface completed as shown and specified to the nearest square foot. No deduction will be made for manhole or valve covers cleaned after the project. No measurement will be made for slurry seal outside the limits of work or not furnished and installed according to specifications.

Payment for slurry seal will be made at the price bid which price and payment shall include furnishing and placing, preparation, cleaning up, protection of all utility covers, labor, material, equipment and all incidentals to complete the work as shown and specified except costs included in other bid items. When a lump sum item is not provided for in the bid schedule for site preparation and traffic control as specified by Section 4-8, full compensation for providing site preparation and traffic control shall be considered as included in the contract unit price paid for slurry seal and no additional compensation will be made therefor.

PART 2

SECTION 5.
CONCRETE AND MASONRY CONSTRUCTION

5-1 Concrete Structures

5-1.1 General - This work shall include construction structures, walls, minor structures and all other types of concrete structures to the lines and grades designated and in accordance with the designs and details shown on the plans. Concrete used shall be as specified in these specifications unless another class is indicated in the Special Provisions or on the plans.

5-1.2 Minor Structures - The following structures are classified as minor structures unless otherwise specified.

1) culvert headwalls
2) drop inlets
3) catch basins
4) manholes
5) junction boxes
6) junction structures
7) other structures as determined by Engineer

At the option of the Contractor, minor structures may be furnished and installed as precast units, provided the structures in place are equal in all respects to the cast-in-place construction as approved by the Engineer.

5-1.3 Dewatering - Dewatering from the interior of any foundation or closure shall be done in such a manner as to preclude the possibility of any portion of the concrete materials being carried away. No pumping will be permitted during the placing of concrete, nor for a period of at least 24 hours thereafter, unless it is done from a suitable sump separated from the concrete work by a tight wall.

5-1.4 Falsework - All falsework and centering shall be designed and constructed to provide the necessary rigidity to vibration resulting from adjacent construction and to support the dead and live loads imposed thereon. Unless otherwise approved by the Engineer, falsework for the support of the structure shall be designed and constructed to support the loads which would be imposed, were the entire superstructure poured at one time.

All falsework, staging, walkways, forms, ladders, cofferdams and similar accessories shall equal or exceed the minimum requirements of the State Division of Industrial Safety. Compliance with such requirements shall not relieve the Contractor from full responsibility for the adequacy of safety measures.

The following unit stresses shall be the maximum allowable for falsework design for used material. The Contractor may elect to furnish new grademarked material, in which event the falsework plans submitted shall indicate the grade. The unit stresses allowed shall be those recommended in the latest issue of "Standard Grading Rules for West Coast Lumber" (published by the West Coast Lumber Inspection Bureau), increased 25% for short time loading.

MAXIMUM UNIT STRESSES FOR FALSEWORK

Axial tension and bending	1,400 psi
Compression perpendicular to grain	350 psi
End grain bearing	1,300 psi
Shear parallel to grain	125 psi

$$\text{Timber columns } S = 1{,}300 \left(1 - \frac{L}{60d} \right)$$

S = Maximum allowable stress in pounds per square inch
d = Least side dimension of column in inches
L/d = Not over 50 for bracing
L/d = Not over 30 for main members

Falsework may be bolted or spiked at the option of the Contractor, but the use of bolts and spikes shall not be combined in the same connection. The allowable spacings and connection values of bolt and spikes shall be in accordance with the National Design Specifications for Stress-Grade Lumber and its Fastenings as recommended by National Lumber Manufacturers Association, except that an additional allowance of 25% for temporary use shall be added to the connection values for bolts and spikes.

Ends of columns bearing on wedges shall be tied in both directions by girts.

All falsework materials shall be completely removed and the premises left in a neat and presentable condition. Falsework piling shall be removed at least two feet below the surface of the original ground or original streambed. When falsework piling is driven within the limits of ditch or channel excavation areas, the falsework piling within such areas shall be removed to at least two feet below the bottom and side slopes of said slopes of said excavated areas and voids filled in.

5-1.5 Forms

5-1.5.1 Formwork - Forms shall be smooth, mortar-tight, true to the required lines and grades and of sufficient strength to resist springing out of shape during the placing of concrete. All dirt, chips, soil, dust, nails, and other foreign matter shall be completely removed from forms before any concrete is deposited therein. Form boards having joints opened by shirnkage of the wood shall be swelled by wetting until closed, before concrete is placed. The design and construction of forms and form supports shall be subject to approval, but responsibility for their adequacy shall rest with the Contractor. Earth cuts shall not be used as forms unless approved or directed by the Engineer.

5-1.5.2 Design - Formwork shall be designed for the loads and lateral pressure outlined in Section 102 of ACI 347 and other loads indicated and shall be designed to have sufficient strength to carry the dead weight of the concrete as a liquid, without appreciable deflection. If any such deflection occurs, it shall be sufficient cause for rejection of the work. Where necessary to maintain the tolerances indicated, the formwork shall be cambered to compensate for anticipated deflections due to the weight and pressure of the fresh concrete and due to construction loads.

5.1.5.3 Surfaces - Forms, for all surfaces which will not be completely enclosed or hidden below the finish surface of the ground, and for surfaces where plywood or other forms are not specified, shall be made of surfaced lumber or material which will provide a surface equal to that obtainable by the use of plywood as specified herein. Lumber and material which becomes warped or checked prior to the placing of the concrete shall be removed and replaced.

5-1.5.4 Edges - Unless otherwise noted, all sharp edges intended to be permanently exposed shall be chamfered with uniform triangular fillets not less than one inch by one inch, to prevent mortar runs and to preserve smooth, straight lines. If approved by the Engineer, extruded vinyl chamfer strips of one inch radius may be used in lieu of the wood strips. However, only one type shall be used throughout any one structure. Matching curved surfaces shall be formed of plywood, metal or other approved material.

5-1.5.5 Plywood - Plywood for forms shall be exterior type, of the grade "Concrete Form Exterior", conforming to the specifications of the U.S. Department of Commerce, National Bureau of Standards, Commercial Standards 45. Form panels less than 5/8 inch thick. All form panels shall be placed in a neat symmetrical pattern subject to the approval of the Engineer. Horizontal joints shall be level and vertical joints shall be continuous and perpendicular thereto unless otherwise shown on the plans.

5-1.5.6 Steel Forms - Surfaces of steel forms shall be free from irregularities, dents, sags, rust, and other material which would discolor or transfer to the concrete.

5-1.5.7 Ties - Approved form clamps or bolts shall be used to fasten forms. The use of ties consisting of twisted wire loops to hold forms in position during the placing of concrete will not be permitted. Bolts and form clamps shall be positive in action and shall be of sufficient strength and number to prevent spreading of the forms. They shall be of such type that when the forms are removed all metal shall be at least 1 inch from any surface. Spreader cones on ties shall not exceed one inch in diameter. These shall be of the type which do not have to be completely withdrawn as holes through the wall will not be permitted.

5-1.5.8 Coating - Before concrete is placed, the contact surfaces for forms shall be coated with an approved nonstaining form coating compound. Forms previously used shall be thoroughly cleaned of all dirt, mortar, and foreign matter before being reused. When forms are coated to prevent bond with concrete, coating shall be done prior to placing of the reinforcing steel. Excess coating material shall not be allowed to stand in puddles in the forms nor allowed to come in contact with concrete against which fresh concrete will be placed.

5-1.5.9 Form Removal - Form work for columns, walls, sides of beams, and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations. The side forms for columns and piers shall be removed before the members of the structure which they support are poured or placed, so that the quality of the concrete may be inspected. Form work supporting beams, soffits, slabs, and other structures shall not be removed until concrete has reached 80 percent of its indicated 28 day compressive strength, unless otherwise specified or permitted. When shores and other vertical supports are so arranged that the form facing material may be removed without loosening or disturbing such supports, the facing material may be removed at an earlier date as specified or permitted.

Whenever formwork is removed during the curing period, the exposed concrete shall be cured by one of the methods specified herein.

5-1.5.10 Pouring Against Earth - Where shown on the plans, specified in the Special Provisions or permitted by the Engineer, side forms for footings may be omitted and concrete may be poured against the firm earth.

5-1.6 Inspection Prior to Placing Concrete - All excavations, falsework, forms, reinforcement, joints made prior to pouring, electrical and mechanical inserts, etc., shall be inspected and approved before concrete is placed, and if found unsatisfactory the work shall not proceed until all defects have been remedied. Approval will in no way relieve the Contractor of his obligations to produce the finished concrete required by the Plans the Specifications.

5-1.7 Expansion Joints - Unless otherwise indicated, reinforcement and other fixed metal items embedded or mounted into concrete shall not run continuously through an expansion joint. Open joints shall be constructed at the locations indicated by means of a wood strip, metal plate, or other approved material, which is subsequently removed.

Premolded (Preformed) Expansion Joint Filler shall conform to ASTM Designation D1751.

5-1.7.1 Contraction Joints - Contraction joints shall be constructed as shown on the plans.

5-1.7.2 Construction Joints - Construction joints shall be sand blasted or cleaned as approved by the Engineer prior to placement of new concrete. Construction joints not shown on the plans shall be so made and located as to least impair the strength of the structure and the Contractor shall submit a plan indicating their location for approval by the Engineer. No loose material or form lubricant of any kind shall be in or on a construction joint. Construction joints are not allowed without approval.

5-1.8 Placing Concrete

5-1.8.1 General - All concrete shall be placed while fresh and before it has taken an initial set. Retempering partially hardened concrte with additional water or vibrating will not be permitted.

Runways or other means must be provided to convey the concrete to the place of deposit in order not to disturb forms or reinforcement. Runways shall not be blocked up on reinforcement and barrows shall not be run directly over reinforcment.

The bottoms of all excavations shall be undisturbed soil properly leveled and moist before receiving concrete. All footings and pedestals shall be poured monolithically unless otherwise shown or directed.

Immediately before placing reinforcement or pouring concrete on the ground, the surface of the ground shall be brought to a true, even plane, and compacted to a solid bearing by rolling or tamping. The earth surface shall then be dampened to prevent abosrption of water form the concrete. Too much water shall not be used and no pools shall form on the area to be concreted.

5-1.8.2 Placing Concrete Under Adverse Weather Conditions - Concrete for structures shall not be placed on frozen ground nor shall it be mixed or placed while the atmospheric temperature is below 35 degrees F, unless adequate means are employed to heat the aggregates and water and satisfactory provisions have been made for protecting the work. Salt, chemicals, or other foreign materials shall not be mixed with the concrete for the purpose of preventing freezing.

Concrete slabs shall not be placed on frozen ground, nor shall concrete be mixed or placed when the atmosphere temperature is below 35 degrees F., or when conditions indicate that the temperature may fall to 35 degrees F. within 24 hours, except with the written permission of the Engineer and only after such precautionary measures for the protection of the concrete have been taken as he may direct.

Concrete shall be effectively protected from freezing or frost for period of 5 days after placing.

Concrete for structures shall not be mixed or placed while the ambient temperature is above 115 degrees F. unless adequate means are employed to cool the aggregate and water and satisfactory provisions have been made for protecting the work. In any case, the temperature of the concrete as placed shall not exceed 90 degrees F.

Concrete placement shall be stopped at construction joints before rainfall starts or is sufficient to cause damage to the work. Poured work shall be covered and protected.

5-1.8.3 Depositing - The concrete shall be deposited as nearly as poosible in its final position and the use of vibrators for extensive shifting of the mass of fresh concrete will not be permitted. Fresh concrete shall not be permitted to fall from a height greater than 4 feet without the use of adjustable pipes or "elephant trunks".

Concrete shall be placed with square ends and level tops. Concrete shall be deposited continuously or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, keyed construction joints shall be located at points as indicated or as approved. Placing shall be carried on at such a rate that the concrete which is being integrated with fresh concrete is still plastic.

Temporary spreaders in forms shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. They may remain embedded in the concrete only if made of metal or concrete and if prior approval has been obtained.

Columns shall be poured through pipes adjustable in length and not less than six inches in diameter unless otherwise permitted by the Engineer.

Placing of concrete in supported elements shall not be started until the concrete previously placed in coumns and walls is no longer plastic or, where so indicated, until initial shrinkage has occurred in such supporting concrete members.

5-1.8.4 Consolidating - Consolidation shall be in conformance with Section 4D-1.07A of the State Specifications and these specifications. Concrete, after being deposited, shall be consolidated until all voids are filled and free mortar appears on the

surface. With the exception of concrete placed as slope paving and slabs, and concrete placed under water, all concrete shall be consolidated by means of high-frequency internal vibrators of type, size, and number as approved by the Engineer. The number of vibrators employed shall be ample to consolidate the incoming concrete to a proper degree within 15 minutes after it is deposited in forms. Vibrators shall not be attached to nor held against the forms or the reinforcing steel. The location, manner, and duration of the application of the vibrators shall be such as to secure maximum consolidation of the concrete without causing segregation of mortar and coarse aggregate and without causing water or cement paste to flush to the surface. The thickness of the layers shall be not greater than can be satisfactorily consolidated with the vibrators. The vibrators shall vertically penetrate a few inches into the previous lift (which should not be rigid) at regular intervals. The use of approved external vibrators for consolidating concrete will be permitted when the concrete is inaccessible for adequate consolidation, provided the forms are constructed sufficiently rigid to resist displacements and damage from external vibration.

5-1.8.5 Concrete Deposited Under Water - Where indicated or where approved by the Engineer, concrete shall be deposited under water. Concrete deposited under water shall be placed by means of a tremie or underwater bottom dump bucket approved by the Engineer. To prevent segregation, the concrete shall be carefully placed in a compact mass and shall not be disturbed after being deposited. Still water shall be maintained at the point of deposit.

5-1.9 Concrete Finishing

5-1.9.1 Preliminary Finish - After the concrete has been placed and consolidated, the surface of the concrete shall receive a preliminary finish. The preliminary finish shall consist of carefully striking of the surface of the concrete with a template, strike board, or approved compacting type screed, operated on and between supports or headers, until a uniform surface is obtained.

A. Imperfect or Damaged Work. The Contractor shall repair and clean all concrete damaged or discolored during construction.

B. Finishing Unformed Surfaces. Following completion of the preliminary finish, a final finish of the type indicated shall be provided.

C. Scratched Finish. When indicated, a scratched finish shall consist of the surface of the preliminary finished concrete roughened by stiff brushes before it has reached its final set.

D. Floated Finish. Where float finish is indicated as final finish, the surface of the concrete shall be given a floated finish with wood, fiberglass, cork, or other approved material base floats.

E. Trowelled Finish. For floors and surfaces indicated to receive a trowelled finish, the surface shall first be given a floated finish as specified above. Final trowelling shall be done with a steel trowel. The finished surface shall be smooth, dense, free of all trowel marks and shall be uniform in texture and appearance.

F. Broom or Belt Finish. Surfaces and slabs so indicated shall be given a coarse transverse scored texture by drawing a broom or burlap belt across a floated finish. Lines shall be parallel and at right angles to the direction of traffic unless indicated otherwise.

5-1.9.2 Finishing Formed Surfaces - After forms have been removed, all concrete which is not formed as shown on the plans, or which is out of alignment or level beyond required tolerances, or which shows a defective surface which cannot be properly repaired or patched, shall be removed. Honeycombed and other defective concrete shall be removed to sound concrete to a depth of not less than 1/2 inch and thoroughly cleaned. When required by the Engineer, epoxy or other adhesive shall be used. Concrete shall be kept damp for seven days. Unless otherwise specified, tie holes shall be cleaned and thoroughly dampened and filled solid with patching mortar. After removal of forms and correction of all surface defects, concrete surfaces shall be given one or more of the following specified finishes as indicated:

A. Ordinary Surface Finish. Ordinary surface finish shall be applied to all concrete surfaces, either as a final finish or preparatory to a higher class finish, except surfaces which are to be buried underground or surfaces which are enclosed such as manholes. Ordinary finish shall consist of removing all fins caused by form joints, and other projections, and rubbing all patched surfaces with a carborundum stone in order to obtain the same color in the mortar as in the surrounding concrete.

B. Smoothed Rubbed Finish. Smoothed rubbed finish shall be produced on green concrete and shall be completed not later than the day following removal of forms. Concrete surfaces shall be wetted and rubbed with carborundum, brick or other abrasive until a uniform color and texture are produced. No cement grout or slush shall be used other than the cement base drawn from the green concrete itself by the rubbing process.

5-1.10 Curing

5-1.10.1 General Curing - Curing shall conform to Section 90-7 of the State Standard Specification and these specifications. Freshly deposited concrete shall be protected from excessively hot or cold tempertures, and shall be maintained without drying for the period of time necessary for the hydration of cement and proper hardening of the concrete.

Steel forms heated by the sun and all wood forms in contact with the concrete during the curing period shall be kept wet. If forms are to be removed during the curing period, one of the following curing materials or methods shall be employed immediately on all exposed concrete surfaces.

5-1.10.2 Methods of Curing - Subject to approval of the Engineer, concrete shall be cured by one of the methods specified below as the Contractor may propose for a minimum period of seven days after the concrete has been placed.

A. Ponding.

B. Continuous sprinkling with a nozzle which, during the first 24 hours, so atomizes the flow that a mist and not a spray is formed. The moisture shall be be applied under pressure directly upon the concrete and shall not be allowed to flow or wash the surface while it is susceptible to erosion.

C. By covering the entire surface of the concrete with a blanket of earth, sand, sawdust, or other nonstaining material not less than two inches in thickness and keeping it continuously wet.

D. By covering the entire surface of the concrete with an absorptive mat or fabric laid directly upon the concrete and kept continuously wet.

E. By sprinkling as in "B" above for at least 16 hours and then immediately covering the concrete surface with waterproof cover approved by the Engineer.

F. By covering the entire surface of newly placed concrete sprayed uniformly with a curing compound while the surface is still moist.

If the finishing processes have not been completed prior to the loss of a visible film or water from the pavement surface, additional water shall be applied by means of a nozzle that so atomizes the flow that a mist and not a spray is formed. The surface shall be maintained with a visible film of water until just prior to the application of the compound.

The curing compound type and application shall conform to Section 90-7.01B of the State Specifications.

5-1.11 Pumping of Concrete - This work shall consist of pumping concrete according to good construction practice. No separate payment will be made for pumping concrete.

5-1.12 Portland Cement Concrete

5-1.12.1 General - Concrete consisting of portland cement, concrete aggregate, sand and water will be designated by a symbol consisting of a number, a letter and a number. The concrete shall be 564-B-3000 unless otherwise specified. The first number will be the weight of cement in pounds per cubic yard; the letter, the grading of the aggregate and the last number, the compressive strength at 28 days. The compressive strength test shall be performed in accordance with ASTM C39. Comparisons are based on 94 lb. sack wt.

5-1.12.2 Concrete Specified by Class - The concrete class and maximum slump for the various types of construction shall be as designated in the following table unless otherwise specified. The exact proportions of aggregates and water to be used in the concrete will be determined by the Engineer from tests of the material to be used.

CONCRETE CLASS USE TABLE

Construction	Concrete Class	Maximum Slump (Inches)
Street Surface Improvements		
Concrete Pavement (not integral with curb)	520-A-2500	3
Curb, Integral Curb and Pavement, Gutter, Walk, Alley Aprons	520-C-2500	4
Extruded Curb, Curb & Gutter	520-C-2500	1-1/2
	520-D-2500	1-1/2
Sewer and Storm Drainage Facilities		
Pipe Collars, Beam Support for Pipe, Pre-Cast Manhole Components, Catch Basins, Sidewalk Culverts	560-C-3250* **	5
Sidehill Surface Drainage Facilities	500-C-2500	3
Pipe Bedding and Encasement,* Anchors and Thrust Blocks, Wall support for Pipe	420-C-2000* **	4
Tunnel Backfill	480-C-2000	5
Trench Backfill Slurry	100-E-100	5
Reinforced Structures		
Bridges, Buildings, Retaining Walls	560-C-3250* **	4
Cast-in-place Piles	560-C-3250* **	4
Channels and Boxes		
Invert	560-B-3250	4
Walls and Deck	560-C-3250	5
Miscellaneous		
Street Light and Traffic Signal Foundations, Survey Monuments	560-C-3250	4
Fence and Guardrail Post Foundations	500-C-2500	5
Concrete not Otherwise Specified	560-C-3250	5
Air Placed Concrete, Method B	600-E-3250	4

* Use limited to bedding concrete over which backfill will be placed not less than 40 hours after placement. For backfill after 24 hours, add 3 pints of calcium chloride. For backfill after 16 hours and removal of sheeting after 18 hours, use 660-C-3750 with 3 pints calcium chloride solution.

** Use B Aggregate gradation when placing conditions permit.

5-1.12.3 Concrete Specified by Compressive Strength - When so specified, the Contractor shall determine the mix proportions of concrete specified on the plans by its 28 day compressive strength within the minimum cement, maximum size coarse aggregate, and admixture limitations designated herein or in the Special Provisions. The concrete shall contain not less than 560 pounds of cement per cubic yard.

The placing of concrete specified by compressive strength shall not begin until the mix design has qualified in accordance with the aforesaid test criteria. Should the source of materials or established procedures change, new trial batches may be required.

5-1.12.4 Test for Portland Cement Concrete - Portland cement concrete shall be sampled and bested in accordance with the following ASTM and California Test Methods:

(1)	Sampling Fresh Concrete	C 172
(2)	Obtaining Drilled Cores	C 42
(3)	Molding and Curing Specimens	C 31
(4)	Compressive Strength	C 39
(5)	Flexural Strength	C 78
(6)	Slump	C 143
(7)	Air Content	C 173 or C 231
(8)	Unit Weight Yield	C 138
(9)	Setting of Mortar	C 191 or C 266
(10)	Mortar Cube Test	Calif. No. 515
(11)	Drying Shrinkage (with admixture)	Calif. No. 530

A compressive strength test shall consist of the average strength of 2 cylinders fabricated from a single load of concrete except that, if any cylinder should show evidence of improper handling, molding, or testing, said cylinder shall be discarded and the strength test shall consist of the strength of the remaining cylinder.

The frequency of sampling will be determined by the Engineer. The Contractor shall afford the Engineer all reasonable access, without charge, for the procurement of samples of fresh concrete at time of placement.

Concrete specified by class shall attain the minimum 28-day strength designated.

Concrete specified by compressive strength shall attain the following 28-day strength: The average of any 3 consecutive strength tests shall be equal to or greater than the specified 28-day strength. Not more than 10 percent of the tests shall be less than specified 28-day strength. No test shall be less than 85 percent of the specified 28-day strength.

5-1.12.5 Portland Cement - All cement to be used or furnished shall be Type II, portland cement, conforming to ASTM C150 unless otherwise specified. The Contractor shall furnish a certificate of compliance signed by the manufacturer identifying the cement and stating that the cement delivered complies with ASTM C150. The cost of furnishing certified material shall be considered as included in the contract bid price.

Whenever suitable facilities, approved by the Engineer, are available for handling and weighing bulk cement, such facilities shall be used. Otherwise the cement shall be

delivered in original unopened sacks that have been filled by the manufacturer. They shall be plainly marked with the manufacturer's name or brand and cement type.

Cement shall be stored in such a manner as to permit ready access for the purpose of inspection and sampling, and suitably protected against contamination or moisture. Should any cement delivered show evidence of contamination, or be otherwise unsuitable, it shall be removed from the site.

All portland cement used in concrete for any individual structure shall be of the same brand and type unless otherwise approved by the Engineer.

Low alkali cement shall conform to the requirements for portland cement as specified in ASTM C150; and, in addition, shall contain not more than 0.60 percent by weight of total alkali calculated as sodium oxide, including all sodium oxide plus 0.658 of all potassium oxide.

Admixtures may be ordered or approved by the Engineer.

5-1.12.6 Aggregate - Aggregates shall be sand and concrete aggregates conforming to the State of California Standard Specifications Section 90 and shall be approved by the Engineer prior to use. They shall meet the grading requirements of this subsection.

Methods of handling materials resulting in segregation, degradation or combining of materials which results in any stockpile failing to meet specifications, shall not be permitted.

Aggregates which are found to have a silica-released to alkali-reduced ratio greater than one, when tested in accordance with ASTM C289, may be used only when approved by the Engineer and provided low-alkali cement is used. No additional allowance will be made for the use of low-alkali cement.

5-1.12.7 Combined Aggregate Gradings - The combined aggregates shall conform to the gradings specified in the following table:

Sieve Size	Grading A	Grading B	Grading C	Grading D	Grading E
2"	100	100			
1-1/2"	95-100	95-100	100		
1"	64-80	80-96	95-100		
3/4"	55-71	64-80	77-93	100	100
3/8"	37-53	40-52	50-70	92-100	90-100
#4	32-42	35-45	39-51	42-60	60-80
#8	25-35	28-38	31-41	33-47	50-70
#16	18-28	21-31	22-32	22-38	33-53
#30	10-18	10-20	12-22	17-25	19-35
#50	3-9	3-9	3-9	6-12	5-15
#100	0-3	0-3	0-3	1-5	2-6
#200	0-2	0-2	0-2	0-2	0-2

5-1.12.8 Water - Water used for concrete shall be clear and free from oil, vegetable matter and other deleterious substances. Water shall not contain an amount of impurities that will cause a change in the time of setting of portland cement of more than 25 percent nor a reduction in the compressive strength of mortar at fourteen days of more than 5 percent compared to results obtained with distilled water.

In conventionally reinforced concrete work, water shall not contain more than 1,000 ppm of chlorides calculated as Cl, nor more than 1,000 ppm of sulfates calculated as SO_4.

In prestressed concrete work, water shall not contain more than 650 ppm of chlorides calculated as Cl, nor more than 800 ppm of sulfates calculated as SO_4. In non-reinforced concrete work, water shall not contain more than 2,000 ppm of chlorides calculated as Cl, nor more than 1,500 ppm of sulfates calculated as SO_4.

The amount of water added at the mixer shall be regulated to take into account the free water in the aggregates. Free water is defined as the total water minus the water absorbed by the aggregate in a saturated surface-dry condition.

The amount of water used in the mixture shall not exceed the amount necessary to permit practical placement and consolidation of the concrete. Total free water in the mixture shall not exceed an amount producing the maximum slump specified and shall not exceed amounts shown in the following table:

MAXIMUM FREE WATER

Aggregate Grading	POUNDS PER CUBIC YARD OF CONCRETE Slump in Inches				
	1	2	3	4	5
A	270	280	290	300	310
B	275	285	295	305	315
C	290	300	310	320	330
D	320	335	350	365	375
E	335	350	365	380	395

When adverse or difficult conditions affect the placement of concrete, the Engineer may authorize a greater slump to be used, provided the cement is increased. Water shall be added at a ratio not to exceed 32 pounds per 100 lbs. of added cement per cubic yard of concrete, and such additional water and cement shall be at the Contractor's expense.

5-1.12.9 Admixtures - No admixture of any type shall be used unless authorized or ordered by the Engineer. When an admixture is permitted or specified, it shall be measured accurately into each batch or load in a form and by a device and method approved by the Engineer.

When an air-entraining agent is used it will be limited to the extent that the amount of entrained air by volume shall not exceed six percent, and the mix shall be designed to adjust the yield.

Admixtures to be used in grouting ducts in prestressed units shall not contain ions in excess of 0.25 percent by weight of admixtures and may be dispensed in a solid form when approved by the Engineer.

When calcium chloride is permitted or required to accelerate the setting time and to reduce the time necessary for the concrete to reach its specified strength, it shall conform to ASTM D98. The calcium chloride solution shall contain not more than 32 percent of anhydrous calcium chloride and the hydrogen ion concentration (pH) shall not be more than 8.0 nor less than 4.0. Calcium chloride solution shall be used at the rate of not more than four pints per hundred pounds of cement.

Patented accelerators, when permitted, shall be used strictly in accordance with the manufacturer's specifications.

Additional cement may be permitted in lieu of calcium chloride or patented accelerators to obtain high early strength in concrete. Unless otherwise approved by the Engineer, additional cement shall be measured into each batch at the rate of 140 pounds of cement per cubic yard of concrete.

Subject to approval of the Engineer, Type III cement (High Early Strength) may be used in lieu of Type II cement in the same batch quantities specified for Type II cement.

When used by the Contractor for his own convenience, the Contractor shall bear the full cost of admixtures, additional cement or substitution of cement type. When ordered by the Engineer payment for such admixtures and additional cement will be made by the City as provided in the section Scope of Work - Changes in Work of the General Provisions.

5-1.12.10 Proportioning - Aggregates and cement shall be proportioned by weight, except when authorized by the Engineer and when the amount of concrete required for any one contract is five cubic yards or less, the materials may be measured by volume. Materials that are proportioned by volume shall be measured in containers of known capacity.

Proportioning shall consist of combining the aggregaates (each stored in a separate bin in the various gradations) with cement and water. Weight hoppers shall be charged from bins located directly over them or from conveyor belts. When conveyor belts are used, there shall be a separate belt for each size aggregate. There shall be an approved moisture meter installed to indicate the moisture in the sand.

Bulk cement shall be weighed in an individual hopper and shall be kept separate from the aggregates until the ingredients are released for discharge. The cement hopper shall be attached to a separate scale for individual weighing.

The amount of water to be added to the mixture shall be measured and discharged rapidly into the mixing drum through a valve with a positive cut-off. When water is measured by weight it shall be weighed on a separate scale.

All weighing or metering devices, except moisture meters, used for proportioning materials shall be accurate to within one percent. They shall be sealed and certified by the County Sealer of Weights and Measures. These certifications shall be dated within the

past twelve months and shall be renewed whenever required by the Engineer. The moisture meter shall be accurate to within one-half of one percent moisture. Whenever portable bunkers are set up at a new location, the scale assemblies shall be inspected and certified regardless of the date the scales were last tested.

Scales utilized in proportioning shall be either springless dial or multiple beam type. Scale graduations shall be no greater than the following:

Aggregate Scales	25 pounds
Cement Scales	5 pounds
Water Scales	5 pounds

All scales shall be of such size and so arranged that they may be read easily from the operator's platform. If a multiple beam type scale is used, the scale shall be provided with an indicator operated by the main beam which will give positive visible evidence of over or under weight. The indicator shall be so designed that it will operate during the addition of the last 400 pounds of any weighing. The over travel of the indicator hand shall be at least one-third of the loading travel. Indicators shall be enclosed against moisture and dust.

Weighing equipment shall be insulated against vibration and movement of other operating equipment in the plant. When the entire plant is running, the scale reading at cut-off shall not vary from the weight designated by more than one percent for cement, one percent for water, one and one-half percent for any size of aggregate, nor one percent for the total aggregate in any batch.

5-1.13 Measurement and Payment

5-1.13.1 Measurement - Except as otherwise provided by the Proposal or Special Provisions, minor concrete structures shall be measured by actual count of each such structure completed. Minor concrete structures are enumerated in subsection 5-1.2, "Minor Structures," hereinbefore. All other concrete structures shall be measured by the cubic yard in accordance with the dimensions shown on the plans or as specified in the Special Provisions.

5-1.13.2 Payment - The price paid for concrete structures shall include full compensation for furnishing all labor, materials, tools, equipment, supplies, formwork, incidentals, and for doing all work involved in constructing, curing and finishing, all structure excavation and backfill and for furnishing and placing all reinforcing steel, metal frames, grates, cover, miscellaneous metal and steps necessary to construct the structures, complete in place, as indicated, and no separate payment will be made for these included items.

Full compensation for furnishing and placing expansion joint filler preformed compression joint seals, construction joints, water stops, coatings, saw cutting and other appurtenant work shall be considered as included in the prices paid for the various items of concrete work and no additional compensation will be allowed therefor.

5-2 Reinforcement

5-2.1 General - This work shall include the furnishing and placing of reinforcement of the shape and dimensions shown on the plans, and as specified.

5-2.2 Materials - Reinforcement for concrete shall conform to Section 52 of the State Standard Specifications.

A. Cleaning. Before concrete is placed, the reinforcement to be embedded shall be free of mortar, oil, dirt, paint, loose mill scale and loose rust, and other coatings of any character which would destroy or reduce the bond.

B. Fabricating. Bars shall not be bent or straightened in a manner which will injure the material. Bars with kinks or improper bends shall not be used. Hooks shall conform to the "ACI Manual of Standard Practice for Detailing Reinforced Concrete Structures" (ACI315).

5-2.3 Placing

A. Reinforcing Bars. The minimum spacing, center to center, of parallel bars should be two and one-half times the diameter of round bars, but in no case shall the clear distance between the bars be less than one and one-half times the maximum size of the coarse aggregate.

B. Positioning. Bars shall be securely held in position by wiring at intersections with No. 14 or No. 16 gauge wire and by the use of precast mortar blocks or metal chairs, spacers, metal hangers, supporting wires, or other approved devices of sufficient strength to resist crushing or displacement under full load. Metal supports which extend to the surface of the concrete shall not be used without the approval of the Engineer. Tack welding on reinforcing bar will not be permitted.

C. Clearnces. The clear coverage of reinforcement measured from the surface of the concrete to the near surface of the bar shall be as shown on the plans.

D. Welded Wire Mesh. Mesh reinforcement shall be rolled flat before placing concrete, unless otherwise shown on the plans. Mesh reinforcement shall be held firmly in place against vertical or transverse movement by means of devices satisfactory to the Engineer and may be adjusted during concrete pouring.

E. Splicing. Splicing of bar reinforcing steel shall be either by lapping or by butt welding at the option of the Contractor subject to approval of the Engineer. The required distance to the surface of the concrete shall not be impaired. Bar reinforcing steel may be continuous at locations where splices are shown on the plans.

F. Splice Location. The location of splices, when not shown on the plans, shall be determined by the Contractor, based upon using available commercial lengths where practicable. Splices at points of maximum stress shall not be allowed.

G. Lap Splices. The length of laps for deformed bars shall be in accordance with Section 52-1.08A of the State Specifications. Spiral reinforcement shall be spliced, either by lapping at least 80 diameters for deformed bars, or 120 diameters for plain bars. Splices shall be staggered at least 30 bar diameters and not more than one-third of the bars may be spliced at one location.

H. Butt Splices. When splices by butt welding are required or allowed by the Engineer, a joint efficiency of one hundred percent shall be obtained. The bars shall be preheated and then welded, using low-hydrogen electrodes. Welding operators shall be prequalified and procedures shall be in accordance with Test Method No. Calif. 601.

I. Wire Mesh. Where splicing is required, wire mesh shall be lapped at least one full mesh overlap.

J. Inspection. No concrete shall be deposited until the Engineer has inspected the placement of the reinforcing steel and given permission to place concrete. Any concrete placed prior to inspection of reinforcing steel is subject to rejection and removal at Contractor's cost.

5-2.4 Measurement - Reinforcement

5-2.4.1 Reinforcing Steel Bar - Reinforcing steel shall be included in the price for the structure or item requiring such steel unless otherwise indicated in the bid item or Special Provisions. If separate measurement is indicated in the bid proposal, quantities of bar reinforcing steel will be measured by the pound. The weight for which payment will be made will be based upon the calculated weights of the reinforcing steel placed in accordance with the specifications.

The estimated quantity shown on the proposal form shall be the final quantities for which payment will be made, unless the dimensions of the work as shown on the plans are revised by the Engineer. If the dimensions of the work in which the reinforcement is measured separately are revised, and said revisions result in an increase or decrease in the quantity of bar reinforcement, the final quantities for payment will be revised in the amount represented by the change in dimensions.

5-2.4.2 Welded Wire Mesh Reinforcement - Quantities of welded wire mesh place as specified will not be measured separately unless a bid item is provided therefor.

5-2.5 Payment - Reinforcement - Unless otherwise specified in the bid proposal, no separate payment will be made for reinforcing steel bar and welded wire mesh and costs for such are included in other bid items requiring such reinforcing.

When separate payment is provided for as a bid item for reinforcing steel bar or welded wire mesh, the price paid for reinforcing steel bar and welded wire mesh shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and placing such reinforcing complete in place, as specified.

5-3 Air Blown Mortar

5-3.1 General - This work shall consists of lining ditches and channels, paving slopes, and other similar features as specified in Section 53, "Air Blown Mortar", of the State Standard Specifications. The work shall conform to said Section 53.

5-3.2 Measurement - Air Blown Mortar - Quantities of air-blown mortar will be measured by the cubic yard computed from measurements, along the slope, of actual areas placed and the theoretical thickness shown on the plans or as otherwise specified in the Special Provisions. No additional compensation will be allowed for additional mortar placed by reason of low foundation.

Full compensation for joint filling material, if required by the plans, will be considered as included in the item of air-blown mortar involved and no separate measurement or payment will be made for such work.

5-3.3 Payment - Air Blown Mortar - The contract unit price paid for air-blown mortar shall include full compensation for furnishing all labor, materials, tools, mortar, including preparing the foundation, reinforcement, and structure backfill, as shown on the plans, as specified in these Specifications and the Special Provisions, and as directed by the Engineer.

5-4 Masonry Construction

5-4.1 Concrete Block Masonry

5-4.1.1 General - All materials for concrete block masonry shall conform to the requirements herein.

5-4.1.2 Materials

5-4.1.2.1 Masonry Units - Masonry units shall be made with sand-gravel aggregate and shall conform to ASTM C90 for Grade N-1 units. The net size of units shall be as indicated on the plans. Unless otherwise specified all units shall be of the normal weight classification (oven-dry weight of concrete 125 lb/ft^3 or more). Lightweight aggregates for use in concrete masonry units shall be manufactured from expanded clay, expanded shale, scoria, pumice or a combination thereof, and shall conform to ASTM C331.

5-4.1.2.2 Mortar, Grout and Water

A. Mortar. Mortar used in concrete block construction shall be Class "D" or "E" as specified herein to which 1/4 to 1/2 part hydrated lime or lime putty has been added.

Designation	Proportions
Class "A" mortar	1 part cement to 1 part sand
Class "B" mortar	1 part cement to 1-1/2 parts sand
Class "C" mortar	1 part cement to 2 parts sand
Class "D" mortar	1 part cement to 2-1/2 parts sand
Class "E" mortar	1 part cement to 3 parts sand
Class "F" mortar	1 part cement to 3-1/2 parts sand

B. Grout. For use in spaces less than 4 inches clear in any dimension, grout proportioned by volume shall be 1 part portland cement and 2-1/4 to 3 parts sand. For spaces 4 inches or larger in all horizontal directions, grout shall be 1 part portland cement, 2 to 3 parts sand and 1-1/4 to 2 parts No. 4 concrete aggregate.

5-4.1.3 Construction - All work shall be performed in a workmanlike manner and in full compliance with the applicable building ordinances.

All masonry walls shall be laid true, level, and plumb in accordance with the plans.

Masonry units shall be cured, dry, and surfaces shall be clean when laid in the walls.

During construction, all partially laid walls as well as units in storage shall be protected from moisture. All concrete block units and any partially laid walls which become wet during the construction shall be permitted to dry for at least one week, or longer if required by weather conditions, before recommencing work.

Proper masonry units shall be used to provide for all windows, doors, bond beams, lintels, pilasters, etc. with a minimum of unit cutting. Where masonry unit cutting is necessary, all cuts shall be neat and regular and edges exposed in the finished work shall be cut with a power driven abrasive saw.

Where no bond pattern is shown, the wall shall be laid up in straight uniform course with regular running bond with alternate header joints in vertical alignment.

Intersecting masonry walls and partitions shall be bonded by the use of 1/4 inch minimum diameter steel ties at 24 inches on centers (maximum).

Where stack bond is indicated on the plans, approved metal ties shall be provided horizontally at 24 inches on centers (maximum).

Mortar joints shall be straight, clean, and uniform in thickness. Unless otherwise specified or detailed on the plans, horizontal and vertical joints shall be approximately 3/8-inch thick with full mortar coverge on the face shells and on the webs surrounding cells to be filled. Units shall be laid with "push joints". No slushing or grouting of a joint will be permitted, nor shall a joint be made by working in mortar after the units have been laid.

Exposed walls shall have joints tooled with a round or V-shaped bar to produce a dense, slightly concave surface well bonded to the block at the edges. Tooling shall be done when the mortar is partially set but still sufficiently plastic to bond. All tooling shall be done with a tool which compacts the mortar, pressing the excess mortar out of the joint rather than dragging it out.

If it is necessary to move a block so as to open a joint, the block shall be removed from the wall, cleaned, and set in fresh mortar.

5-4.1.3.1 Placing Reinforcing Steel - Reinforcing steel shall be placed as indicated on the plans. Splices shall be lapped a minimum of 40 diameters, except that dowels other than column dowels need be lapped only 30 diameters. Column dowels shall lap 50 diameters.

Outside horizontal steel shall lap around corners 40 diameters and be carried through columns unless otherwise shown on the plans. Inside horizontal steel shall extend as far as possible and bend into corner core. A dowel shall be provided in the foundation for each vertical bar.

Where horizontal courses are to be filled, metal stops shall be used. Use of paper stops will not be permitted. All horizontal reinforcing steel shall be laid in a course of bond beam blocks filled with grout.

Vertical cores containing steel shall be filled solid with grout, and thorougly rodded.

Where knockout blocks are used, steel shall be erected and wired in place before three courses have been laid. Vertical cores at steel locations shall be filled as construction progresses.

Where knockout blocks are not used, vertical cores at steel locations shall be filled in lifts of not more than 4 feet. The maximum height of pour shall be 8 feet. Cores shall be cleaned of debris and mortar and shall have reinforcing steel held straight and in place. If ordered by the Engineer, inspection and cleanout holes shall be provided at the bottom of each core to be filled.

Reinforcing steel shall be inspected prior to placing grout.

5-4.1.3.2 Protection and Curing - During construction operations all adjoining work shall be protected from mortar droppings. Concrete block masonry shall be protected from the sun and rain. When approved in advance by the Engineer, completed masonry construction may be protected with a curing compound. Except in hot weather when it may be fog-sprayed sufficient to dampen the surface, finshed concrete block masonry shall not be wetted.

5-4.2 Brick Masonry

5-4.2.1 Materials - Unless otherwise specified, brick masonry shall be constructed of Grade MW brick and cement mortar.

5-4.2.2 Bricklaying - Brick shall be clean, wetted immediately before laying, and shall be laid on a full mortar bed with "push joints". In no event will slushing or grouting of a joint be permitted, nor shall a joint be made by working-in mortar after the brick has been laid. Joints between courses of bricks shall be of a uniform thickness of 3/8 inch as nearly as possible. Joints on surfaces which are not to be plastered, or on any surface that will be exposed upon completion of the work, shall be neatly struck and new work is to be joined to the existing or unfinished work, the contact surfaces of the latter shall first be properly cleaned and moistened.

Brickwork shall not be constructed upon a concrete foundation until at least 24 hours after such foundation has been placed. No brick shall be laid in water nor shall water be permitted to stand or run on any brickwork until the mortar has thoroughly set.

5-4.2.3 Protection and Curing - During construction operations, all adjoining work shall be protected from mortar droppings. Brickwork shall be protected from the sun and rain.

Except in hot weather when it may be fog-sprayed sufficient to dampen the surface, finished brick masonry shall not be wetted.

5-4.3 Measurement and Payment - Masonry Construction - Masonry and brick construction, unless otherwise specified in the Special Provisions, shall be considered as part of the structure or item for which it is appurtenant to and no separate measurement or payment will be made therefor.

5-5 Concrete Curb, Gutter and Sidewalks

5-5.1 General - This work shall consist of construction of curbs, gutters, valley gutters, sidewalks, wheel chair ramps, driveway sections and driveway aprons as shown on the plans and as specified. Concrete shall be as specified and shall have at least 560 pounds of cement per cubic yard with a compressive strength of at least 2,500 psi. Lampblack shall be of approved quality mixed at a rate of one pound per cubic yard of concrete. Unless otherwise specified herein or on the plans, all such work shall be in conformance with Section 73, "Concrete Curbs and Sidewalks," and 90-10, "Minor Concrete," of the State Specifications.

5-5.2 Subgrade and Base Preparation - The subgrade and base preparation shall be constructed according to the plans and specifications.

The subgrade, including any base material, shall be thoroughly compacted by an approved mechanical device to not less than ninety percent (90%) relative compaction as determined by Test Method No. Calif. 216 or 231 before placing the concrete. Where expansive soils exist the minimum relative compaction may be reduced to 85 percent upon approval of the Engineer. In such areas the maximum relative compaction shall not exceed 92 percent.

Material under the curbs and valley gutters shall not be displaced when the roadway section is excavated.

5-5.3 Existing Curbs and Sidewalks - Where the plans provide for the reconstruction of an existing curb and sidewalk, the existing section shall be cut to a minimum depth of two inches (2") with an abrasive type saw at the first scoring line at or beyond the point of connection and the entire section to be reconstructed shall be removed. The new curb and sidewalk shall join the old work at this line.

5-5.4 Forms - In lieu of the provisions in Section 73-1.04, "Forms," of the Standards, surfaced lumber of nominal dimension may be used for forming the back of the curb and the front face of the gutter, provided the completed curb and gutter are constructed to the full concrete dimensions shown on the Contract Plans.

Forms shall be carefully set to alignment and grade and shall conform to the required dimensions. Forms shall be held rigidly in place by stakes. Clamps, spreaders and braces shall be used where required to insure rigidity in the forms.

When grades are less than 0.4 percent, the Contractor shall set form stakes at a minimum of 25 foot intervals.

Benders or a thin plank form or other material may be used on curves, grade changes or for curb returns. They shall be of sufficient strength to prevent any deformation in the forms when placing concrete.

5-5.5 Placing Concrete - Forms previously used shall be thoroughly cleaned of all dirt, mortar and foreign matter before being reused. Before concrete is placed within the forms, all inside surfaces of the forms shall be thoroughly coated with an approved form oil.

Concrete shall be placed on finished subgrade sufficiently dampened to insure that no moisture will be absorbed from the fresh concrete. Concrete shall be placed and consolidated in forms without segregation. Where expansive clay soils exist the subgrade shall be thoroughly wet just prior to placing concrete.

After the concrete for walk has been placed, a strike-off shall be used to bring the surface to the proper elevation when compacted. It shall be spaced along the form faces and tamped to assure a dense and compact mass, and to force the larger aggregate down while bringing to the surface not less and three-eights inch (3/8") of free mortar for finishing purposes.

The forms on the face of curbs shall not be removed while the concrete is sufficiently plastic to slump.

5-5.6 Finishing Concrete - Prior to the removal of the forms, the surface shall be finished true to grade by means of a straightedge float, not less than ten feet (10') in length, operated over the surface of the concrete. Form clamps shall be so constructed as not to interfere with the operation of this float. The finished surface shall then be troweled smooth with a steel trowel and given a firm brush finish.

Brush finish shall be parallel to the length of curb and gutter and transverse to the direction of travel on sidewalks and valley gutters. All exposed edges shall be tooled with a one-half inch (1/2") radius tool.

The finished surface shall be true and straight, and shall be of uniform width, free from humps, sags, or other irregularities. When a straightedge ten feet (10') long is laid on the surface, the surface shall not vary more than 0.01 foot from the edge of the strightedge, except at changes or curves where surface shall not vary more than .01 foot from design geometry.

Where gutter grades are less than one percent (1%), the Contractor shall water test the gutters for low spots. Any depressions shall be corrected prior to asphalt concrete paving.

The Contractor shall stamp an appropriate 2 inch symbol S, W or C in the top of curb at all locations where sanitary sewer, water or conduit crosses under curbs.

Scorelines, weakened plane joints, expansion joints and other details shall conform to the applicable provisions of Section 73 of the State Specifications and City Standard Plans.

5-5.7 Curing - The entire exposed area of the concrete shall be cured with curing compound as specified in Section 90-7 of the State Specifications.

5-5.8 Extruded Curbs, Gutters and Sidewalks - Any curb and gutter, except on structures, may be placed by extrusion machine, upon approval of the City Engineer of the method, workmanship and type of extrusion machine.

Slip form equipment shall be provided with traveling side and top forms of suitable dimensions, shapes and strength to support the concrete for a sufficient length of time during placement to produce curb, gutter and sidewalk of the required cross section. The equipment shall spread, consolidate and screed the freshly placed concrete in such a manner as to provide a dense and homogeneous product. Work and materials shall conform to the provisions of Seciton 73-1.06 of the State Specifications.

5-5.9 Backfill Behind Curbs - Unless otherwise specified, the planter area in medians and between the back of curb and the front of sidewalk shall be compacted to a relative compaction of not less than 85% as determined by Test Method No. Calif. 216. The material may be selected from the excavation and shall be free of lumps and debris greater than one inch (1") and shall be cohesive.

5-5.10 Imperfect or Damaged Work - The Contractor shall replace or repair and clean all concrete damaged or discolored during construction. Concrete may be cleaned by an abrasive blast cleaner. Where curb, gutter or sidewalk requires repairs before acceptance, the repairs shall be made by saw cut removing and replacing the entire portion between weakened plane joints or score marks and not by refinishing the damaged portion.

5-5.11 Measurement - Curbs, Gutters and Sidewalks - Unless otherwise provided, quantities of curbs and gutter will be measured by the linear foot along the back of the curb. Quantities of sidewalks, wheel chair ramps, driveways and valley gutters will be measured by the square foot of surface constructed as shown and specified.

5-5.12 Payment - Curbs, Gutters and Sidewalks - Unless otherwise provided, quantities of curbs and gutter shall be paid for at the contract price per linear foot. Quantities of sidewalks, wheel chair ramps, driveways and valley guters shall be paid for at the contract price per square foot. The above prices shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals including subgrade preparation, excavation, resurfacing, and for doing all the work involved in constructing curbs and gutters, sidewalks, driveways and valley gutters, including reinforcement, curing, finishing and all other costs, complete and in place, as shown and specified and no additional compensation shall be allowed therefor.

PART 2

SECTION 6.
UNDERGROUND CONDUIT CONSTRUCTION

6-1 General - All utility lines shall be designed and constructed in accordance with the rules and regulations of serving utilities. All utilities shall be installed prior to placement of the wearing surface of the street. It shall be the responsibility of the Contractor to conform to these provisions.

All materials regardless of character and subsurface conditions shall be excavated to the depths indicated or specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins, or shall be separately stockpiled. All excavated materials not required or unsuitable for backfill shall be disposed of outside the Right of Way as specified in Section 7-1.13 of the State Specifications.

All surface openings shall be saw cut in accordance with the applicable provisions of Section 40-1.08 B(1) of the State Standards for both concrete and bituminous street and sidewalk surfaces.

Impact pavement breakers (drop hammers, stompers) are not permissible.

The requirements of Section 5-1.02A and 7-1.01J of said State Standards Concerning Trench Safety shall be complied with in addition to the requirements of Article 6 and Section 1503 of the State of California Construction Safety Orders.

Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled if the pipe, cable, or duct can be safely and properly installed, and backfill can be properly tamped in such tunnel sections.

All broken concrete, pavement, base and other material and unsuitable and surplus excavated material shall be removed, hauled off the site and disposed of by the Contractor at a location obtained by the Contractor and approved by the Engineer all at no additional cost to the City; said costs and fees shall be considered as included in the prices bid.

6-1.1 Bridges - Foot bridges of approved construction not less than 4 feet in width, and provided with hand rails and supports of dressed lumber, shall be installed over trenches at all crosswalk intersections, and at such other points where traffic conditions make it advisable. Substantially constructed bridges, adequate for handling all vehicular traffic, shall be installed over any trench or other excavation in a street intersection, whenever such excavation is in excess of half the width of the street crossing. Adequate bridges shall be provided to make possible the safe and full use of all driveways or roadways used to move vehicles from the public street onto private property. All bridges required to be installed shall be maintained in place as long as the condition of the work requires their use for the safety and convenience of the public. Removal or relocation of bridges shall be at the Contractor's own discretion and risk.

6-1.2 Protection of Other Property - Excavation and other work under or adjacent to existing pipe lines, cables, conduit runs or structures of any kind, shall be prosecuted in such a manner as not to interfere with the safe operation and use of such installations. Should any damage be incurred to existing facilities during the Contractor's operations, the Contractor shall immediately notify the proper owners or authorities, and shall arrange for the immediate repair of same at the Contractor's own expense.

Excavations for apputenant structures, such as but not limited to manholes, transition structures, junction structures, vaults, valve boxes, catch basins, thrust blocks, and boring pits shall, for the purpose of shoring and bracing, be deemed to be in the category of trench excavation.

Excavation shall include the removal of all water and materials of any nature which interfere with the construction work. Removal of ground water to a level below the structure subgrade will be necessary unless specified otherwise.

Excavation for conduits shall be by open trench, unless otherwise specified or shown on the plans. However, should the Contractor elect to tunnel or jack any portion not so specified, he shall first obtain approval from the Engineer. Payment for such work will be made as though the specified methods of construction has been used.

Trenching, tunneling, boring and jacking shall comply with the applicable provisions of the State Standard Specifications, these specifications and the plans. All work shall comply with the applicable Federal, State and local laws, regulations, codes and ordinances, and in addition, shall meet the respective utility agencies' requirements for joint trench construction for installation of conduits, including, but not limited to, safety, depth, size, type, connection and other regulations and shall be considered as included in the various contract items of work and no additional compensation shall be made therefor.

6-2 Maximum and Minimum Trench Width - For pipe (except corrugated metal pipe), the minimum and maximum width of the trench permitted shall be as indicated on the plans or standard plans.

For corrugated metal pipe, the trench shall be at least sixteen inches (16") wider than the diameter of the pipe to be installed.

If the maximum trench width is exceeded, the Contractor shall provide additional bedding, another type of bedding, or a higher strength of pipe, as shown on the plans or approved by the Engineer, at no additional cost to the City.

6-2.1 Maximum Length of Open Trench - Except by permission of the Engineer, the maximum length of open trench where prefabricated pipe is used shall be the distance necessary to accommodate the amount of pipe installed in a single day. The distance is the collective length at any location, including open excavation, pipe laying and appurtenant construction and backfill which has not been temporarily resurfaced.

Except by permission of the Engineer, the maximum length of open trench in any one location where concrete structures are cast in place will be that which is necessary to permit uninterrupted progress.

6-2.2 Access to Trenches - Safe and suitable ladders which project two feet (2') above the top of the trench shall be provided over five feet (5') in depth. One ladder shall be provided for each one hundred feet (100') of open trench, or fraction thereof, and be so located that workers in the trench need not move more than fifty feet (50') to the ladder.

6-2.3 Bracing Excavations - The manner of bracing excavations shall be as set forth in the rules, orders and regulations of the Division of Industrial Safety of the State of California.

In conformance with the Labor Code, a detailed plan showing the design of shoring, bracing or sloping of all trenches five feet (5') deep or deeper, must be submitted and approved by CAL/OSHA prior to commencing any such trenching operations. If the submitted plan varies form the standards established by the State Construction Safety Orders, the plan shall be prepared by a Registered Civil or Structural Engineer.

6-2.4 Trench Excavation in Embankment Areas - Where pipe culverts are to be installed in new embankment, it shall first be constructed to the requried height as shown on the plans, and for a distance each side of the culvert location of not less than five (5) times the diameter of the culvert, after which the trench shall be excavated with sides as nearly vertical as soil conditions will permit and culvert installed.

6-2.5 Trench Excavation in Unsuitable Area - If soft, spongy, unstable or other similar material is encountered upon which the bedding material or pipe is to be placed, this unsuitable material shall be removed to a depth ordered by the Engineer and replaced with bedding material suitably densified. Additional bedding so ordered, over the amount required by the plans or specifications, will be paid for as provided in the Proposal or the Special Provisions. If the necessity for such additional bedding material has been caused by an act or failure to act on the part of the Contractor, or is required for the control of ground water, the Contractor shall bear the expense of the additional excavation and bedding.

6-3 Pipe Bedding - Bedding shall be defined as that material supporting, surrounding and extending to one foot above the top of the pipe. Where it becomes necessary to remove boulders or other interfering objects at subgrade for bedding, any void below such subgrade shall be filled with the bedding material designated on the plans. Where concrete is specified to cover the pipe, the top of the concrete shall be considered as the top of the bedding.

If soft, spongy, unstable, or other similar material is encountered upon which the bedding material or pipe is to be placed, this unsuitable material shall be removed to a depth ordered by the Engineer and replaced with bedding material suitably densified. Additional bedding so ordered over the amount required by the plans or specifications, will be paid for as provided in the Proposal or the Special Provisions. If the necessity for such addiitonal bedding material has been caused by an act or failure to act on the part of the Contractor, or is required for the control of ground water, the Contractor shall bear the expense of the additional excavation and bedding.

Bedding material shall first be placed so that the pipe is supported for the full length of the barrel with full bearing on the bottom segment of the pipe equal to a minimum of 0.4 times the outside diameter of the barrel. If the pipe is to be laid in a rock cut, there shall be at least 4 inches of bedding below the pipe. Then the remainder of the bedding shall be placed.

Unless the sheeting or shoring is to be cut off and left in place, densification of bedding for pipe shall be accomplished after the sheeting or shoring has been removed form the bedding zone. Alternate methods of pipe laying which are recommended by the pipe manufacturer may be used if approved by the Engineer.

6-4 Trench Bedding Material - Bedding material shall be Type 1 backfill except that bedding shall not contain material larger than 1-1/2" in greatest dimension. For PVC pipe, material shall not exceed 3/4" in greatest dimension.

Where excavated trench material is unsuitable for bedding, material meeting requirements of Type 2 backfill with largest dimension of 1-1/2" and 3/4" for PVC shall be used.

In cases where native free-draining granular material is suitable for use as bedding, the trench may be excavated to a point above the invert grade and the trench bottom hand-shaped so that the bottom segment of the pipe is firmly supported on undisturbed material.

Unless otherwise specified, special pipe bedding will not be required for steel, ductile or cast iron water pipe, and the trench bottom need not be shaped to the outside diameter of the pipe. However, the trench bottom shall provide firm and uniform bearing with bell poles.

The Engineer may require a concrete cradle or similar structure as pipe bedding and support or combination thereof as deemed necessary when ground conditions encountered in the trench bottom so warrant. Such special treatment for pipe bedding and/or support will be as specified in the Special Provisions or as determined by the Engineer.

Compaction of bedding material shall be by hand tamping, hand held mechanical vibrating equipment or other means approved by the Engineer. Compaction shall be not less than 90% as determined by test method No. California 216. In the case of bedding within the upper 3 feet of improved roadway surface, compaction shall be not less than 95%.

Bedding material shall be sufficiently moist to assure optimum compaction. Watering or drying shall be accomplished to facilitate this requirement.

Jetting or flooding will not be allowed except with authorization of the Engineer. Where conditions are suitable for this method, including the character of bedding material, the bedding shall be water densified by jetting prior to backfilling. The size and length of jet pipe, quantities of water, and jetting locations shall be sufficient to thoroughly saturate the bedding material around the pipe.

Conditions suitable for compaction using jetting methods require that except where otherwise specified, bedding material and adjacent trench soil shall be sand, gravel, crushed aggregate, native free-draining granular material having a sand equivalent of not less than 30 or having a coefficient of permeability greater than 0.001 centimeter per second, or other material approved by the Engineer.

6-5 Pipe Laying - Pipe will be carefully inspected in the field before and after laying. If any cause for rejection is discovered in a pipe after it has been laid, it shall be

subject to rejection. Any corrective work shall be approved by the Engineer and shall be at no cost to the City.

When connections are to be made to any existing pipe, conduit, or other appurtenances, the actual elevation or position of which cannot be determined without excavation, the Contractor shall excavate for, and expose, the existing improvement before laying any pipe or conduit. The Engineer shall be given the opportunity to inspect the existing pipe or conduit before connenction is made.

Any adjustments in line or grade of not more than 0.5 feet up or down which may be necessary to accomplish the intent of the plans shall be considered as included in the various contract items of work and no additional compensation will be made therefor.

Pipe shall be laid upgrade with the socket or collar ends of the pipe upgrade unless authorized by the Engineer.

Concrete pipe with elliptical reinforcement shall be laid with the minor axis of the reinforcement cage in a vertical position.

Corrugated metal pipes shall be laid with external laps of the circumferential seams toward the inlet end. Corrugated pipes shall be shipped and handled in such a manner as to prevent damage to protective coatings.

Installation of slotted corrugated steel pipe shall not be started until after paving of the traffic lanes adjacent to the pipe has been completed at the locations where the pipe is to be placed. The slot shall be covered with roofing paper or other approved covering during backfilling operations to prevent infiltration of material into the pipe.

Pipe shall be laid to plan line and grade, with uniform bearing under the full length of the barrel of the pipe. Suitable excavation shall be made to receive the socket or collar, which shall not bear upon the subgrade or bedding. Any pipe which is not in true alignment or shows any undue settlement after laying shall be taken up and relaid at the Contractor's expense.

Pipe sections shall be laid and joined in such a manner that the offset of the inside of the pipe at any joint will be held to a minimum at the invert. The maximum offset at the invert of pipe shall be 1 percent of the inside diameter of the pipe or 3/8 inch, whichever is smaller.

When pipe is laid in a sheeted trench, all sheeting against which concrete cradle is to be placed shall be faced with at least one thickness of building paper and the sheeting shall be withdrawn without displacing or damaging the cradle.

After the joints have been made, the pipe shall not be disturbed in any manner.

At the close of work each day, or whenever the work ceases for any reason, the end of the pipe shall be securely closed unless otherwise permitted by the Engineer.

All pipe shall be installed in accordance with the manufacture's recommendations. The Contractor shall furnish all tools, including without limitation, temporary blowoffs, test heads, joint swabbing balls and all other equipment or tools used during construction that do not become a part of the permanent facility.

Pipelines shall not be installed until the roadway subgrade is established to within one-quarter foot (0.25') of final grade, except with the approval of the Engineer.

The interior of the pipe shall be clean and free from foreign materials before sections of the pipe are connected. The open ends of the pipe shall be sealed with watertight plugs or other approved means at times when pipe laying is not in progress. Under no conditions shall ground water be allowed to enter the pipe.

Dropping or bumping of pipe will not be permitted. Care shall be exercised by the Contractor to prevent damage to the pipe during handling. There shall be no distortion or deflection of the pipe which might induce damage to the pipe, pipe lining, pipe coating or joints.

Pipe will be carefully inspected in the field before and after laying. In no event shall rejected pipe be installed. Any pipe failing to pass inspection after laying shall be subject to rejection. Any corrective work shall be approved by the Engineer and shall be at no cost to the City.

The Contractor shall provide a minimum of six inches vertical clearance between the pipe and proposed or existing facilities and improvements. A minimum of twelve inches (12") vertical clearance between the pipe and sanitary sewers, gas or petroleum linse and telephone cables shall be provided. Clearance for electrical conduits shall be as provided in the applicable General Safety Orders or utility regulations. Sanitary sewer and water lines shall be not closer than 10 feet horizontally and not in the same trench unless specifically shown or directed.

Requirements for pipe, joints, testing and other activities concerning the construction and installation of pipe shall be in conformance with the specifications, plans, and manufacturer's recommendations for the particular type, class and use of the pipe required. Any such installation not meeting requirements or tests shall be corrected or replaced at Contractor's cost until conformance is satisfied.

Thrust blocks. All pressure pipe, force mains, and, where required, other lines, shall be furnished with restraints and thrust blocks of a size sufficient to retain the pipes, under maximum rated and test pressures, at all levels, fittings and points of potential displacement.

Testing and inspection shall precede backfilling except as necessary to secure pipe line and appurtenances from displacement or movement including such resulting from test pressures or flow. Sterilization, where required, may be performed in conjunction with tests, if approved.

Water lines shall not be accepted or turned into service until bacteriological tests meet State Health and Safety Code requirements for water supplies.

6-6 Trench Backfill - General - Backfill is considered to be the material used to fill the portion of a trench between the pipe bedding and the roadbed or finish surface in non-roadway areas. Backfill shall be placed and consolidated in a manner which will permanently prevent damage to the roadbed, road surfacing and public or private property, and which will cause a minimum of interference with passage of traffic through the construction zone.

Trenches shall not be backfilled until all required pressure tests are performed and until the utilities systems as installed conform to the requirements specified in the several sections covering the installation of the various utilities.

Trenches shall be backfilled as specified with material that is suitable for the specified compaction. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted as specified, or the condition shall be otherwise corrected as directed. The meaning of DENSITY OF THE ADJACENT SOIL when the adjacent formation is rock shall be interpreted as maximum density in accordance with AASHO Designation T 180, Test Method "C".

In areas of high vehicular or pedestrian volumes, the Engineer may order the immediate removal of excavated material and that sidewalks and gutters be kept clean at all times.

Every precaution shall be taken against floating the pipe. In case of such floating, the Contractor shall replace the pipe to its proper location at his own expense, and replace any damaged pipe which may have resulted.

6-7 Backfill Materials Clasification

Type I Backfill - Material furnished for Type I backfill shall consist of any one or a mixture of the following materials:

(a) Broken stone or crushed gravel.

(b) Natural material having essentially the same qualities of angularity or surface irregularities and roughness as broken stone.

(c) Natural rough surfaced gravel.

The percentage composition by weight of Type I backfill shall conform to the following gradings when determined by Test Method No. California 202.

Sieve Sizes	Percentage Passing Sieves
2"	100
1-1/2"	90-100
1"	-
3/4"	50-85
No. 4	24-45
No. 30	10-25
No. 200	2-9

Tests	Test Method No. Calif.	Requirements
Loss in Wet Shot Rattler	210	55% Maximum
Loss in Los Angeles Rattler (after 500 revolutions)	211	50% Maximum
Resistance (R-value)	301	78 Minimum
Sand Equivalent	217	30 Minimum

Type 2 Backfill - Material furnished for Type 2 backfill shall be unwashed creek or bank gravel, crushed rock, bankrun rock, or a mixture of these materials, free from roots, vegetable matter or other deleterious substance. The material shall be of such nature that it will bind and compact readily to form a firm, stable base.

The percentage composition by weight of Type 2 backfill shall conform to the following gradings when determinted by Test Method No. California 202:

Sieve Sizes	Percentage Passing Sieves
1-1/2	100
No. 4	25-60
No. 200	3-11

The material shall have a minimum resistance (R-value) of 50 when determined by Test Method No. California 301 and shall conform to at least one of the following quality requirements:

Tests	Test Method No. Calif.	Requirements
Plasticity Index	204-B	6 Maximum
Plasticity Index (not to exceed 15) times the percentage passing No. 200 Sieve	204-B and 202	90 Maximum
Sand Equivalent	217	20 Minimum

Type 3 Backfill - Material for Type 3 backfill may be obtained from the excavation, and shall be free from stones, lumps, broken concrete or bituminous surfacing exceeding four (4) inches in greatest dimension, vegetable matter, or other unsatisfactory material.

The material shall contain sufficient fines to ensure that voids will be filled and that specified compaction requirements will be met. When material from the excavation is unsuitable for use as backfill, it shall be disposed of and suitable material shall be furnished in accordance with applicable portions of these Specifications.

6-8 Placing Trench Backfill

6-8.1 Backfilling Completely Each Day - All trenches within the existing roadway shall be backfilled completely and the roadway made passable to traffic at the end of each day's operation.

Backfill, or fill, as the case may be, for cast-in-place structures such as, but not limited to, manholes, transition structures, junction structures, vaults, valve boxes and reinforced concrete conduits shall start at the subgrade for the structure.

Except where the pipe must remain exposed for force main leakage tests and subject to the provisions herein, the Contractor shall proceed as soon as possible with backfilling operations. Care shall be exercised so that the conduit will not be damaged or displaced. If the pipe is supported by concrete bedding placed between the trench wall and the pipe,

the remainder of any bedding material shall be placed to 1 foot over the top of the conduit. The backfill above the concrete bedding shall not be placed nor sheeting pulled until the concrete has attained sufficient strength as required by the Engineer.

The Engineer may permit the use of admixtures or the use of additional cement in various parts of the structure to accelerate strength.

Rocks greater than 4 inches in any dimension will not be permitted in backfill placed between 1 foot above the top of any pipe or box and 1 foot below pavement subgrade.

When the trench is wider than 3 feet, rocks not exceeding 6 inches in greatest dimension, which originate from the trench, may be permitted in the backfill from 1 foot above the top of any pipe or box to 5 feet below the finished surface.

Rocks greater than 2-1/2 inches in any dimension will not be permitted in backfill placed within 1 foot of pavement subgrade.

Where rocks are allowed in the backfill, they shall be mixed with suitable excavated materials so as to eliminate voids.

Subject to the provisions specified herein, the material obtained from project excavations may be used as backfill provided that all organic material, rubbish, debris, and other objectionable materials are first removed. However, broken portland cement concrete and bituminous type pavement obtained form the project excavations will be permitted in the backfill subject to the same limitations as rocks.

Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, the voids remaining after the removal of the boulders shall be backfilled with suitable material and densified as approved by the Engineer.

The removal of all boulders or other interfering objects and the backfilling of voids left by such removals shall be at the expense of the Contractor and no direct payment for the cost of such work will be made. The cost of such work shall be included in the prices bid for the various items of work.

Voids left by the removal of sheeting, piles and similar sheeting supports shall be immediately backfilled and compacted into place to assure dense and complete filling of the voids.

After the placing of backfill has been started, the Contractor shall proceed as soon as practicable with densification.

6-8.2 Mechanically Compacted Backfill - Backfill shall be mechanically compacted by means of tamping rollers, sheepsfoot rollers, pneumatic tire rollers, vibrating rollers, or other mechanical tampers. All such equipment shall be of a size and type approved by the Engineer. Impact-type pavement breakers (stompers) will not be permitted.

Permission to use specific compaction equipment shall not be construed as guaranteeing or implying that the use of such equipment will produce required results or will not result in damage to adjacent ground, existing improvements, or improvements installed under the contract. The Contractor shall make its own determination in this regard.

Material for mechanically compacted, backfill shall be placed in lifts which, prior to compaction, shall not exceed the thickness specified below for the various types of equipment:

1) Vibratory equipment, including vibratory plates, vibratory smooth-wheel rollers, and vibratory pneumatic-tired rollers - maximum lift thickness of 2 feet.

2) Rolling equipment, including sheepsfoot (both vibratory and non-vibratory), grid, smooth-wheel (non-vibratory), pneumatic-tired (non-vibratory), and segmented wheels - maximum lift thickness of 1 foot.

3) Hand-directed mechanical tampers - maximum lift thickness of 4 inches.

Mechanically compacted backfill shall be placed in horizontal layers of thickness compatible to the material being placed and the type of equipment being used. Each layer shall be evenly spread, moistened (or dried, if necessary), and then tamped, vibrated or rolled until the specified relative compaction has been attained.

6-8.3 Water Densified Backfill - As used in these specifications, flooding shall mean the inundation of backfill with water puddled with poles or bars to insure saturation of the backfill material for its full depth. Jetting shall be accomplished by the use of a jet pipe to which a hose is attached carrying a continuous supply of water under pressure.

Jetting or flooding methods of compacting are not allowed unless specified in the Special Provisions, specifically approved or required in writing. When such methods are approved or required, they shall conform to this section unless otherwise specified.

Jetting may not be allowed in existing streets.

Jetting may be permitted outside of street areas when the trench backfill is composed of sandy or gravelly material and approved by the Engineer. Such material will not absorb or retain water and the surrounding ground is of such character that it will not soften or be otherwise damaged by the applied water.

If permitted, material for use a trench backfill shall be placed and jetted in layers not exceeding four feet (4') in thicknes. Jetting shall be supplemented by the use of approved mechanical compaction equipment to obtain the required compaction. Jetting of any trench backfill within the upper three feet (3') of the trench will not be permitted. The upper three feet (3') of a trench will be compacted by mechanical compaction methods. A minimum of one inch (1") diameter jet pipe, with at least sixty (60) psi shall be applied at intervals not exceeding four (4) to six (6) feet.

The backfill shall be placed and flooded or jetted in accordance with the following requirements:

1) The Contractor shall apply water in a manner, quantity and at a rate sufficient to thoroughly saturate the thickness of the lift being densified.

2) Where densities are required which cannot be attained by jetting or flooding alone, the Engineer may direct the Contractor to supplement the jetting or

flooding process with the application of vibrating compacting equipment to the backfill.

3) The lift of backfill shall not exceed that which can be readily densified by the jetting or flooding procedure, but in no case shall the undensified lift exceed 4 feet.

4) Where the nature of the material excavated from the trench is generally unsuitable for densification with water, the Contractor may, at no cost to the Agency, import suitable material for flooding or jetting, or densify the excavated material by other methods. If water densification methods are employed in such cases, the Contractor shall, at its expense, provide free-draining bedding material under the pipe and all structures to permit the unimpeded movement of excess water to the downstream end of the construction where the Engineer may require the Contractor to provide a sump and pump to remove the accumulated water.

5) The Contractor shall make its own determination that the use of flooding or jetting methods will not result in damage to existing improvements. Permission to use such methods in densifying backfill shall not be construed as guaranteeing or implying that adjacent ground and improvements will be unaffected.

6) Tests may be required to assure required compaction is attained.

6-9 Imported Backfill - If the Contractor elects to import material from a source outside the project limits for use as backfill, said materials shall be clean soil, free from organic material, trash, debris, rubbish, broken portland cement concrete, bituminous materials or other objectionable substances.

Whenever the Contractor elects to use imported material for backfill, it shall deliver, not less than 10 days prior to intended use, a sample of the material to the Engineer. The sample shall have a minimum dry weight of 100 pounds and shall be clearly identified as to source, including street address and community of origin. The Engineer will determine the suitability, the minimum relative compaction to be attained, and the placement method.

Should the imported material not be substantially the same as the approved sample, it shall not be used for backfill and shall be removed from the jobsite at the Contractor's expense.

The densification method for imported material authorized by the Engineer will be dependent upon its composition, the composition of the in-place soil at the point of placement, and the relative compaction to be obtained.

6-10 Transported Backfill - The Contractor may transport or back-haul material to be used as backfill material from any portion or line of a project to any other portion or line of the same project, or from any project being constructed under one contract to any other project being constructed under that same contract. Such transported material shall be clean soil, free from organic material, trash, debris, rubbish, or other objectionable substances except that broken portland cement concrete or bituminous type paving allowable for the type of backfill specified may be permitted.

6-11 Trench Resurfacing

6-11.1 Temporary Resurfacing - Unless permanent pavement is placed immediately, temporary bituminous resurfacing 2 inches thick shall be placed and maintained at locations determined by the Engineer wherever excavation is made through pavement, sidewalk or driveways. In sidewalk areas the temporary bituminous resurfacing shall be at least 1 inch thick; in all other areas it shall be at least 2 inches thick. At major intersections and other critical locations, a greater thickness may be ordered. Temporary resurfacing shall be placed as soon as the condition of the backfill is suitable to receive it and shall remain in place until the condition of the backfill is suitable for permanent resurfacing. Surfacing shall be maintained in a smooth and level condition. The temporary paving shall conform to the requirements of Section 39 of the State Specifications and unless specified differently in the Special Provisions, may use any of the mixes allowed in Seciton 39 for such temporary surfacing of trenches.

The mixture may be furnished from stockpiles or directly from the plant mixer and may be laid cold, at the option of the Contractor. The resurfacing shall be placed, rolled, maintained, and removed and disposed of by the Contractor.

6-11.2 Permanent Resurfacing - Unless otherwise specified on the plans or in the Special Provisions, all surface improvements damaged or removed as a result of the Contractor's operations shall be reconstructed by the Contractor to the same dimensions, except for pavement thickness, and with the same type materials used in the original work. Trench resurfacing shall be 1 inch greater in thickness than existing pavement.

6-11.3 Pavement Replacement - Minimum pavement replacement shall be that which will restore the trench and adjacent area to its former condition of stability and smoothness. The type and thickness of the replacement pavement, base, cement treated base, and subbase for trenches in public streets and highways shall be as shown on the plans or designated by the Engineer.

Unless otherwise specified, the following requirements shall govern:

Subbase - Existing subbase shall be replaced with material conforming to that specified for Type 2 backfill. The thickness of subbase replacement shall be designated by the Engineer, and that portion of trench backfill lying within such designated limits shall be compacted in accordance with this article.

The relative compaction of the subbase material shall not be less than ninety-five (95) percent as determined by Test Method No. Calif. 216.

6-11.5 Aggregate Base - Aggregate base for trenches in existing streets shall be of the gradation matching the existing section or Type 2 backfill and compacted to 95% using Test Method No. Calif. 216. Thickness shall be not less than 2 inches greater than existing or 8 inches if none existing. On new street work, base should be as for street sections.

6-12 Asphalt Concrete Pavement - Replacement of existing asphalt concrete surfacing shall be in conformance with Section 39 of the State Specifications using the type and grading asphalt concrete most nearly matching the existing. The thickness shall be the same as the existing adjacent pavement, but not less than two inches.

6-13 Prime coat shall be SC-250 liquid asphalt applied per Section 38 of the State Specifications.

6-14 Tack coat shall be AR 1000 paving asphalt applied per Section 37 of the State Specifications.

6-15 Surfacing of trenches in new street sections shall be as required to match the street section involved.

6-16 Slurry seal on trench resurfacing in existing streets, if required, shall be in conformance with Section 37 of the State Specifications.

6-17 Measurement and Payment - When a bid item is included for Trenching or Joint Utilities Trenching, measurement, unless otherwise designated, shall be the number of linear feet of longitudinal trench centerline, measured along the design slope of the trench bottom, to the nearest foot to the conduit end, pay line, or outside face of connecting structure as designated. Any trenching or excavation for connecting structures shall be included in the measurement for the structure.

Payment shall be at the unit price bid for the item and shall include all trenching, removal of existing surfacing, excavation and hauling, disposing or storing of material, sheeting, shoring, dewatering, bedding, backfilling, compacting, subgrade, subbase and surfacing and any and all work, costs, materials and incidentals to complete the item as shown or specified and no additional compensation will be made therefor.

6-18 Boring and Jacking

6-18.1 General - Installation of pipe or conduit by boring and jacking methods shall be in conformance with the applicable provisions of Section 66-3.10 of the State Specifications and the plans and specifications.

Before starting bore pit or other excavation, the Contractor shall submit descriptions of method and drawings of jacking pit bracing, casing, conduit and jacking head proposed to be used. Such drawings shall be prepared under supervision of a Civil or Structural Engineer registered in California and are subject to approval of the Engineer.

Unless otherwise specified, the methods and equipment used in jacking casing or conduit shall be optional with the Contractor, provided that the proposed method is approved by the Engineer. Such approval, however, shall in no way relieve the Contractor of the responsibility for making a satisfactory installation meeting the criteria set forth herein.

Only workers experienced in jacking operations shall be used in performing the work.

The leading section of conduit shall be equipped with a jacking head securely anchored thereto to prevent any wobble or variation in alignment during the jacking operation.

The driving ends of the conduit shall be properly protected against spalling and other damage, and intermediate joints shall be similarly protected by the installation of sufficient bearing shims to properly distribute the jacking stresses. Any section of

conduit showing signs of failure shall be removed and replaced with a new seciton of precast conduit, or with a cast-in-place section, which is adequate to carry the loads imposed upon it.

The Contractor shall furnish, place and maintain such sheeting, bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen, to facilitate the work, and to prevent damage to the pipes and structures being constructed; and also to prevent damage to adjacent structures or facilities. Upon completion of the work, all bracing and shoring shall be removed.

Excavation shall not be made in excess of the outer dimensions of the conduit being jacked unless approved by the Engineer. Every effort shall be made to avoid any loss of earth outside the jacking head. Excavated material shall be removed form the conduit as excavation progresses, and no accumulation of such material within the conduit will be permitted.

Once the jacking operation has commenced, it shall be continued uninterrupted around the clock until the conduit has been jacked between the specified limits.

Upon completion of the jacking operations, all voids around the outside face of the conduit shall be filled by grouting.

Grouting equipment and material shall be on the job site before jacking operations and drilling of grout holes are completed in order that grouting around the jacked conduit may be started immediately after the jacking operations have finished.

Should appreciable loss of ground occur during the jacking operation, the voids shall be backpacked promptly to the extent practicable with soil cement consisting of a slightly moistened mixture of 1 part cement to 5 parts granular material. Where the soil is not suitable for this purpose, the Contractor shall import suitable material at its expense. The soil cement shall be thoroughly mixed and rammed into place as soon as possible after the loss of ground.

6-18.2 Jacking Steel Casing - Casing shall be ASTM A245 Steel, Commercial Grade. Unless otherwise specified on the plans, the size and wall thickness of the casing to be jacked to accommodate the contract pipeline shall be at the Contractor's option, except that the casing thickness shall be not less than 3/8 inch, and the Contractor shall be fully responsible for the sufficiency of the casing provided.

The joints of sections of casing to be jacked shall be welded with a continuous circumferential weld. It shall be the Contractor's responsibility to provide stress transfer across the joints which is capable of resisting the jacking forces involved. Spiral welded pipe will not be permitted. The size of the casing shall be sufficient to allow a minimum clearance of 1 inch between the inside circumference of the casing and the outside of the bell or other extremity of the pipe. Such clearance and sizes shall be provided considering deviation of casing from plan alignment and grade.

6-18.3 Jacking - Variation from theoretical alignment and grade at the time of completion of placing shall not exceed 1 inch for each 100 feet of pipe placed.

The diameter of the excavated hole shall not be more than 0.1 foot greater than the outside diameter of the pipe. Sluicing or jetting with water will not be permitted.

Any deviation greater than allowed or which prevents correction by alignment of the pipe in the conduit using adjustment of skids, while retaining the minimum 1 inch clearance between bell and casing to connect at end junctions and maintain grading alignment, shall be corrected by the Contractor at his expense. Such correction may involve pulling and re-jacking, installing oversize casing, installation by open trench methods, additional junction boxes or manholes or other means proposed by the Contractor and approved by the Engineer at no additional cost to the City, as necessary to complete the project.

6-18.4 Underground Obstructions - Locations of existing underground utilities and structures, insofar as they are known from information furnished by the respective utility companies and agencies, have been shown on the plans. The City assumes no responsibility for the accuracy or completeness of said data, which is offered solely for the convenience of the Contractor. It shall be the Contractor's responsibility to verify the location of these obstructions, and to locate any other underground utilities or structures, which might interfere with the jacking operations.

6-18.5 Pipe Skids and Casing Closure - Lumber for pipe skids and closure blocks shall be Construction Heart redwood, S4S. Skids shall be secured to the pipe with steel box straps (Band-It). The casing closures shall conform to the details shown on the plans. Skids shall be sized to assure minimum clearance of pipe bell in casing.

6-18.6 Installation of Pipe in Casing - Pipe to be installed in jacked casing shall be of the type and size shown on the plans and shall conform to the requirements specified elsewhere in these specifications for the respective type. Pipe skids shall be as detailed on the plans. The pipe shall be pulled into the casing in such a manner that the joints of the pipe will not be compressed beyond the limits recommended by the pipe manufacturer.

6-18.7 Sand Fill - The annular space between the casing and the pipeline shall be completely filled with gunite sand. Sand shall be placed by a method that will insure filling of all voids. After the sand is in place, the casing end seals shall be installed.

Gunite sand shall be placed with a pneumatic gun in accordance with the requirements for placing gunite concrete except that no portland cement need be added. The Contractor may add up to 100 pounds of cement per cubic yard to improve placement stability at its option and expense. In either case, water sufficient to saturate the material and insure proper packing and minimize rebound shall be added to the mixture. The nozzleperson shall operate in the immediate vicinity of the backfill face to insure compaction and complete filling of voids.

The Contractor shall submit to the Engineer for approval, at least 30 days prior to backfill operations, a proposed mix design and method of placing concrete, including placing equipment. No pressure concrete backfill shall be placed until mix design, placement method and equipment have been approved. If the approved mix cannot be readily pumped or placed by the Contractor's placing equipment, additional water may be added, provided the water-cement ratio of the approved mix design is not exceeded.

6-18.8 Backfill - Jacking pits shall be backfilled with material from excavation, free from stones or lumps exceeding 3 inches in greatest dimension, and free from vegetable matter or other unsatisfactory material. The backfill shall be placed in uniform, horizontal layers not exceeding 8 inches in thickness before compaction. Each layer shall be watered or dried, as required to bring the soil as close as practicable to the optimum moisture content for proper compaction, and then compacted to a relative compaction of not less than 95 percent of that determined by AASHO Designation T180, Test Method "C".

6-19 Measurement and Payment - Quantities of jacked conduit shall be the number of linear feet of conduit pipe, jacked in place as shown and specified, measured along the centerline axis of the conduit, to the nearest foot between pay lines, conduit ends or outside face of connecting structure as designated, for the respective type or size as included in bid items. Measurement of the jacked conduit shall include the pipe installed therein, jacking pits and all work and material related thereto.

Payment shall be at the unit price bid for the type or size of conduit jacked in place as shown and specified, as measured by the Engineer, which price and payment shall constitute full compensation for all labor, materials, equipment and supplies to furnish and install the conduit complete in place, including corrective work if necessary, including the jacking pits, excavating, shoring, dewatering, hauling, backfilling, and all costs of any nature whatsoever to complete the item and no additional compensation will be made therefor.

6-20 Adjustment of Structures - Existing manholes, catch basins, rodding inlets, etc., shall be adjusted to conform to the elevations of the new construction.

If an existing manholes cannot be set to the surface elevation of the paved streets by use of concrete or steel adjusting rings in the opinion of the Engineer, the Contractor shall reconstruct the manhole in accordacne with the City Requirements for new manholes as directed by the Engineer.

6-21 Measurement - Adjustment of Structures - Except as otherwise specified herein, pay quantities of concrete in structures will be measured by the cubic yard in accordance with the dimensions shown on the plans or as specified in the Special Provisions. No deduction will be made for the volume occupied by bar reinforcing steel or structural steel in concrete.

A. Structures. Unless otherwise specified, structures will be measured as a unit from actual count.

B. Manholes. Manholes will be measured as a unit complete in place, unless otherwise specified in the Special Provisions.

C. Adjusted Structures. Structures which are adjusted will be measured as units from actual count.

6-22 Payment - Adjustment of Structures - The price paid for concrete structures shall include full compensation for furnishing all labor, materials, tools, equipment, supplies, formwork, incidentals, and for doing all work involved in constructing, curing and finishing, all structure excavation and backfill and for furnishing and placing all

reinforcing steel, metal frames, grates, cover, miscellaneous metal and steps necessary to construct the structures, complete in place, as indicated, and no separate payment will be made for these included items.

Quantities for adjusted structures will be paid for at the contract price per each which price shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in adjusting the structures and furnishing adjacent payment.

Full compensaton for furnishing and placing expansion joint filler performed compression joint seals, construction joints, water stops, coatings, saw cutting and other appurtenant work shall be considered as included in the prices paid for the various items of concrete work and no additional compensation will be allowed therefor.

PART 2

SECTION 7.
STORM DRAINPIPE

7-1 General - Storm drainage facilities shall be constructed in the locations and in conformance to the lines, grades and details shown on the plans, and as specified.

Related work of excavation, trench, bedding, backfill and surface restoration requirements for the work of this section are shown on the detailed drawings of the plans and specified elsewhere in the specifications.

Unless modified elsewhere on the plans and specifications, all pipe shall conform to the applicable provisions of Section 65 of the State Specifications and AASHTO M-170.

7-2 Reinforced Concrete Pipe

7-2.1 General - These specifications apply to reinforced concrete pipe intended to be used for the construction of storm drains, sewers and related structures.

The size, type and D-load or class of the concrete pipe to be furnished shall be as shown on the plans, or specified under the item of work for the project.

7-2.2 Materials - Except when otherwise permitted by the Engineer, no materials shall be used in manufacturing of the pipe other than water, Portland cement, mineral aggregates and steel conforming to ASTM C-76, ASTM C-655 and AASHTO M-170.

The aggregates shall be so graded, proportioned, and thoroughly mixed in a batch mixer to produce a homogeneous concrete mixture of such quality that the pipe will conform to the test and design requirements specified.

Reinforcing shall conform to the requirements of AASHTO M-170.

7-2.3 Joints - Joints shall be designed so as to be self-centering. Unless otherwise specified, joints in concrete pipe details shall be submitted to the Engineer for approval. Joints shall conform to AASHTO M-170.

When pipe joints of the reinforced concrete collar type or of rubber gasketed type are specified or indicated on the plans, joint details shall be submitted to the Engineer for approval.

Pipe with beveled ends for use around curves, the radii of which are shown on the plans, shall be provided where necessary. Either one or both ends shall be beveled a maximum of 5^{o} as may be required to provide well-fitting joints.

If required by the Engineer, the pipe shall be "match marked" to meet specified laying tolerances at the place of manufacture and laying diagrams shall be furnished to the Contractor with copies to the Engineer.

7-2.4 Causes for Rejection - Pipe may be rejected for cause including, but not necessarily limited to, the following reasons:

Nonconformance with the plans or specifications.

Failure to meet any requirement specified in AASHTO M-170.

Failure during or after installation due to materials or Contractor's operations, settlement, damage or misalignment for any reason, including Contractor' failure to protect, drain or otherwise secure the project form such injury or damage.

The imperfections and variations as causes for rejection in sewer and storm drain pipe, as specified, shall apply to pipe for which design details are indicated on the drawings as well as for pipe which is specified by D-load or class. Pipe shall be considered ready for transporting to the project site when it conforms to the specified requirements for curing, testing and inspection.

7-3 Cast-In Place Concrete Pipe

7-3.1 General - Cast-in place concrete pipe shall consist of Portland cement concrete in accordance with Section 63 of the State Specifications and these specifications, insofar as the same may apply and shall be installed only in locations approved by the Engineer.

7-3.2 Concrete - Concrete for cast-in place pipe shall be at least 6 sack mix and slump between 1 and 3 inches. Aggregate shall not be larger than one third minimum wall thickness. Cement shall be Type I or II. The cement shall be free from lumps and damaged cement. The fine and coarse aggregates shall conform to the requirements of these specifications. Slump shall not exceed three inches.

7-3.3 Admixtures - All admixtures shall meet the approval of the Engineer before use.

7-3.4 Wall Thickness - Minimum wall thickness for the various sizes of pipe shall conform to the following table:

Internal Diameter	Minimum Wall Thickness For Pipe
24"	3"
27"	3"
30"	3"
33"	3-1/2"
36"	3-1/2"
42"	4"
48"	5"
54"	5-1/2"
60"	6"
66"	6-1/2"
72"	7"

7-4 Asbestos Cement Pipe

7-4.1 General - These specifications apply to asbestos cement pipe to be used in storm drains and related work. Unless otherwise specified, the pipe shall comply with the requirements of Section 71 of the State Specifications and AASHTO M-217.

The diameter and D-load of the asbestos cement pipe to be furnished shall be as specified on the plans or in the Special Provisions. If D-load or class is not specified on the plans or Special Provisions, the minimum D-load and class shall be 2000D - Class III. D-load is defined as the crushing load in pounds per linear foot of pipe, divided by the inside diameter of the pipe in feet.

Each pipe length shall be provided with a coupling designed to maintain alignment and insure a close fitting, flexible joint. Epoxy bonded fittings may be used only when specified.

Pipe stronger than that specified may be furnished at the Contractor's option, and at his own expense, provided such pipe conforms in all other respects to these specifications.

7-4.2 Materials and Tests - Materials used in the manufacture of asbestos cement pipe and fittings shall be Type II and D-load strength tested in accordance with AASHTO M-217. The material for the coupling may be either the same composition as the pipe or a polyethylene material meeting applicable AASHTO requirements for that pipe.

7-4.3 Marking - Each length of pipe shall be marked by the manufacturer with the trade name, nominal size, D-load, class, date of manufacture and lot number. The D-load, class and lot number designations shall be marked on the inside of the pipe.

Pipe Class	Crushing Strength Per Foot, In Pounds
II	1,500 D
III	2,000 D
IV	3,000 D
V	3,750 D

(Where D is the diameter of the pipe, in feet)

A lot is defined as 100 lengths of pipe, or a fraction thereof, of one diameter and D-load manufactured within a 24-hour period.

Each coupling shall be marked with the nominal size and D-load for the pipe with which it shall be used.

7-4.4 Basis for Acceptance - The basis for acceptance of lots shall be: D-load strength test, compliance with specifications, inspection of pipe manufacture and inspection of completed pipe.

At his option, the Engineer may accept a certification indicating compliance with these specifications in lieu of City inspection.

7-4.5 Causes for Rejection - Inspection of pipes as may be deemed necessary by the City will be made at the project site. Pipe may be rejected for any of the following reasons in addition to the requirements of ASTM C-428:

(a) Any crack, any piece broken from the pipe or other irregularities.

(b) Deficiencies or irregularities in unmachiend wall thickness. Wall thickness shall be at least 95% of the manufacturer's specified nominal wall thickness.

(c) Improper machining of ends of pipe lengths. When plastic couplings are used, pipe ends shall be machined at least 1/16" deep for a minimum of 2/3's of the full circumference. Unmachiend portions of the ends shall be sanded smooth to provide a close fitting joint.

7-4.6 Perforated Pipe - Perforated asbestos cement pipe shall conform to the requirements of AASHTO M-189, Type II.

7-5 Corrugated Metal Pipe

7-5.1 General - All corrugated metal pipe, pipe arches and connectors shall be manufactured and inspected in conformance with AASHTO M-36 and coated in conformance with AASHTO M-218 and as specified herein. The size, type and gage of the pipe to be furnished shall be as shown on the plans or in the Special Provisions.

Corrugated metal pipe arches shall consist of corrugated metal pipe which has been re-formed to multi-centered pipe, having an arch-shape top with a slightly curved integral bottom. Nominal diameter as referred to in AASHTO M-36 shall be defined as meaning the minimum inside dimension of the pipe.

7-5.2 Materials - Corrugated metal products provided for by this subsection may be fabricated of any of the base metals listed in AASHTO M-218 or ASTM A-444. All pipe for each installation shall be fabricated from the same base metal. After galvanizing and corrugating, the base metal shall conform to the following physical properties:

Tensile Strength	45,000 psi minimum
Yield Point	33,000 psi minimum
Elongation in two inches	20 percent minimum

When requested by the Engineer, tension heat specimens shall be prepared and tested in accordance with ASTM A-446.

Mill tests reports for each heat and gage shall be made available to the Engineer for review upon request.

All pipe, corrugations, dimensions, laps and other requirements shall conform to AASHTO M-36 and M-218.

7-5.3 Connection Bands - The connecting bands shall conform to the requirements of AASHTO M-36, except that the minimum width of the band for annular and helical pipe shall be 10 inches and 12 inches, respectively, for pipe diameters 18 inches and larger.

The connecting bands shall be the same base metal as the pipe and shall be galvanized. The gage of the connecting bands shall be the same as the pipe, except that for the pipe arches the gage shall be the same as for the equivalent diameter of circular pipe.

The connecting bands shall have corrugations that mesh with the corrugations of the pipe and shall be connected at the ends by galvanized angles. Connecting bands less than 12 inches in width shall be connected by at least two galvanized bolts not less the 1/2 inch diameter. Bands 12 inches or greater in width shall have at least three 1/2-inch diameter galvanized bolts. Other equally effective types of connecting bands may be used if approved by the Engineer.

When watertight joints are specified on the plans or in the Special Provisions, the connecting bands shall be placed over a 1/4-inch thick neoprene gasket, 0-ring type gasket or a 1/4-inch layer of asbestos fiber asphalt caulking compound, except that the 0-ring type gasket shall not be used with pipes of helical ends. The 0-rings shall conform to Section 3 of ASTM C-443 and have a minimum cross sectional diameter of 13/16 inch.

7-5.4 End Finish - When no headwalls or flared end sections are specified on the plans, the ends of all pipes fabricated of 16 or 14 gage sheets shall be reinforced. The reinforcement at the ends of the pipe shall consist of galvanized steel rod not less than 7/16 inch in diameter rolled in the sheet, or by a galvanized metal band with a minimum cross section of 3/8 inch by 1-1/2 inch, or the outer one foot of pipe shall be fabricated of 12-gage material for 16-gage pipe, and 10-gage material for 14-gage pipe. Where a band is used, it shall be placed around the ends of the pipe and fastened with rivets or resistance spot welds at intervals of 10 inches or less.

7-5.5 Bituminous Coating - Bituminous coatings shall be in conformance with AASHTO M-190 for the type of pipe shown or specified. Bands and couplings may be dipped if approved. Rivits shall be in valley of corrugations for lined pipe.

Damaged bituminous coatings shall be repaired by the Contractor at his expense by applying bituminous material conforming to the provision of this subsection.

7-5.6 Asbestos Bonded - Asbestos bonding shall consist of pressing a thin layer of asbestos fibers into the molten zinc on both sides of the sheet during the galvanizing process. The asbestos fibers shall be evenly distributed over the surfaces and thoroughly embedded in the zinc. Immediately after the zinc coating has cooled, the asbestos fibers shall be thoroughly saturated with a bituminous primer and the pipe shall be coated as specified for bituminous coatings herein.

7-6 Plastic Pipe

7-6.1 General - Plastic pipe, fittings and joint material specified herein consist of Acrylonitrile Butadiene Styrene, hereinafter referred to as A.B.S., and Poly-Vinyl Chloride, hereinafter referred to as P.V.C.

All A.B.S. pipe 8 inches or greater in diameter shall conform to the requirements of ASTM Designation D 2680 as it applies to Composite Pipe. Fittings or parts thereof for the above-mentioned pipe sized not manufactured under the provisions for Composite Pipe shall be shop fabricated or molded form resins specified and shall conform to the physical

requirements in said ASTM D2680 and shall be tested and proved to be equivalent quality to the pipe.

All P.V.C. pipe and fittings shall be, at a minimum, conform to the requirements of ASTM Designation D 3034-73 as they apply to type SDR 35 P.V.C. Sewer Pipe using an Elastomeric Gasket Joint in a bell and spigot assembly system. Rubber sealing gaskets shall meet the requirements of ASTM Designation D1869. No solvent cement joints will be permitted.

All plastic pipe required in odd lengths shall be cut using a proper cutting tool and guide that insures true line cut on planes perpendicular to the pipe axis. No bevel cuts for pipeline alignment adjustments will be permitted.

All plastic pipe shall be bedded and backfilled as specified with extra care taken in compaction of said bedding and backfills as specified and on the plans.

The inside diameter of an installed section of plastic pipe shall not be allowed to deflect more than 5%. All plastic pipe shall be mandrel test checked by means of a pipe deflection gauge in the presence of the Engineer, after the placement of trench backfill. Any section or sections of plastic pipe that does not permit deflection gauge passage will not be accepted and said section or sections shall be properly repaired or replaced and rechecked as directed by the Engineer. Mandrel shall have a minimum diameter of 95% of the pipe inside diameter and a length of the circular portion shall be not less than the nominal diameter of the pipe.

All plastic pipe entering or leaving a concrete structure shall have a rubber sealing gasket, as supplied by the pipe manufacturer, firmly seated perpendicular to the pipe axis, around the pipe exterior and cast into the structure as a water stop. Said water stop may also consist of a manhole coupling with rubber sealing rings cast into the structure.

7-7 Cast Iron Culvert Pipe - If cast iron is called for as culvert, said pipe shall be AASHTO M-64 Extra Heavy unless otherwise specified using AWWA C105 Method A encasement.

7-8 Precast Structures

7-8.1 Precast reinforced concrete manholes shall be as shown and shall conform to ASTM Designation C478, using Type II cement conforming to ASTM Designation C150.

7-8.2 Precast reinforced concrete catch basins may, with permission of the Engineer, be furnished and installed in lieu of cast-in-place catch basin structures.

Precast reinforced drop inlets shall have standard metal grate covers and side openings. Such precast inlets and grates shall be substantially as shown subject to approval of the Engineer.

The Contractor shall submit details of precast concrete catch basins, inlets grates, covers and frames proposed to be furnished to the Engineer for approval prior to ordering of same.

7-8.3 Precast concrete flared end sections shall conform to the requirements for Class III reinforced concrete pipe of ASTM Designation C76, using Type II cement conforming to ASTM Designation C150. The area of steel reinforcement per linear foot of flared end section shall be at least equal to the minimum steel requirements for circular reinforcement in circular pipe for the internal diameter of the circular portion of the flared end section. The basis for acceptance shall conform to the requirements of Article 3 (a) (2) of said C76.

7-9 Cast-in-place Structures - Concrete for cast-in-place structures shall conform to the requirements for Class "A" concrete as specified in Section 90 of the State Specifications, using Type II cement. The maximum size aggregate shall not exceed 1/5 of the narrowest dimension between sides of forms, 1/3 of the depth of slabs, nor 3/4 of the minimum clear distance between reinforcing bars or between bars and forms whichever is least.

7-10 Iron and Steel - Miscellaneous iron and steel items shall conform to the dimensions and details shown on the plans, and as specified.

Cast iron for drainage structure frames, grates, and covers, shall conform to the requirements for Class 30 gray iron castings, as specified in ASTM Designation A48. The castings shall be thoroughly cleaned and coated with commercial quality, asphaltum paint. Frames and grates or covers shall be match-marked in pairs before delivery to the work, and the grates or covers shall fit into their frames without rocking.

Steel shapes, bars and plates for drainage structure frames and grates, shall conform to the requirements of ASTM Designation A36. Welding shall conform to the requirements of the AWS Code for Arc and Gas Welding in Building Construction. Steel frames and grates shall be hot-dip zinc coated after complete fabrication, in conformance with the requirements of ASTM Designation A123. Frames and grates shall be match-marked in pairs before delivery to the work, and the grates shall fit into their frames without rocking.

Manhole steps shall be constructed of 3/4 inch diameter deformed reinforcing steel bars, drop-step shape, 14 inches wide minimum, and shall be hot-dip zinc coated after fabrication, in conformance with the requirements of ASTM Designation A123.

7-11 Excavation for Drainage Structures shall be made accurately to the lines, grades and elevations shown or as directed. Excavations shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm surface, either level, stepped, or serrated, as shown or as directed. Loose disintegrated rock and thin strata shall be removed. When concrete is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete is to be placed.

7-12 Placing Pipe - Each pipe shall be carefully examined before being laid and defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary.

Concrete pipe laying shall proceed upgrade, with the spigot ends of bell-and-spigot pipe and the tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

Circular concrete pipe with elliptical reinforcing shall be so placed that the reference lines designating the top of the pipes will be not more than 5 degrees from the vertical plane through the longitudinal axis of the pipe. In all backfilling operations care shall be taken to prevent damage to or misalignment of the pipe.

7-13 Concrete Pipe Joints - Cement Mortar Tongue-and-Groove Joint: The first pipe shall be bedded carefully to the established grade line with the groove upstream. A shallow excavation shall be made underneath the pipe at the joint and filled with mortar to provide a bed for the pipe. The grooved end of the first pipe shall be carefully cleaned with a wet brush, and a layer of soft mortar applied to the lower half of the groove. The tongue of the second pipe shall be cleaned carefully with a wet brush, and while in a horizontal position, a layer of soft mortar shall be applied to the upper half of the tongue. The tongue end of the second pipe shall then be inserted in the grooved end of the first pipe until mortar is squeezed out on the interior and exterior surfaces. Sufficient mortar shall be used to fill the joint completely and to form a bead on the outside. The mortar shall be used within 30 minutes from the time the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. In pipe too small for a man to work inside, wiping may be done by dragging a suitable swab or long-handled brush through the pipe as work progresses. The mortar bead on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

7-14 Drainage Structures - Manholes, catch basins, field inlets, headwalls, box culverts and other drainage structures, shall be constructed as shown on the plans and in accordance with the requirements of Section 90 of the State Specifications.

Precast sections of manholes or catch basins shall be assembled accurately with fullbed mortar or preformed flexible plastic sealant ("Ramneck" or approved equal) joints. There shall be not more than 12 inches of throat section between the top of the cone and the bottom of the manhole frame. Tops of manholes, catch basins and other structrues shall be accurately brought to the elevations indicated on the plans, or if no elevation is indicated, tops shall be brought flush with the surface of the surrounding ground or pavement. Concrete surfaces of box culverts, headwalls, and other structures in contact with flowing water, shall be finished smooth, so as to reduce friction loses as much as possible. All fins and projections shall be removed. All form tie holes, honecomb areas, and other voids and irregularities shall be filled with a stiff cement grout and troweled flush with adjoining surfaces.

7-15 Disposal of Surplus Materials - Unless otherwise specified in the Special Conditions, surplus excavated and unsuitable materials shall become the property of the Contractor and shall be disposed of off the project site, or at designated disposal sites.

7-16 Restoration of Surfaces - Pavement, curbs, gutters, walks, driveways, planted areas and similar surfaces removed, cut, or damaged during the construction of storm drainage facilities, shall be replaced or restored to their original condition. Local ordinances governing such replacement shall be adhered to in all respects.

7-17 Cleaning - All storm drain lines, manholes, catch basins, field inlets, culverts, and similar structures, shall be thoroughly cleaned of all dirt, debris and obstructions of any kind, to the satisfaction of the Engineer.

7-18 Installation - Installation shall be as shown on the plans and as specified under the Section for Underground Conduit Construction of these specifications and the applicable provisions of Section 71 of the State Specifications.

7-19 Inspection and Testing - All materials and installations shall be tested in accordance with applicable ASTM, AASHTO or manufacturer's recommendations for the item involved. Infiltration-exfiltration shall not exceed the allowable as described in 15.4 of AASHTO M-266 as .079 gallons per inch diameter per 100 feet of pipe tested per hour of test unless otherwise specified in the Special Provisions or permitted by the Engineer.

Departure from and return to established grade and alignment shall not exceed 1/8 inch per linear foot in any 10 linear feet of installed pipe. Inspection may be made after completion using portable lights, reflectors or other means as well as during installation.

Contractor shall furnish all material and do all work of field tests the costs of which shall be included in the price bid.

7-20 Measurement and Payment - Measurement for payment shall be at the unit designated in the contract bid items by size, type, class or whatever information is necessary to identify the item. Measurement for pipe shall be along the slope of the centerline in place to the nearest foot between pay lines, pipe ends, outside of connecting structures or as otherwise designated. Measurement shall be along centerline of bends, elbows or other fittings. Measurement for manholes, inlets or junction structures shall be the number of units of each size, type or class designated as a contract item.

Unless specifically designated elsewhere and provided for in the bid item, no separate measurement shall be made for trenching, cradles, saddles, fittings or other items as work appurtenant to the completion of the bid item.

Payment shall be at the price bid for the item and such price and payment shall be full compensation for the item including furnishing and installing all material, supplies, equipment and doing all the work necessary to complete the item in place, including excavation, backfill, sheeting, shoring, dewatering, forming, reinforcing, restoration of surfaces, bridges, headwalls, hauling, disposal, adjusting to grade, couplings, fittings, frames, covers, grates, testing and any and all costs of any nature whatsoever necessary to complete the item and no additional compensation shall be made therefor.

PART II

SECTION 8.
SANITARY SEWER PIPE

8-1 General - All pipe, pipeline installations and requirements incident to appurtenant structure or joint connections shall be as specified herein. All pipe installation procedures and materials shall be in accordance with the pipe manufacturer's recommendations and as set forth by these specifications.

All pipe sizes refer to the nominal inside diameter of pipe (including any pipe linings) and no pipe, except where specified herein, shall be more than one-quarter (1/4) inch smaller than the nominal size designated. All pipe, pipe joints incorporated into the pipe, and manufactured fititngs connecting pipe between structures shall be of the same type, quality, class and size unless otherwise specified or detailed on the Drawings. Jointing of pipe dissimilar in size and/or material shall be accomplished either by use of special adapters or couplings as specified on the plans or approved by the Engineer for such use. All field cut pipe shall be accomplished with equipment recommended by the pipe manufacturer. No hammer or chisel cuts will be permitted. The Contractor shall submit at his own expense shop and material details of all special pipe for approval before the pipe shall be manufactured or used on the work. All pipe and fittings delivered to the job site shall be marked by the manufacturer with such inventory and identification (Brand Name, Pipe Type, Strength Class, Batch Lot, Lengths, etc.) as to be properly identified in the field as meeting the requirements herein and for the work.

8-2 Vitrified Clay Pipe (V.C.) - All V.C. Pipe and fittings shall conform to the requirements of ASTM Designation C700 as it applies to extra strength, unglazed vitrified clay pipe with bell and spigot ends. Truss pipe will not be permitted.

Resilient material conforming to the requirements of ASTM Designation C425 shall be used for V.C. jointing.

Rubber couplings used to joint plain end V.C. pipe shall coform to the material and performance requirements of ASTM Designation C594.

8-2.1 Vitrified Clay Pipes - For vitrified clay pipe with flexible compression joints, the mating surfaces shall be wiped clean of dirt and foreign matter, and an approved lubricant as recommended by the pipe manufacturer shall be applied to the joint surfaces. The spigot shall then be positioned inside the bell and the joint shoved home. For small diameter pipe this operation may be done by hand, but on large diameter pipe a lever attachment, or a bar cushioned with a wooden block, shall be used to shove the joint into place.

Rubber "Band-Seal" joints with stainless steel bands shall be made in accordance with the manufacturer's instructions.

Mechanical compression joints shall be approved type of interlocking resilient joint, formed on the pipe at the factory and made of plastisol (polyvinyl chloride) to specifications established by the National Clay Pipe Research Corporation. This type of joint shall be "Wedgelock" as manufactured by Pacific Clay Products, "Speed Seal Mainline" as manufactured by Gladding, McBean & Company, or approved equal.

8-3 Cast Iron Pipe - Cast iron pipe shall conform to ANSI A21.6 or A21.8 for the required working pressure. Joints shall be mechanical joints or rubber gasket joints. Fittings shall conform to ANSI A21.11 for mechanical joint, or ANSI A21.10 and AWWA C100 for bell and spigot joint. Flanged fittings shall conform to ANSI B16.1, Class 125, unless otherwise noted. Cast iron pipe 4 inches and larger in diameter shall be cement mortar lined with the cement mortar conforming to ANSI A21.4

For mechanical pipe (joint), the bell and spigot shall first be cleaned thoroughly, and then the mating surfaces shall be brushed with soapy water. With the gland and the gasket on the spigot end, the pipe shall be seated into the bell. The gasket shall be pressed firmly and evenly into the bell and the gland positioned. When tightening the bolts, the gland shall be brought up evenly at all points around the bell flange.

For rubber gasket joints, the gasket and bell shall be thoroughly cleaned before inserting the gasket into the bell. After the gasket is positioned, a thin film of approved lubricant shall be applied to the exposed surface of the rubber gasket. After wiping the spigot clean, it shall be shoved home into the bell. If pipe is field cut, the spigot end shall be tapered with a file to about 1/8 inch back at an angle of 30 degrees with the centerline of the pipe.

All main and trunk sewer C.I. pipe and fittings shall be of sufficient thickness to withstand the designed working pressure, and depth of cover under the laying conditions as indicated on the plans.

C.I. pipe may, upon approval of the Engineer, be installed without use of foundation bedding material whre trench bottom provides a firm cushion bearing for the full length of pipe between bell holes, and where such installation otherwise meets the requirements of the Specifications.

Whenever the design criteria of these Specifications requires the use of C.I. type pipe and plan design or field conditions additionally require installation of short radius horizontal or vertical curves which would necessitate multiple pipe cuts and coupling type jointings; all such curves shall be constructed using manufactured short lengths with approved jointing at deflections not exceeding that directed and approved by the Engineer.

All C.I. pipe shall be polyethylene encased in accordance with AWWA C105, Method A.

8-4 Asbestos-Cement Pipe

8-4.1 Non-Pressure Pipe Asbestos-cement non-pressure sewer pipe shall conform in all respects to AASHTO M-266, Type II. Pipe shall be Class 3300 unless a higher strength pipe is required. The pipe shall be properly machined on each end so as to facilitate the joining of the pipe sections by the use of a coupling and rubber rings. The coupling shall consist of an asbestos-cement sleeve and two solid rubber rings of uniform cross section and shall be suitable in size and design for the pipe with which it is to be used. The inner surface of the coupling shall be machined with gasket retaining grooves, so that when the joint is assembled, the rubber gasket is compressed to form a tight seal.

Asbestos-cement fittings shall be manufactured in classes suitable for the class of pipe for which they will be used and shall be regularly manufactured items.

Epoxy lined asbestos-cement pipe shall be the same as described above, except it shall have a centrifugally applied lining of one hundred percent (100%) solid content epoxy resin base. The thickness of the lining shall be a minimum of 20 mils, and the coverage shall be continuous and shall contain no uncoated areas, pinholes, thin spots, runs or sags. Couplings, fittings and machined sections shall also be lined as specified.

8-4.2 Pressure Pipe - Asbestos-cement pressure pipe shall conform in all respects to ASTM C-296 for the class and type of pipe for the required working pressure. Pipe ends, sleeves, and rubber rings shall be as specified hereinbefore except that the coupling shall be designed to withstand the internal hydrostatic pressure corresponding to the pipe with which it is to be used.

Cast iron fittings for pipe 12 inches and smaller shall conform to ANSI A21.10 for the class shown on the drawings, and the bells shall be machined to fit standard asbestos-cement rubber rings joints. For pipe sizes over 12 inches, fittings shall be cement lined and coated steel.

8-4.3 Asbestos-Cement Pipe Joints - Rubber gasket joints for both non-pressure and pressure asbestos-cement pipe shall be made in accordance with the manufacturer's instructions. The machined surfaces shall be wiped clean, lubricated with an approved lubricant, and the joint made. After making the joint the position of the rubber gasket shall be carefully checked with a special feeler gage.

Asbestos-cement pipe that is field cut must have the ends machined to the same configuration as a factory machined end. In the case of epoxy-lined pipe, field cuts shall be machined. After machining, the tapered ends and noses shall be painted with epoxy resin to the same thickness as the pipe lining.

Asbestos-cement pipe installations shall be in compliance with AWWA Manual M-16 on Work Practices for A.C. pipe in addition to all other requirements including pipe manufacturer's recommendations.

8-5 Reinforced Concrete Pipe - Reinforced Concrete Pipe shall conform to AASHTO M-170 and ASTM C-76 unless otherwise specified. Joining shall be accomplished, where not otherwise specified, by the assembly systems using rubber gaskets, bell and spigot or double spigot and approved steel joint sleeve. Rubber gaskets conforming to ASTM Designation C362 shall not be used except where prior written approval by the Engineer is given. All gaskets shall be confined in a groove formed in the outside surface of the spigot end of the pipe.

Rubber gaskets for reinforced concrete pipe shall be lubricated with an approved lubricant and carefully positioned in the gasket groove on the spigot. After the pipe is shoved home, the position of the rubber gasket shall be verified with a special feeler gage. If the pipe is elliptically reinforced, special care shall be taken to insure the pipe is installed with the marked vertical axis in a vertical position.

8-6 Plastic Pipe - Plastic pipe unless specified differently shall be in conformance with AASHTO M-267 for the type of pipe requried and in conformance with the

requirements for plastic P.V.C. and A.B.S. pipe specified under the Storm Drain Pipe Section of these Specifications.

8-7 Castings - All castings for manhole rings and covers, clean out frames and covers, or other purposes, shall be tough grey iron, free from cracks, holes, swells, and cold sheets and be of workmanlike finish and shall conform to the plans. The cast iron shall meet the requirements of Specifications ASTM Designation A48, Class 35, and Section 55-2 of the State Specifications.

Manhole covers shall be turned in a lathe and dressed to assure a tight fit and to prevent rocking. The seat for the manhole cover shall also be turned in a lathe to provide a true and a smooth surface. All manhole covers which do not fit neatly and bear firmly in the ring will be rejected.

The cast iron frame for clean out shall conform to the latest AWWA Specifications for Class A cast iron pipe. Any clean out cover which does not properly fit the frame will be rejected.

8-8 Precast Manholes - The manhole sections shall be made of concrete with not less than one part of Type II cement to five parts of aggregate, and shall have tongue and groove joints. Metal forms shall be used in the manufacture of the precast sections so as to obtain smooth surfaces. The concrete shall be well compacted by being centrifugally-spun, vibrated, or mechanically-tamped.

Concrete - Concrete shall meet the requirements of Section 90 of the State Specifications. Unless otherwise specified, Class "A" concrete shall be used throughout.

The amount of water used shall be the minimum amount necessary to produce a plastic mixture of the required density, uniformity, and workability, and shall not exceed six and one-half gallons per sack of cement.

All concrete shall have a minimum compressive strength of three thousand (3,000) pounds per square inch twenty-eight days after placement.

Cement Mortar or Grout - Cement mortar or grout shall be composed of one part Type II cement and three parts of clean concrete sand.

8-9 Reinforcement - Bar reinforcement shall be deformed, and shall be intermediate grade conforming to the "Billet-Steel Bars for Concrete Reinforcement" (ASTM Designation A15), and be of the shape and dimensions shown on the plans. Before any reinforcing steel is delivered to the job site, prints of the shop drawings shall be submitted to the Engineer for his approval, showing the number, length, and a dimensioned bending diagram of all steel bars and rods. Such approval is intended only as an additional precaution against errors and the responsibility for furnishing and placing steel in accordance with the details shown on the plans and as specified shall still remain with the Contractor.

8-10 Manholes - Manholes shall be watertight structures constructed by placing precast concrete sections on a poured concrete base. Poured-in-place manholes shall not be used unless specifically called for in the plans and Specifications.

Whenever the excavation for a manhole exceeds the outside diameter of the manhole by 10 inches, measured along a radius line, the backfill shall be placed in layers not to exceed 8 inches uniformly around the structure and mechanically tamped to a relative compacton of not less than ninety percent for each layer. Compacted sand backfill for the entire depth may be substituted for the above.

The poured concrete base shall be made of Class 560-A-3250 concrete. It shall rest on firm, undisturbed soil and shall be of the dimensions shown on the standard drawings or plans.

All joint surfaces of precast sections and face of manhole base shall be thoroughly clean prior to setting precast sections. These various sections shall be set in preformed plastic sealing gaskets of material conforming to the requirements of FEDERAL SPECIFICATION SS-S-00210.

Installation of gaskets:

a. Apply one coat of primer to clean, dry joint surface (both tongue and groove) and allow to dry. Remove the paper wrapper from one side only of the two-piece wrapper on the gasket. The outside paper will protect the gasket and assure against stretching. Before setting the manhole section in the trench, attach the plastic gasket strips end-to-end to the tongue of each joint, forming a continuous gasket around the entire circumference of the manhole joint.

b. Handling of barrel sections after the plastic gasket has been affixed shall be carefully controlled to avoid bumping of the gasket and thus displacing it or covering it with dirt or other foreign material. Any gaskets so disturbed shall be removed and replaced if damaged and repositioned if displaced.

c. Care shall be taken to properly align the manhole section with the previously set section before it is lowered into position.

d. During cold or wet weather, pass direct heat over the concrete joint surface lightly until ice, frost and moisture are removed and surface to b primed is dry and warm immediately before application of primer. Direct heat shall also be passed over plastic gasket strips immediately prior to attaching them to joint surfaces and immediately prior to insertion of tongue into groove.

Where sewer lines pass through manholes, the pipe shall be laid continuously as a whole pipe. After the manhole base and precast sections have been placed and sufficient time has elapsed to allow all concrete and grout to set, the top half of the pipe within the manhole shall be carefully cut off and the sides mortared. All channels so formed shall form a smooth flowing channel at all flow depths.

Temporary covers of steel plate of sufficient size to adequately cover the opening shall be placed on the cone until the pavement is completed. Suitably located ribs shall be welded to the underside of the cover to hold it in place during the grading and paving operations.

The throat of the manhole shall be made of precast concrete rings of the proper inside diameter. The minimum depth of throat permitted shall be one 3-inch ring between

the cone and the frame. The maximum depth permitted shall be 12 inches of rings between the cone and frame.

When adjusting the manhole frame and cover to grade, the frame shall be secured and the throat completed to the right level. Whenever the space between the bottom of the frame and the top of a ring is less than 3 inches, the void may be filled with concrete, poured against a suitable form on the inside of the structure.

When adjusting an existing manhole to grade and the total depth of the throat from the top of the frame to the bottom of the throat exceeds 24 inches, the upper portion of the manhole shall be removed to the first full-size manhole section. The upper portion shall then be reconstructed.

8-11 Connection to Existing Manholes - Connections to existing manholes shall be made by carefully breaking an opening in the wall of the manhole, inserting the end of the pipe through the opening to flush with the inside wall, and packing the opening around the pipe with a stiff mix of cement mortar, thoroughly compacted to form a water-tight connection. The mortar shall be troweled smooth and flush with the interior surface of the manhole. Channelizing of the flow through the manhole shall conform to the details shown on the drawings for new manholes.

The Contractor shall notify the Engineer twenty-four hours in advance before any connection is made to existing structures. He shall schedule his work so that there is no interruption of flow.

8-11.1 Drop Connections - Where required, a drop connection shall be constructed whenever any sewer enters a manhole more than four (4) feet above the flow line of the manhole, in accordance with the drawings, and may include a connection to either an existing manhole or a new manhole.

Care shall be taken that the riser portion is vertical, and that the elbow is firmly supported by the concrete.

8-12 Cleaning and Testing

8-12.1 Description - All work involved in testing and cleaning sewer lines between manholes and/or rodding inlets, as required herein, shall be completed within fifteen (15) working days after completion of installation of sewer lines and structures. In new subdivisions or projects involving possible conflicts with other underground utilities, preliminary tests may be conducted at the discretion and expense of the Contractor at any time, but the final test for acceptance will be made after the installation of all underground facilities and installation of aggregate subbase, but prior to installation of aggregate base. Where new roadways are to be all asphalt concrete layer constructed, pipelines installed under such paved ways shall be air tested prior to placement of the final layer of said asphalt concrete pavement.

If damage is done to the sewer system subsequent to the final test, the Contractor will be required to make another final test after the damage has been repaired. All final testing and cleaning of sewer lines shall be done in the presence of the Engineer. The Contractor shall furnish all labor, materials, tools, and equipment necessary to make the test, clean the lines and to perform any work incidental thereto. Precautions shall be

taken to prevent joints from drawing during tests, and any damage resulting from tests shall be repaired by the Contractor at his own expense. The type of test and time of testing shall be specified by the Engineer.

8-12.2 Testing - The Contractor shall perform low air pressure tests on the total footage of all new sewer pipeline installations after such pipelines have been properly installed, including necessary test fittings and backfilling. Sections not to be air tested, if any, shall be designated by the Engineer.

In new tract or subdivision developments, air testing shall be performed only after the installation of all proposed lateral sewers to the main sewer system has been completed. Side sewer system installations shall be air tested with the sewer mains.

Low pressure air tests shall be conducted in accordance with the following Test Procedure of these Specifications. All necessary test equipment shall be in proper working order and tests shall be made in the presence of the Contractor and a District representative. Test plugs shall be carefully placed at each end of the section of line to be tested. When all necessary test equipment is in place, a compressed air supply shall be attached to the air fitting on the test equipment and the air pressure within the line increased to four (4) pounds per square inch (4 psi). After the air supply is securely turned off or disconnected, there shall be a two (2) minute waiting period to allow stabilization of air within the sewer line before the actual test period begins. In no case shall the air pressure, within the line, be less than 3.5 psi at the beginning of the test period. When testing main or trunk sewers up to and including eighteen (18) inches in diameter, refer to the nomograph in City Std. Detail No. S-304 for the length of the test period (minimum two (2) minutes) and the allowable air pressure loss during that time. When testing side sewers, or portions thereof, the test period shall be two (2) minutes and the allowable loss shall not exceed one (1) pound per square inch. The maximum length of a sewer line that may be tested at one time shall be five hundred (500) feet. After completion of a test, the air pressure shall be released slowly through the valve, which is incorporated in the test equipoment. Air test plugs shall not be removed until the air pressure is no longer measurable.

As a safety precaution, pressurizing equipment shall include a regulator set at not more than 10 psi to avoid over-pressurizing and damaging an otherwise acceptable line. No one shall be allowed in manholes during testing.

8-12.3 Cleaning - All new main and trunk sewer installations, and such site collector and side sewer installations deemed necessary by the Engineer, shall be cleaned as required herein with an approved cleaning ball or device in accordance with such device manufacturer's instructions or recommendations and/or flushed prior to sanitary waste use. Screens used in trapping debris shall be approved by the Engineer and secured to the steps of manholes with an approved nylon rope. All cleaning by balling and flushing, including screen installations and removal, shall be accomplished by the Contractor in the presence and under the direct supervision of the Engineer.

a. After all work on the pipeline installation has been completed to the satisfaction of the Engineer, including all manhole channeling and final air testing prior to any final pavement placements.

b. Prior to acceptance, and after all other required inspections, the Contractor shall perform a final pipeline cleaning as hereinabove set forth.

8-12.4 Hydrostatic Testing - Testing shall be in conformance with Section 15.5 of AASHTO M-266 for gravity mains and AWWA C600 for force mains, cast iron, ductile iron and A.C. pressure pipe and shall be not less than 50 psi over the pressure class of the pipe. Pipelines not meeting the test requirements shall be corrected or replaced until requirements are met.

8-13 Trench Widths - The maximum width of trench measured at the top of pipe shall be governed in all cases by the size of the pipe to be installed therein. Trenches shall have a minimum width of 12 inches (6 inches on each side) more than the exterior diameter of the pipe, exclusive of bells and branches. They shall have a maximum width of 16 inches more than the outside diameter of the pipe.

8-14 Excavation for Sewers - The excavation for sewer pipe shall be an open trench, excavated to a depth of the flow line plus the thickness of the pipe wall. Bell holes shall be excavated to provide a 1-inch opening surrounding the bell. The Engineer will be the sole judge of the suitability of the native material.

When the trench is in an existing paved area, the pavement shall be sawed or scored and broken ahead of the trenching operations. The proper tools and equipment shall be used in marking and breaking so that the pavement will be cut accurately on neat and parallel lines at the width required for the trench, except that when the existing pavement is concrete, it shall be sawed to a neat line 6 inches wider on each side than the trench width.

Whenever the bottom of the trench is soft, yielding, or unsuitable as a foundation for the pipe, sufficient crushed rock or coarse clean gravel shall be rammed into the soft material. If such treatment does not provide a proper foundation, the unsuitable material shall be removed to a depth such that when replaced with bedding material it will provide a suitable foundation.

Whenever the trench bottom is in rocky material, the trench shall be excavated to 6 inches below the flow line shown on the plans or 3 inches below the outside diameter of the bell, whichever is greater, and backfilled to grade with crushed rock of 3/4-inch maximum size thoroughly compacted into place.

When water is encountered, the trench shall be kept dry until the placing of the bedding material, laying and jointing of the pipe, and placing of the shading material has completed, inspected and approved. The Contractor shall place not less than 6 inches of 2-inch drain rock below the required bedding material, or otherwise de-water the trench in a manner which has received prior approval of the Engineer. Ground water pumped from the trench shall be disposed of in such a manner as will not cause injury to public or private property or constitute a nuisance or menace to the public. The manner employed to dispose of water pumped form an excavation shall be subject to the approval of the Engineer.

8-15 Bracing and Shoring - As required by the "Trench Construction Safety Orders" fo the California State Industrial Accident Commission, sufficient bracing and shoring shall be installed in trenches to insure the safety of workmen, and to protect and

facilitate the work. Where practicable, all such bracing and shoring shall be removed form the trench as the backfilling proceeds.

8-16 Laying Sewer Pipe - Sewer pipe shall be laid to the line and grade established by the Engineer. A string line shall be set and maintained by the Contractor by measuring from three (3) consecutive points shown on the same rate of grade or slope, in order to detect any variation from a straight grade, and in any case such discrepancy is not reported to the Engineer, the Contractor shall be responsible for any error in the finsihed work.

Pipe shall be laid continuously upgrade with the bell of the pipe forward. Each length of pipe shall be laid on a firm bed and shall have a true bearing for the entire length between bell holes. No wedging or blocking up of the pipe will be permitted. Pipe found to be damaged must be replaced by new sections - repair clamps will not be allowed.

Both bell and spigot shall be clean before the joint is made and care shall be taken that nothing but the joint making material enters the joints.

When, for any reason, pipe laying is interrupted, the open end of all lines shall be closed with a close-fitting stopper.

8-17 Measurement and Payment - Measurement for payment should be at the unit designated in the contract bid items by size, type, class or whatever information is necessary to identify the item. Measurement for pipe shall be along the slope of the centerline in place to the nearest foot between pay lines, pipe ends, outside of connecting structures or as otherwise designated. Measurement shall be along centerline of bends, fittings elbows or other fittings. Measurement for manholes, inlets or junction structures shall be the number of units of each size, type, or class designated as a contract item.

Unless specifically designated elsewhere, and provided for in the bid item, no separate measurement shall be made for trenching, cradles, saddles, fittings or other items as work appurtenant to the completion of the bid item.

Payment shall be at the price bid for the item and such price and payment shall be full compensation for the item including furnishing and installing all material, supplies, equipment and doing all the work necessary to complete the item in place, including excavation, backfill, sheeting, shoring, dewatering, forming, reinforcing, restoration of surfaces, bridges, hauling, disposal, adjusting to grade, couplings, fittings, frames, covers, grates, testing and any and all costs of any nature whatsoever necessary to complete the item and no additional compensation shall be allowed therefor.

PART 2

SECTION 9.
WATERLINES

9-1 General - All pipe, pipeline installations and facilities related thereto, shall be as specified herein. All pipe installation shall be in accordance with the manufacturers recommendations, AWWA standards and as set forth by these specifications.

All pipe, pipe joints incorporated into the pipe, and manufactured fittings connecting pipe, shall be of the same type, quality, class and size unless otherwise specified or detailed on the plans. Jointing of pipe dissimilar in size or material shall be accomplished either by use of special adapters or couplings as specified on the plans or approved by the City Engineer for such use. All field cut pipe shall be accomplished with equipment recommended by the pipe manufacturer. No hammer and chisel cuts will be permitted. The contractor shall submit at his own expense, shop and material details of all special pipe for approval before the pipe shall be manufactured or used on the work. All pipe and fittings delivered to the job site shall be marked by the manufacturer with such inventory and identifications (brand name, pipe type, strength class, batch lot, length, etc.) as to be properly identified in the field as meeting the requirements herein and for the work.

Pipe shall be classed for 150 psi working pressure, unless otherwise specified in the Special Provisions or shown on the Plans. Pipes, valves, hydrants, fittings and appurtenances shall be new and unused.

9-2 Protective Coatings - In addition to any other requirement or reference specification, all ferrous fittings, flanges, valves, connections or other water line appurtenances shall be protected using liquid epoxy coating, factory applied, 3M Scotchkote brand type 306 or approved equal. This is in lieu of any other directly applied exterior coating referenced in AWWA, ASTM or other specification. All ferrous pipe shall be protected with polyethylene encasement unless other coating is specifically required. Hydrants, burys, risers, breakoff risers and appurtenances shall also be liquid epoxy coated as above specified. All nuts, bolts and washers below grade shall be type 316 stainless steel. Any damage to epoxy coatings shall be repaired with epoxy to the satisfaction of the Engineer.

9-3 Asbestos Cement Pipe - Asbestos cement pipe and fittings shall conform to American Water Works Association (AWWA) standard C400 for Asbestos Cement Pressure Pipe minimum pressure class 150 and be installed in accordance with AWWA C603. Work practices for asbestos-cement pipe shall conform with AWWA Manual of Water Supply Practices AWWA No. M16, "Work Practices for Asbestos-Cement Pipe."

9-4 Polyvinyl Chloride Pipe - PVC pipe shall conform to the AWWA Standard C900 for Municipal Water Systems. The class of PVC pipe shall be as indicated on the plans.

The pipe shall be installed in accordance with the manufacturer's recommendations, except as otherwise specified herein.

The joints in plastic pipe shall be made by the use of rubber gaskets conforming to ASTM D1869. For rubber ring pipe, the pipe ends shall be thoroughly cleaned over the entire circumference of the pipe back to the stop mark. The lubricant shall then be

applied to the entire cleaned area. Coating shall be approximately the thickness of a brush coat of unthinned enamel paint. After the joint has been assembled, a feeler gauge shall be inserted under the coupling or bell to check the position of the rubber rings. If the feeler gauge indicates that the rubber ring is out of position, the joint shall be taken apart and reassembled. No leaded or caulked joints shall be made with plastic pipe.

When closing pieces are required, the contractor shall make all necessary measurements and shall be responsible for the correct length of the closure. If materials other than standard pipe lengths are required, the contractor shall perform all necessary cutting and fitting. Field cuts may be made by use of pipe cutters or a saw and 90^{o} miter box. Only 90^{o} cuts may be made. Beveling of pipe ends may be made with either a beveling machine or a file.

All plastic pipe shall be installed with a single strand of twelve (12) gage copper locator wire located directly on top of the pipe, and taped to the pipe.

9-5 Cast Iron Pipe - Cast iron pipe shall conform to AWWA Standard C100, C104, C106, and as provided herein and be installed according to AWWA C600.

Unless otherwise specified, cast iron fittings and specials shall conform to AWWA C110, C111 and C115 as applicable and as specified herein.

9-5.1 Mechanical Joints - Mechanical joints are not permitted unless specifically specified or shown on the plans in which case they shall conform to AWWA C110 and C111. The spigot, bell and rubber gaskets shall be thoroughly cleaned before assembly. Cleaning fluids that are harmful to the gasket or rubber ring shall not be used. The gland and gasket shall then be slipped on the spigot end of the pipe. The gasket shall be pressed evenly into the bell only after the spigot is seated in the bell. The gland shall be brought up evenly by tightening the nuts 180^{o} alternately. Torque applied shall be in accordance with the table below.

9-5.2 Flanged Joints - Flanged joints shall be firmly and fully bolted with machine bolts of proper size. Approved gaskets shall be used at all flanged joints. Torque applied shall be in accordance with the table below.

Bolt Size	Range of Torque (ft.-lb.)
5/8"	50 - 60
3/4"	60 - 90
1"	70 - 100
1 1/4"	90 - 120

9-5.3 Rubber Ring Joints - The joint shall be thoroughly cleaned before assembly and shall provide a secure water tight joint. When pipe is cut in the field, the cut plain end shall be tapered back approximately 1/8" at an angle of 30^{o} with the center line of the pipe.

9-5.4 Protective Coatings - All buried cast iron pipe and fittings shall be Polyethylene encased. Polyethylene protective wrapping material shall be in accordance with AWWA C105 method A. Care shall be exercised to prevent entrapment of soil materials between the polyethylene wrap and metal surfaces.

9-6 Steel Pipe - Unless otherwise indicated on the plans, or specified in the Special Provisions, steel pipe shall conform to AWWA C200, butt-welded, Schedule 40, black. Fittings shall be black malleable iron conforming to ANSI P16.3, threaded, banded and suitable for 150 psi working pressure. Where welded joints are used, fittings shall be forged steel and shall conform to ANSI B16.9 for butt-welding. Where noted or specified, both pipe and fittings shall be galvanized. Where cast iron fittings are used, only the pipe shall be galvanized. Cast iron fittings shall be threaded and shall conform to ANSI B16.12.

Schedule 80 steel pipe shall be black, seamless, and shall conform to ASTM A120. Fittings shall be threaded and banded black malleable iron conforming to ANSI B16.9 and rated for 300 psi working pressure. Unions shall be ammonia type.

All buried black and galvanized steel pipe shall be provided with a protective wrap conforming to AWWA C203 and consisting of a fibrous glass mat and bonded asbestos felt wrap. AWWA C105 method A Polyethelyne may be substituted with prior approval of the Engineer.

For steel pipe, 4" and larger, fittings and specials for steel pipe shall be fabricated from the same materials as the pipe, and shall conform to the requirements of AWWA Standard C208. Specials and fittings may be made of standard steel tube turns or the segmentally welded sections specified, with ends to accommodate the type of couplings or joints specified for the pipe. Fittings and specials shall be lined and coated as specified for the pipe. Fittings and specials that cannot be mechanically lined and coated shall be lined and coated by hand, using the same materials used for the pipe.

Fittings and specials for steel pipe, less than 4" shall be malleable iron, galvanized, screwed, 150 pound class, unless otherwise specified or shown.

Fittings and specials for steel pipe 4" and larger joints shall be bell and spigot ends with rubber ring gaskets.

9-7 Copper Pipe - Copper pipe shall conform to ASTM B88, Type K, hard or soft temper as specified. Fitting shall be brass, wrought copper or wrought bronze with joints as specified or noted on the plans.

9-8 Ductile Iron Pipe - Shall be AWWA 115 class 3 with AWWA C104 lining, rubber gasketed, or push-on, or if specified, self-restrained (internally locked) joint designed for assembly by positioning a gasket in an annular recess in the bell end of the pipe and forcing a grooved end spigot with the gasket having molded into it a number of alloy steel struts equally spaced around its circumference which engage the grooved spigot end when properly inserted into the bell socket which completed assembly must provide a positive lock against joint separation without the use of thrust blocks or tie rods. Installation shall be according to AWWA C600.

9-9 Valves - The valves for 6 inches and smaller shall be gate valves, double-faced wedge-type with non-rising stems, flanged type or bell ends, as required, cast iron body with seats, wedges and stems of bronze. When valves are open, the area of the opening shall at least be equal to the area of the adjacent pipe. Valves shall open counter-clockwise, and have opening nuts of uniform size. Stuffing boxes shall be bolted and constructed so as to permit removal of parts for repairs. Valves shall be equal in material

of construction, quality and performance to AWWA Standards, Mueller or equal. "O" ring stuffing boxes are required on all gate valves. Extension stems with standard AWWA nut shall be used to bring nut to within 12 inches of finish grade.

Butterfly valves. The valves for lines over 6 inches shall be butterfly valves conforming to AWWA 504 for Class 150B using bronze disc, bronze stem and fittings, counter clockwise opening standard AWWA 2 inch nut, extension stems shall be used to bring nut to within 12 inches of finished surface.

9-10 Valve Boxes and Covers - Valve boxes are to be 12-inch high and 8-3/4 inch inside diameter, of concrete construction, equal to Brooks Products, Incorporated, Gate Valve Box No. 4-TT or equal, as shown on Standard Detail Drawing. The covers are to be cast iron and marked "water" and accompany every valve.

9-11 Fire Hydrants - Fire hydrants shall meet AWWA C503, be U.L. listed and approved have 2 - 2 1/2 inch or 2 - 2 1/2 and 1 - 4 1/2 inch national standard thread outlets as noted in the plans or specifications. Hydrants shall be set using breakoff risers, flanged burys and suitable thrust blocks. Riser, bury and ferrous parts of hydrant shall be epoxy coated. Bolts shall be stainless steel. Hydrants and fittings shall otherwise be Rich 900 series or approved equal. A 6 inch gate valve shall be installed between the main and bury. Where placed in unpaved areas, all hydrants shall have a 4' x 4' slab of concrete 4-inch in thickness constructed to the same standards required for sidewalks in these Specifications. The top flange of the hydrant shall be 2-inches above finished grade.

9-12 Service Lines - The service line between the water main and the property line shall be of soft rolled copper water tube, type K, meeting the requirements of AWWA Specifications B 88. Threads for service line fittings shall conform to AWWA Specifications C 800. Only one union or splice shall be allowed for each service line and shall be a flared type fitting for services 1-1/2 inch and smaller, and shall be a sweat soldered fitting for services greater than 1-1/2 inch.

9-13 Service Clamps - The service clamps used for service connections to the pipe mains shall be equal in material and construction to Bronze Service Clamps, Double stainless steel or bronze straps.

9-14 Corporation Stops - The corporation stops shall have a bronze body and plug providing smooth operation and seating. They shall have a rating of 125 pounds per square inch, and shall be equal in materials of construction, quality and performance to Mueller H15000, 3/4-inch minimum size.

9-15 Construction Methods - Depth - Water mains shall be installed at a depth which will provide a minimum cover of 42 inches over the top of the pipe measured from the finished grade or as shown on the plans.

9-15.1 Excavation - The minimum trench width shall be the nominal diameter of the pipe plus 12 inches, but in any case, shall be ample to permit the proper installation of the pipe and appurtenances.

All of the requirements for trench excavation, shall apply to excavation for water mains. Upon approval of the Engineer, tunneling for short distances under other utilities, sidewalks, etc., will be permitted.

9-15.2 Laying Pipe - Each section of pipe and each fitting shall be thoroughly cleaned out before it is installed. All pipe, fittings, valves, etc., shall be carefully lowered into the trench by suitable tools or equipment, in such manner as to prevent damage to the pipe, lining, coating, fitting or other appurtenances.

The pipe shall be laid true to line, with no visible change in alignment at any joint, unless curved alignment is shown on the plans.

When curved alignment is shown on the plans, the maximum deflection at any joint shall not exceed the manufacturer's recommendation for the type of pipe and joint being used.

Thrust blocks of Class 420-B-2000 concrete shall be cast-in-place at all bends of 11 degrees or more, behind each tee or each cross which is valved in such a manner that it can act as a tee, pipe ends and at the back of fire hydrant burys. The thrust block shall extend from the fitting to undisturbed soil, shall be kept clear of the joints, and shall be of such bearing area as to assure adequate resistance to the force to be encountered. In lieu of the above, movement may be prevented by the use of pipe collars and rods if specifically approved by the Engineer.

Whenever pipe laying is discontinued for short periods, or when work is stopped at the end of the day, the open ends of all mains shall be closed with water-tight plugs or bulkheads. The plug or bulkhead shall not be removed unless or until the trench is dry.

Valves shall be set plumb, supported on a concrete base or a 2" x 12" x 18" redwood block, and properly fitted to the adjacent sections of main. A valve box shall be installed over each valve stem.

(a) Asbestos-cement Pipe - Asbestos-cement pipe joints shall be made only with the couplings and rubber rings furnished with the pipe, and aligned and constructed in the trench in accordance with the manufacturer's instruction manual.

(b) Cast Iron Pipe - Before lowering into the trench, each section of cast iron pipe shall be rung with a light hammer and examined for defects. Any defective, damaged, or unsound pipe shall be rejected. Where necessary to properly locate valves and fittings, the pipe shall be neatly and squarely cut to length. After the pipe or fittings has been lowered into the trench, all foreigh matter shall be completely brushed from the bell and spigot end before assembly.

9-16 Testing - Upon completion of installation of the pipeline and all appurtenances thereto, the pipeline shall be hydrostatically tested, in accordance with AWWA Standard C600 or C603 as applicable and as provided herein.

Prior to beginning hydrostatic testing, the pipeline shall have been filled with water and allowed to stand a minimum of twenty-four (24) hours under a slight pressure. Pressure and leak tests may be done concurrently with disinfection.

The Contractor shall furnish all required equipment, pumps, gages and materials, make all connections and perform the required tests. All pressure pipelines shall be tested and made tight to the satisfaction of the Engineer at a test pressure of 150 percent

of the working pressure, but in any case, the test shall not be less than 50 psi over the class rating of the pipe.

Pipelines, including service lines, shall be hydrostatically tested for a period of four (4) hours. In the event that the rate of loss of water or pressure during the test is greater than that allowed, the contractor shall locate the leaks and perform the required repairs and retest the pipeline. Regardless of the test results, all detected leaks shall be repaired and any defective pipe or other material shall be repaired, or where applicable, replaced with new sections and another test made. During hydrostatic testing, the contractor shall provide for temporary blocking of the pipeline at the tie-in points or as directed by the Engineer. No hydrostatic test will be allowed against a closed valve connected to the existing system except under specific supervised conditions approved by the Engineer. No leakage from exposed piping will be allowed.

Plastic pipe shall be tested the same as AC Pipe under AWWA C603. Screwed, soldered or flanged pipe shall be tested under AWWA C600 with no allowance for pressure or leaks.

9-16.1 Connection to Existing Mains - The Engineer shall be given not less than 24 hours notice before any connection shall be made to any existing main. In general, shutdowns in residential areas shall be made at times when there will be the least interference with the preparation of meals. Connections shall be made only after complete and satisfactory preparation for such work has been made, in order that the shutdown may be as short as possible. Prior written approval from the Engineer is required.

Under no circumstances shall anyone other than a representative of the Water Division of the Department of Public Works open or close any valve in the city-operated water system.

9-17 Disinfection - All water piping, conduits, fittings, connections and utility water piping shall be disinfected with chlorine solution or with HTH tablets in accordance with AWWA C601.

9-17.1 HTH Tablets - If the contractor elects to use HTH tablets for disinfection of pipelines, extreme care shall be taken in installation of the mains so that a minimum of contact is made between the pipe interior and groundwater or dirt. Such precautions shall include covering pipe ends at all times and maintaining dry trenches by pumping. As pipe laying progresses, each pipe length shall have attached to the top interior of the pipe the number of HTH tablets recommended by the manufacturer. The method of attachment shall be approved by the Engineer and shall be done with materials that will not cause an impairment of the water quality. The main shall be slowly filled and allowed to stand full for at least twenty-four (24) hours, after which flushing shall be done as described above. Pressure testing may be conducted in conjunction with disinfecting period or as a separate procedure following disinfection. Except as herein specified, disinfection shall conform to applicable requirements of AWWA C601.

9-17.2 Disinfection of Tie-Ins - The contractor shall disinfect all piping materials used for tie-ins by swabbing with chlorine or by other approved methods. Following a tie-in, the area effected by the tie-in shall be thoroughly flushed and bacteriological samples will be taken by the contractor.

9-17.3 Bacteriological Sampling and Testing - The contractor shall provide temporary one-half inch (1/2") outlets, with piping and shut-off valves on each treated waterline, for use as sampling piping. When the sampling piping is no longer needed, it shall be removed by the contractor and a approved watertight plug shall be provided at each outlet.

After flushing the disinfected facilities, samples shall be taken by the Engineer and delivered to a certified water laboratory for bacteriological testing. Should the test results indicate the presence of coliform organisms, the entire disinfection procedure shall be repeated. Bacteriological testing shall conform with and meet requirements of AWWA C601 and these specifications.

9-18 Meaurement and Payment - Measurement for payment shall be at the unit designated in the contract bid items by size, type, class or whatever information is necessary to identify the item. Measurement for size shall be along the slope of the centerline in place to the nearest foot between paylines, pipe ends, outside of connecting structures or as otherwise designated. Measurement shall be along centerline of bends, fittings, elbows or other fittings. Measurement for valves, hydrants, services, air valves, vaults, or other items shall be the number of units of each size, type or class designated as a contract item. Where not separately designated, measurement of such appurtenances shall be included with pipe measurement.

Unless specifically designated elsewhere, and provided for in the bid item, no separate measurement shall be made for trenching, cradles, saddles, fittings, thrust blocks or other items or work appurtenant to the completion of the bid item.

Payment shall be at the price bid for the item and such price and payment shall be full compensation for the item including furnishing and installing all material, supplies, equipment and doing all the work necessary to complete the item in place including excavation, backfill, sheeting, shoring, dewatering, forming, reinforcing, restoration of surfaces, bridges, hauling, disposal, adjusting to grade, couplings, fittings, valve covers, coatings, sterilization, testing and any and all costs of any nature whatsoever necessary to complete the item and no additional compensation shall be made therefor.

PART 2

SECTION 10.
PAINTING

10-1 General

10-1.1 Description - This work shall consist of painting new installations and repainting existing installations in conformance with the requirements of the various sections of these specifications.

Painting shall conform to the requirements specified in Section 59 of the State Specifications and these specifications, the Special Provisions, and as shown on the plans or directed by the Engineer.

10-1.2 Weather Conditions - Paint shall be applied only on thoroughly dry surfaces and during periods of favorable weather. Painting will not be permitted when the atmospheric temperature is at or below 35°F. at the site of the work, or when freshly painted surfaces may become damaged by rain, fog, or condensation, or when it can be anticipated that the atmospheric temperature will drop below 35°F. during the drying period, except as provided in the following paragraph for enclosures. If fresh paint is damaged by the elements it shall be replaced or repaired by the Contractor at his expense.

Subject to approval by the Engineer in writing, the Contractor may provide suitable enclosures to permit painting during inclement weather. Provisions shall be made to control atmospheric conditions artificially inside the enclosures within limits suitable for painting throughout the painting operation. Full compensation for providing and maintaining such enclosures shall be considered as included in the prices bid for the various contract items of work requiring paint and no additional compensation will be allowed therefor.

10-1.2 Application - The Contractor shall notify the Engineer, in writing, at least one (1) week in advance of the date cleaning and painting operations are to begin.

Each application of paint shall be thoroughly cured and any skips, holidays, thin areas or other deficiencies corrected before the succeeding application. The surface being covered shall be free from moisture, dust, grease or any other deleterious material which would prevent the bond of the succeeding applications. In spot painting, old paint which lifts after the first application shall be removed by scraping and the area repainted before the next application.

Brushes, when permitted, shall have sufficient body and length of bristle to spread the paint in a uniform film. Paint shall be evenly spread and thoroughly brushed out.

On all surfaces which are inaccessible for painting by regular means, the paint shall be applied by spray, sheepskin daubers, especially constructed for the purpose, or by any other means approved by the Engineer.

Rollers, when permitted, shall be of a type which do not leave a stippled texture in the paint film unless required by the Engineer.

If spray methods are used, runs, sags, thin areas in the paint film, or skips and holidays shall be considered as evidence that the work is unsatisfactory and the Contractor may be required to apply the remainder of the paint by brush.

A water trap acceptable to the Engineer shall be furnished and installed on all equipment used in spray painting.

Mechanical mixers shall be used to mix paint. Prior to applying, the paint shall be mixed a sufficient length of time to thoroughly mix the pigment and vehicle together, and shall be kept thoroughly agitated during its application.

Precautions in the handling and the application of paints shall be in accordance with the General Industry Safety Orders of the Division of Industrial Safety, Department of Industrial Relations, of the State of California.

10-2 Material - Paint shall be homogeneous, free of contaminants, and of a consistency suitable for the use for which it is specified. The pigment shall be finely ground and properly dispersed in the vehicle according to the requirements of the paint; and this dispersion shall be of such nature that the pigment does not settle appreciably, does not cake or thicken in the container, or become granular or curdled. Paint and paint materials shall be delivered to the jobsite in new, unopened, air-tight containers, identified with the manufacturer's name, date of manufacture, type of paint or paint material, and when appropriate, State of California specification number, and lot or batch number, except when using pavement striping machine.

No paint shall be used until at least seven days have elapsed from the date of manufacture.

10-3 Testing - When required by the Engineer, all paint and paint materials shall be sampled and tested prior to use. All tests will be conducted in accordance with the methods specified in ASTM or methods set forth in Federal Standard 141. In the absence of any such methods, other suitable methods may be designed and utilized by the Engineer.

Lots or batches of paint of proprietary brand, which have been previously sampled and tested by the City and approved as conforming with these specifications, may be used without further testing, if permitted by the Engineer. For the purpose of these specifications, proprietary brands of paint and paint materials are construed to mean those conforming to the requirements of these specifications which are produced for distribution through regular wholesale and retail outlets.

10-4 Paint Coats - The first coat of paint applied to an unpainted surface shall be called the prime coat. The paint applied to field connections, welds, rivets, and all damaged or defectively painted or rusty areas shall be a prime coat. The paint applied over the prime coat shall be called the intermediate coat. The final coat of paint shall be called the finish coat.

10-5 Paint Systems - Unless otherwise specified, the paint systems to be used will be in compliance with the applicable provisions of Sections 59 and 91 of the State Specifications.

10-6 Thinning Paint - Paints specified are to be formulated ready for application and no thinning will be allowed unless otherwise specifically provided.

10-7 Protection Against Damage - The Contractor shall provide protective devices, such as tarps, screens or covers, as necessary to prevent damage to the work and to other property or persons from all cleaning and painting operations.

All adjacent surfaces shall be protected from disfiguration by spatter, splashes, spillage, and dripping of paint or other material. Paint or paint stains on surfaces not designated to be painted shall be removed and contracted by the Contractor at his expense.

If traffic causes an objectionable amount of dust, the Contractor, when directed by the Engineer, shall sprinkle the adjacent roadbed and shoulders with water or dust palliative for a sufficient distance around the location where painting is being done and such application shall be at the Contractor's expense.

All painted surfaces shall be protected from injury and damage of any kind. All painted surfaces that are marred or damaged shall be repaired by the Contractor, at his expense, with materials and to a condition equal to that of the coating specified herein.

In areas of high traffic volume, the Contractor shall schedule his work to paint traffic lines and markings in off-peak traffic hours as specified by the Engineer.

Upon completion of all painting operations and of any other work that would cause dust, grease, or other foreign materials to be deposited upon the painted surfaces, the painted surfaces shall be thoroughly cleaned. At the time of opening structures to public traffic, the painting shall be completed, and the surfaces shall be undamaged and clean.

10-8 Painting Galvanized Surfaces

10-8.1 General - When galvanized surfaces are required to be painted, such surfaces shall be cleaned and painted in conformance with the provisions in Section 59-3 of the State Specifications and this Section.

10-8.2 Surface Preparation - Hand Cleaning: Concrete spatter, grease and other foreign matter shall be completely removed from galvanized surfaces by hand scraping, wire brushing or other means.

10-8.3 Solvent Cleaning - After hand cleaning, all galvanized surfaces shall be cleaned by the solvent cleaning procedures to remove all oil, grease, and other detrimental foreign matter.

10-8.4 Pretreatment - After hand and solvent cleaning, a vinyl wash primer conforming with State Specification 91-2.07 shall be applied to all galvanized surfaces. The first undercoat or paint shall be applied the same day as pretreatment is applied.

10-8.5 Painting - After preparation, all galvanized surfaces that are to be painted shall be covered with one application of Zinc Dust - Zinc Oxide Primer, Federal Specification TT-P-641, Type II. The primer shall be applied by spraying to produce a complete covering of the galvanized surface.

After the application of primer, one application of Pretreatment, Vinyl Wash Primer, State Specification 701-80-52 shall be applied to such surfaces. The Vinyl Wash Primer shall be applied by spraying to produce a uniform wet film on the surface.

Such surfaces shall then be covered with a prime coat, intermediate coat, and final finish as required by said Section 59 unless a different color is shown on the plans or specified in the Special Provisions.

10-8.6 Measurement and Payment - No separate measurement or payment will be made for preparing and painting galvanized surfaces and full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing and painting galvanized surfaces as shown on the plans, and as specified in these specifications and the Special Provisions, and as directed by the Engineer will be considered as included in the prices paid for the various contract items of work involving the galvanized surfaces.

10-9 Painting Wood Surfaces

10-9.1 General - Timber surfaces which are required to be painted shall be prepared and painted in conformance with the provisions in Section 59-4 of the State Specifications and these specifications.

Unless otherwise shown on the plans or specified in the Special Provisions, all new timber requiring painting shall be painted with 3 applications of paint. The paint used for various applications will be shown on the plans, specified, or in the Special Provisions and if not so shown or specified, the paint to be used will be selected by the Engineer and furnished by the Contractor.

10-9.2 Surface Preparation - All cracked or peeled paint, loose chalky paint, dirt and other foreign material shall be removed by wire brushing, scraping, or other means immediately prior to painting. The moisture content of the timber shall not be more than twenty (20) percent at the time of the first application.

10-9.3 Painting - When permitted in writing by the Engineer, the first application of paint may be applied prior to erection.

After the first application has dried and the timber is in place, all cracks, checks, nail holes, or other depressions shall be puttied flush with the surface and allowed to dry before the second application of paint.

Skips, holidays, thin areas or other deficiencies in any one coat of paint shall be corrected before the succeeding coat is applied.

The surface of any paint coat being covered shall be free of deleterious material before additional paint is applied.

10-9.4 Measurement and Payment - No separate measurement and payment will be made for preparing surfaces and for painting timber and full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing surfaces and painting timber as shown on the plans, and as specified in these specifications and the Special Provisions, and as directed by the Engineer will be considered as included in the prices paid for the various contract items of work involving timber.

10-10 Painting Concrete Surfaces

10-10.1 General - When painting is specified in the Special Provisions, cleaning and painting of concrete surfaces shall conform to the provisions in Section 59-6 of the State Specifications and these Specifications.

10-10.2 Surface Preparation - Prior to painting concrete surfaces, a brush coat or surface film of thin cement mortar composed of one part portland cement and one part of fine sand of such size that it will pass a No. 16 sieve, or at the option of the Engineer, a neat cement wash shall be applied. When the cement film has set sufficiently so that the sand particles or cement will not drag out of surface pin holes, but before the final set has taken place, the entire surface shall be thoroughly rubbed either by hand or by mechanical means as necessary to remove excess mortar and produce a smooth surface of even texture. No greater amount of mortar shall be applied in advance of rubbing than can be completely rubbed before final setting takes place.

Immediately following the rubbing process the finished surface shall be thoroughly washed with water. After drying, a muriatic acid wash, consisting of ten (10) to fifteen (15) percent muriatic acid, shall be applied to the concrete surfaces. The acid wash shall be applied in such manner as to completely remove all oily film and to lightly etch the surface. Following the application of acid wash, the concrete surface and any other surface receiving the acid wash shall be thoroughly rinsed with clean water to remove all acid. All use of acid shall be in accordance with appropriate safety orders.

Concrete surfaces shall be thoroughly dry and free of dust at the time the paint is to be applied.

Any artificial drying procedures and methods shall be subject to approval by the Engineer.

10-10.3 Paint - Paints to be applied to concrete surfaces shall conform to either Section 91-4.04 or 91-4.05 of the State Specifications or other paints as specified in the Special Provisions.

All paints shall be white, matching color chip No. 36 (State of California Specification 8010-91B-95), unless otherwise specified in the specific provisions.

10-10.4 Application of Acrylic Emulsion Paint - Acrylic emulsion paint shall be applied in not less than two (2) applications to produce a uniform appearance.

10-10.5 Application of White Epoxy Enamel Concrete Coating - White epoxy enamel concrete coating shall be applied in not less than two (2) applications to produce a uniform appearance.

The paint shall be applied only when the ambient temperature is 50° F., or above. Painting will not be permitted when it can be anticipated that the ambient temperature will drop below 50° F. during the application and drying of the paint.

10-10.6 Measurement and Payment - No separate measurement and payment will be made for preparing surfaces and for painting concrete and full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in preparing surfaces and painting concrete as shown on the plans, as specified in these Specifications and the Special Provisions and as directed by the Engineer will be considered as included in the prices paid for the various contract items of the work including concrete.

PART 2

SECTION 11.
PAVEMENT DELINEATION

11-1 Marking of Surfaces

11-1.1 General - The Contractor shall apply all traffic striping, markings and all other directional information or pavement delineation on the surfaces of streets, detour roads, parking lots, median strips and curbing in accordance with the plans, Special Provisions and as specified herein, in conformance with the applicable provisions of the State Specifications and California Vehicle Code.

11-1.2 Layout, Alignment and Spottings - All layout, spotting and tracking required shall be performed by and at the expense of the Contractor and approved by the Engineer, prior to placement of pavement striping or markings.

When no previously applied figures, markings, or traffic striping are available to serve as a guide, suitable layouts shall be spotted in advance of the permanent paint application by any means satisfactory to the Engineer.

The Contractor shall mark or otherwise delineate the traffic lanes in the new roadway or portion of roadway, or detour before opening it to traffic.

The Contractor shall provide an experienced technician to supervise the location, alignment, layout, dimensions, and application of the paint.

The Contractor shall furnish all equipment, materials, labor and supervision necessary for installing pavement striping and markings in accordance with the contract plans or temporary detours required for the safe control of traffic through and/or around the project.

11-2 Pavement Markers - Pavement markers shall be installed in accordance with Section 85 of the State of California Standard Specifications, and as specified herein and in the Special Provisions.

Should the Contractor elect to alter the existing traffic stripes and markings, or to divert the flow of traffic on construction projects for his own convenience and there are no special pavement markings or land delineations shown on the plans or in the Special Provisions, he shall, at no expense to the City, provide the necessary temporary striping in accordance with the State Traffic Manual, unless otherwise directed by the Engineer. Removal of such striping shall be at the Contractor's expense. The Contractor shall remove all existing or temporary detour striping or markings that may confuse the public. When temporary detour striping or markings are no longer required, they shall be removed prior to applying the new traffic stripes or markings.

Standard word markings, letters, numerals and symbols shall be as shown on the plans. In the absence of such information, all stencils and templates shall be identical with those used by the City. The Contractor shall obtain stencils for all required legends.

Unless otherwise specified in the Special Provisions or contract plans all pavement striping and markings (except temporary) shall be thermoplastic.

11-3 Removal of Existing Markings - Existing striping and pavement markings that will be in conflict with the finish traffic circulation shall be removed as directed by the Engineer in accordance with Section 15-2.02 of the State Specifications.

11-4 Thermoplastic Striping - The installation of thermoplastic striping and marking shall conform to Section 84-2 and 84-3 of the State Specifications.

11-5 Painted Striping and Markings - General: Paint for pavement striping and markings, if such are required, shall conform to State Specifications 721-80-97 with color required and as specified herein.

11-5.1 Red Curb Painting - Red curb painting shall be applied as shown on the plans and as directed by the Engineer. Red curb painting shall include the application of two coats of traffic paint with glass beads incorporated in the second coat. Top and face of curb shall be painted.

11-5.2 Glass Beads - All traffic stripes, except the black separation line, shall be beaded.

Glass beads shall be applied directly and uniformly to the set traffic line with a bead dispenser machine placed the proper distance behind the paint spray nozzle, unless pre-mix is approved.

Glass beads shall be applied to pavement markings and crosswalks by a special paint spray gun developed for this purpose.

11-5.3 Application Rate

Broken Stripe

First Painting
New surface, first coat; 4 to 5 gallons per mile
Second coat; 7 to 7.4 gallons per mile

Restriping; 7 to 7.4 gallons per mile

Glass Beads; 42 pounds per mile

11-5.4 Solid Stripe

First Painting
New surface, first coat; 12 to 14 gallons per mile
Second Coat; 16 to 18 gallons per mile
Glass beads with second coat; 110± pounds per mile

Restriping; 16 to 18 gallons per mile
Glass Beads; Approximately 110 pounds per mile
Black traffic paint; Approximately 8 gallons per mile

11-5.5 Pavement Markings

First Painting; Light application to seal pavement

Second Coat; 1 gallon per 100 square feet

Glass Beads; 6 pounds per gallon of paint

Restriping; 1 gallon per 100 square feet
Glass Beads; 6 pounds per gallon of paint

11-6 Raised Bars

11-6.1 General Description - These specifications apply to precast, cast-in-place or extruded raised bars intended to be used as traffic delineators or bumper stops. This work consists of furnishing and installing precast, cast-in-place or extruded raised bars at the locations shown on the plans or directed by the Engineer and to the requirements specified in these specifications and the Special Provisions.

Raised bars shall conform to the details and dimensions shown on the plans.

11-6.2 Classification Types - Raised bars are classified by type in accordance with the minimum supportive strength of the bar. The types are as follows:

Type A - 400 pounds minimum load

Type B - 150 pounds minimum load

The type of bar to be used shall be as shown on the plans or specified in the Special Provisions. If the type designation of the bar is not shown on the plans or specified in the Special Provisions, Type A will be used.

Type A raised bars may be either precast, cast-in-place, or extruded, at the option of the Contractor. Type B raised bars shall be precast.

11-6.3 Materials

Precast Raised Bars - Precast raised bars shall be constructed of 560-D-3000 concrete. Other materials such as glass fiber, asbestos and wood chips may be substituted for the aggregate in raised bars provided the portland cement content is adjusted to such materials and such use of other materials is approved by the Engineer.

Cast-In-Place Raised Bars - Concrete used in cast-in-place raised bars shall be 560-D-3000 concrete, containing calcium chloride at the rate of 2 pounds per 100 pounds of cement. The slump of the concrete shall be not less than 1/2 inch and not greater than 1-1/2 inches and within these limits the consistency shall be regulated as necessary to provide a dense bar having the shape shown on the plans.

Extruded Raised Bars - Concrete used in forming bars by the extrusion process shall consist of a homogeneous mixture of portland cement, aggregate, and water, in which an air-entraining agent may be incorporated. The concrete shall contain sufficient moisture

to produce a mass that can be formed into a cohesive cast by hand pressure and which will permit the formation of extruded bars free from crumbling or cracking.

Adhesive - The adhesive for attaching raised bars to pavements shall conform to the provisions of Section 95-2.04 of the State Specifications. The adhesive shall be of a consistency suitable for heavy trowel application at atmospheric temperature, capable of developing a tenancious bond, and holding the bar in place immediately upon placement. The adhesive shall not soften in the presence of water.

Paint - Paint to be applied to raised bars shall be traffic line paint only.

The surface of the bars shall receive 2 applications of white traffic line paint; the first application shall be applied within 15 minutes after the bar has been cast and the second application shall be applied before acceptance of the work. The paint shall be applied at a rate to provide a uniform white color without holidays. Adequate precautions shall be taken to avoid discoloration of the adjacent pavement with paint.

11-6.4 Design - Raised bars shall conform to the details and dimensions shown on the plans.

11-6.5 Test Requirements - During the progress of the work, the Contractor shall cast or extrude at least one group of 3 test bars for each 200 linear feet, or fraction thereof, of raised bars placed. The test bars shall be cast at the intervals directed by the Engineer.

Each test bar shall be 32 inches in length and of the same cross section as the bars being placed. They shall be cast or extruded on a cleaned and oiled, flat 18-gage, or heavier, metal plate and shall receive the same treatment as the raised bars being placed in the work.

The Contractor shall furnish the equipment necessary in making beam tests and shall make tests in the presence of the Engineer. The cast-in-place or extruded test bar, after removal from the metal plate, shall be loaded as a simple beam with the base in tension on roller supports at 28-inch centers. The bar shall be loaded at midspan through a saddled one inch wide shaped to conform to the contour of the bar. The load shall be applied at a uniform rate or in increments not in excess of 50 pounds.

The acceptability of the bars in place shall be determined by conformance to plan dimensions, to prescribed surface texture, to adequancy of painting, and to minimum beam strength of test bars as hereinafter specified.

Cast-in-place or extruded raised bars in place will be accepted at the end of 24 hours after casting, if the test bars at this age withstand a test load of 250 pounds applied to the saddle. If the test bars develop a lower strength at this age, one or more bars of each group shall be tested at the age of 72 hours. If the test bars at the latter age withstand a test load of 350 pounds, the raised bars in place, represented by the test bars, will be accepted. During weather in which the average of the maximum and minimum daily temperatures is less than 50°F. and if the bars do not conform to the 24-hour test requirement, the test bars may be moved at the end of 24 hours to a location at which the average temperature is maintained between 55°F. and 80°F. and the strength determined at the age of 72 hours.

Cast-in-place or extruded raised bars in place, represented by test bars that do not comply with the strength requirement at the end of 72 hours, shall be removed from the work and be replaced with acceptable bars by the Contractor at his expense. No payment will be made for bars so replaced.

Each precast bar shall be properly cured, and at the time of shipment shall be capable of supporting the minimum load, for each type as specified. Precast bars shall be tested as described above.

11-6.6 Marking - Precast bars shall be marked with the date of manufacture and the identifying mark of the manufacturer.

The manufacturer of pre-cast raised bars shall establish the necessary quality control and inspection practice to assure compliance with these specifications.

11-6.7 Extruded Raised Bars - The machine used for extrusion shall be capable of forming bars of the dimensions shown on the plans. Raised bars shall be extruded onto a previously placed adhesive.

The extrusion machine shall be so operated as to produce a well compacted mass free from large torn areas in the surface. If minor surface pits or small torn areas are formed, the surface of the bar shall be worked with a template type trowel until defects have been eliminated. The ends of the bars while plastic shall be formed to the shape and angle shown on the plans. When bars are placed over an open joint or crack, an open joint shall be formed through the bar at that point.

11-7 Measurement and Payment - The quantity of paint of traffic striping and marking shall be measured by one or more of the following methods: Lineal footage, the area in square feet, or one lump sum item, complete in place.

The contract lump sum or unit prices paid for the various types of pavement striping and markers shown in the bid proposal shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved in striping and markings, complete in place, as shown on the plans, as specified in these specifications and the Special Provisions, and as directed by the Engineer.

PART 2

SECTION 12.
SIGNS

12-1 General - Any permanent traffic control sign as required on the plans or in the specifications shall conform with the provisions of Section 56 of the State of California Standard Specifications and the manual on Uniform Traffic Control Devices for Streets and Highways, and the following provisions.

12-2 Base Metal - The base metal shall be new sheet aluminum of alloys conforming to State Specifications Section 56. The thickness of the aluminum sheet shall be .080 gauge unless otherwise specified. The material shall be subject to inspection prior to installation.

The fabrication of all signs shall be accomplished in a uniform and workmanlike manner. The sign panels are to be cut as shown on the sign specification sheets. The dimensional tolerance of the panels shall be plus or minus one-sixteenth (1/16") inch. Metal panels shall be cut to size and shape and shall be free of buckles, warp, dents, cockles, burrs, sharp edges and any other defects resulting from fabrication.

All possible fabrication, including shearing, cutting and punching of holes, shall be completed prior to the base metal preparation.

12-2.1 Base Metal Preparation - The aluminum base metal shall be thoroughly cleaned and anodized as per State Standard Specifications.

12-3 Reflective Sheeting - Reflective sheeting shall be Scotchlite brand high intensity grade or equal unless otherwise indicated on the plans.

Vendors shall present proof that the type of reflective sheeting they intend to use in the manufacture of the signs has been used on highway signs located on California highways for a period of at least two (2) years and has proven entirely satisfactory.

The surface of the reflective sheeting shall be of a flexible, transparent plastic material and shall be smooth. The backing medium shall be of synthetic sheet resin or other suitable non-cellulosic material. The bonding adhesive shall have no staining effect and shall be mildew resistant. The sheeting shall permit cutting and color processing at temperatures of 60 to 100° F. and relative humidities of twenty (20) to eighty (80) percent. The sheeting shall be heat resistant and permit force curing of unapplied sheeting at temperatures up to 150°F., and up to 200°F. on applied sheeting. The sheeting surface shall be solvent resistant to gasoline, naphtha, mineral spirits, turpentine and methanol.

The reflective sheeting shall be applied to the face of the sign by an approved vacuum applicator using a combination of vacuum and heat, as recommended by the reflective sheeting manufacturer. After aging for forty-eight (48) hours, the adhesive shall produce a durable bond equal to or greater than the strength of the reflective sheeting. No air pocket or bubbles shall exist between the sheeting and the base material.

Repairs to damaged reflective sheeting due to poor workmanship or defective material will not be allowed, items must be replaced.

Reflective sheeting screening coats shall be oven cured as recommended by the reflective sheeting manufacturer.

12-3.1 Splices - Vacuum applied sheeting: There shall be no splices in the reflective sheeting on panels with a minor dimension of forty-eight (48) inches or less. On all rectangular signs with a minor dimension of more than forty-eight (48) inches, the splice shall be horizontal.

No finished sign shall have more than one splice and no splice shall fall within two (2) inches of the sign edge. When splices do occur, the adjoining reflective sheeting shall be color matched under both incident and reflected light.

12-3.2 Edge Sealing - The edges of each completed reflective sheeting sign face and of all cutout letters, numbers, arrows, symbols and borders shall be sealed in a manner and with a sealing solution as recommended by the manufacturer of the reflective sheeting.

12-3.3 Finish - The finished sign shall be flat within a ratio of 0.04 inches per linear foot when measured across the plane of each panel from the opposite corners, or at any location on the panel. All finished signs shall have smooth flat surfaces without defects or objectionable marks of any kind on either the front or back faces.

All letters and designs shall be clearly cut and sharply defined, meeting State Standards.

12-3.4 Legend - The legend shall be of high intensity cutout reflective sheeting applied in the same manner as the reflective sheeting specified herein.

12-3.5 Manufacturer's Identification - The manufacturer's identification shall be according to the State of California Standard Specifications unless otherwise directed by the Engineer.

12-4 Sign Posts - Except as shown on the plans, all traffic signs shall be mounted on two (2) inch inside diameter galvanized iron pipe at a mounting height meeting State Specifications and traffic code standards and as shown on the plans.

All posts shall be set in concrete a minimum of two (2) feet below existing grade level. Minimum diameter of concrete footing for posts installed oustide of sidewalk shall be ten (10) inches.

Signs to be located in existing sidewalk area may be placed by drilling a hole in the sidewalk one inch (1") larger than the diameter of the pole, a minimum of two (2) feet deep; fill the hole with mortar and place the pole in the hole in a plumb position. Top of pipe post should be fitted a screw cap unless a sign or other device will cap said post.

12-5 Inspection - All materials and finished signs are subject to inspection by the Public Service Department and shall be subject to final inspection by the City Engineer. The finished signs shall be clean and free from all router chatter marks, burrs, sharp edges, loose rivets, delaminated reflective sheeting and aluminum marks. Signs with any

defects or damage that would affect their appearance or serviceability will not be acceptable. No repairs shall be made to the face sheet without the approval of the City Inspector. All signs not conforming in all respects to the requirements of these specifications will be rejected and replaced at Contractor's cost.

12-6 Removal and Relocation of Existing Signs - Traffic control signs are to be removed or relocated as shown on the plans.

Existing mountings may be used; however, the Contractor shall furnish, at his expense, additional mountings necessary to complete the reinstallation.

Any damage to the existing traffic control sign during removal and reinstallation shall be repaired by the Contractor at his expense.

12-7 Measurement and Payment - The quantity of each type of sign shown in the bid proposal will be measured in units determined from actual count in place.

The contract unit prices paid for the types of traffic signs shown in the bid proposal shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and placing signs complete in place, including adhesives, backing, bolts, frames, posts, caps, cement and all other costs as shown on the plans as specified in these specifications and the special provisions, and as directed by the Enginer.

PART 2

SECTION 13.
SIGNALS AND LIGHTING

13-1 General - All signals and lighting materials shall conform to the applicable provisions of the standards specified in Section 86 of the State Standard Specifications and these specifications.

13-2 Description - The work shall consist of furnishing and installing, modifying or removing one or more electrical systems, all as shown on the plans and as specified in these specifications and the Special Provisions. Any deviation from the contract documents shall be approved by the Engineer.

All materials furnished and used shall be new, except materials specified to be reused.

All incidental parts which are not shown on the plans, or specified herein or in the Special Provisions, and which are necessary to complete or modify the systems, shall be furnished and installed as though such parts were shown on the plans or specified herein. All systems shall be in satisfactory operation at the time of completion of the work. All work and materials shall conform with the appropriate utility agency standards at Contractor's cost.

13-3 Regulations and Codes - All equipment and work shall be performed in accordance with the regulations and codes as follows: National Electrical Manufacturers Association (NEMA), the Underwriters' Laboratories Inc. (UL), or the Electronic Industries Association ((EIA), wherever applicable. In addition to the requirements of the plans, these specifications, and the Special Provisions, all materials shall conform where applicable to the requirements of the National Electrical Code, hereinafter referred to as the Code; California Administrative Code, Title 8, Subchapter 5, Electrical Safety Orders; Rules for Overhead Electrical Line Construction, General Order No. 95 and Rules For Construction of Underground Electric Supply & Communication Systems, General Order No. 128 of the Public Utilities Commission; Standards of the American Society for Testing and Materials (ASTM); American National Standards Institute (ANSI); Military Specifications (Mil Spec); and any local ordinances which may apply.

13-4 Equipment List and Drawings - Unless otherwise authorized in writing by the Engineer, the Contractor shall, within 10 days following execution of the contract, submit to the Engineer for approval, a list of equipment and materials which he proposes to install. The list shall be complete as to name of manufacturer, size and identifying number of each item. In addition, the Contractor shall submit detailed drawings and wiring diagrams for all electrical equipment to be used. The City will not be liable for any material purchased, labor performed, or delay to the work prior to review of documents required above.

If ordered by the Engineer, the Contractor shall submit for review sample articles of the material proposed for use. After review, said sample articles will be returned to the Contractor.

Upon completion of the work, the Contractor shall submit one complete set of "as-built" or corrected plans showing in detail all construction changes.

13-5 Warranties and Instruction - Manufacturers' warranties and guarantees furnished for materials used in the work and instruction sheets and parts lists supplied with materials shall be delivered to the Engineer prior to acceptance of the project. The duration of the warranty or guarantee shall be the standard of the industy with a minimum of one year from the date of acceptance of the work.

13-6 Maintenance of Existing Systems - Existing electrical systems, or temporary replacements thereof, shall be maintained in effective operation by the Contractor during the progress of the work. The Contractor shall notify the Engineer at least two working days prior to performing work on existing systems.

Temporary wiring as described herein shall not apply to circuits exceeding 150 volts to ground.

Temporary wiring may be either overhead or underground conductors. All temporary overhead conductors shall be slack-spanned with 20-foot minimum overhead clearance across thoroughfares and 12 foot minimum clearance above sidewalk areas. No temporary conductor may run on top of the ground or across any sidewalk area unless adequately protected in an electrical raceway. Overhead conductors shall be multi-conductor cable or single conductors, securely tied or taped at intervals not to exceed 5 feet. No spare conductors are required, All splices within 10 feet above ground level shall be enclosed in metal junction boxes. Splices made at ground level shall be enclosed in pull boxes.

13-7 Electrical Equipment - Electrical equipment shall conform to applicable regulations and codes.

13-7.1 Electroliers - Electroliers shall be as specified in the Special Provisions and as shown on the plans.

13-7.2 Anchor Bolts - Anchor bolts shall be of the type and size as shown on the plans. Anchor bolts shall coform to the specifications of ASTM A307, and shall be provided with 2 nuts and 2 washers each.

Anchor bolts, nuts, and washers shall be galvanized by the hot-dip process conforming to ASTM A153, or cadmium plated with Type NS coating conforming to ASTM A165.

All nuts shall be symmetrically formed with the hole centered and at right angles to the face, tapped to fit a corresponding thread so that nut can be run the entire length of the thread by the fingers without undue forcing, and without noticeable play or rocking.

13-7.3 Conduit - Conduit and conduit fittings shall be galvanized by the hot-dip, electrodepositing, or metallizing process. Galvanized conduit shall conform to standards for rigid steel conduit as specified by Underwriters' Laboratories, Inc., and shall bear the Underwriters' label on each length.

Conduits shall be of the size indicated on the plans. It shall be the option of the Contractor to use larger conduit than that specified, provided that where such substitution is made, it shall be for the entire length of the conduit run. No reducing fittings will be permitted.

The ends of the conduit shall be free of burrs and rough edges.

The maximum bend of a conduit shall be 90° and the minimum radius of a factory bend shall be 12 inches (305mm).

All threads shall be treated with approved joint compound before fittings are placed thereon. Where the galvanized coating of conduit or fittings has been injured in handling or installing, such damaged areas shall be thoroughly painted with a rust preventive paint.

Ends of conduit shall be properly coupled. Running threads, threadless connectors or threadless couplings will not be permitted. Where non-metallic conduit is specified it shall be Schedule 40 PVC when concrete encased or Schedule 80 PVC when direct buried.

13-7.4 Wire - Copper wire shall conform to the applicable portions of ASTM B3 and B8. Wire sizes shall be based on American Wire Gate (AWG).

Conductors for series street lighting systems shall be No. 8 AWG solid copper wire insulated with 0.110 inch thickness Polyethylene insulation. Standard S-61-402 of Insulated Power Cable Engineers Association, and designated for operation at 5,000 volts.

A certificate of compliance with these specifications shall be submitted to the Engineer by the manufacturer with all 5,000-volt series lighting conductors.

Where isolating transformers or ballasts are used, the secondary conductors from transformer to luminaire shall be insulated No. 10 AWG solid copper wire. Multiple-circuit conductors shall be of a size indicated on the plans. Insulation for such conductors shall be rated and UL approved for 600-volt operation, and shall be standard THHN Type. Grounding conductors shall be stranded soft drawn bare copper of the size indicated on the drawings. Insulated ground wires shall be permitted in raceways and shall be THHN Type with green insulating jacket.

The Contractor shall investigate and conform the installation connections to any utility services, shall meet the specifications of the utility agency involved. In case of conflict, the utility specifications shall control and the Contractor shall comply in all respects at no additional cost to the City.

13-8 Construction - Excavation and Backfill: The excavations required for the installation of conduit, foundations and other equipment shall be performed in such a manner as to cause the least possible damage to the streets, sidewalks and other improvements. The trenches shall not be excavated wider than necessary for the proper installation of the electrical equipment or foundations. Excavating shall not be performed until just prior to installation of equipment. The material from the excavation shall be placed in a location to cause the least obstruction to surface drainage and vehicular and pedestrian traffic.

Where excavations are required in parkways and lawns, existing sod shall be removed and preserved by the Contractor. After backfilling, the sod shall be replaced and the entire area restored to original grade and condition or better.

Where excavations are required in concrete sidewalk, cuts and joints shall conform with the applicable provisions regarding concrete.

After backfilling, excavations shall be kept well filled and maintained in a smooth and well-drained condition until permanent repairs are completed.

At the end of each day, and at all other times when construction operations are suspended, all equipment, material and debris shall be removed from that portion of the right of way open for vehicluar and pedestrian traffic. Barricades shall be erected at all excavations not backfilled or finished to final grade. Such shall conform with OSHA requirements.

All excavations, including those resulting from removal of existing equipment as specified or on the plans, shall be backfilled and the surface restored to match existing improvements in conformance with the applicable requirements concerning such work.

The work in the street or highway shall be performed in such a manner that not more than one lane of traffic is restricted in either direction at any time, unless approved by the Engineer.

Foundations: All work shall conform to line elevation and grade as shown on the plans required by the utility or as established by the Engineer.

The foundations shall be constructed in a single placement of concrete of the class specified. The bottom of the foundations shall rest securely on firm, undisturbed ground. When a firm footing cannot be obtained at the depth shown on the plans, or where the foundation cannot be constructed to standard dimensions because of an obstruction, the foundation shall be installed as directed by the Engineer.

Where forms are required because of soil conditions or grade, they shall be true to line and grade, firmly braced and secured in place, and shall not be removed until the concrete has set.

Foundations shall cure for 24 hours before erecting standards and 72 hours before erecting arms. Pile foundations shall cure for 48 hours before erecting standards and 7 days before erecting arms.

Wherever the edge of a concrete foundation extends within 18 inches of any existing concrete improvement, a concrete slab with a minimum thickness of 3 inches shall be extended to meet such improvement.

The foundation cap shall be of similar color, finish and material as the adjacent sidewalk. It shall be a minimum of 3 inches thick and shall be placed after the standard is set in final position.

All anchor bolts, nuts and washers, including those required for existing standards to be relocated, shall be furnished by the Contractor.

13-9 Standards and Steel Pedestals - Plumbing of standards shall be accomplished by adjusting the nuts on the anchor bolts before the foundation cap is placed. Shims or other similar devices for plumbing or raking will not be permitted. After plumbing the standard, anchor bolts shall be cut off 1/4 inch above the nuts and the exposed surfaces shall be repaired with cold galvanizing paint.

Holes left in the shafts of existing standards, due to removal of equipment, shall be repaired by either welding a suitable disc, grinding smooth, and painting as provided for repairing damaged galvanized surfaces elsewhere specified or grouting to match existing texture and color.

13-10 Pull Boxes - Pull boxes shall be installed at the locations shown on the plans or, in long runs, they shall be spaced at not over 200 feet. It shall be the option of the Contractor, at its expense and subject to the approval of the Engineer, to install additional pull boxes that he may desire to facilitate the work.

The bottom of the pull box shall rest firmly on a 12-inch-thick bed of 1-inch crushed rock extending 6 inches beyond the outside edges of the pull box.

Where practical, pull boxes shown in the vicinity of curbs shall be placed adjacent and level with the back of curb. Pull boxes shall be installed with the long side parallel to the curb.

Where ballasts or transformers are installed in a pull box, a pull box extension shall be used.

Pull boxes shall not be installed in any part of a driveway or other traveled way unless otherwise specified.

13-11 Conduit - All conductors shall be run in conduit except where they are inside standards, or for overhead and temporary installations or otherwise specified.

All conduit shall be the rigid galvanized steel type unless otherwise specified.

Detector or telephone interconnect or street lighting conduit shall be 1 inch nominal size. Direct interconnect or utility service conduit shall be 1-1/2 inches nominal size. Traffic signal conduit shall be 2 inches nominal size, except conduit from the standard to an adjacent pull box may be 1-1/2 inches unless otherwise specified.

The Contractor may, at its own expense, use conduit of a larger size than that shown or specified, provided the larger size is used for the entire length of the run. Reducing couplings shall not be used.

Conduit installed on the surface of poles or structures or other exposed locations or in concrete structures and foundations shall be unpainted, except that exposed conduit installed on a painted structure shall be painted the same color as the structure.

The conduit run on the surface of structures shall be secured with galvanized malleable iron clamps spaced not more than 5 feet apart.

Expansion fittings, as detailed on the plans, shall be installed where the conduit crosses an expansion joint in a structure. Each expansion fitting shall be provided with a No. 8 AWG copper bonding jumper.

Conduit shall be placed to a depth of not less than 30 inches nor more than 60 inches below the flow line grade, except that conduit placed behind a curb shall be not less than 14 inches nor more than 36 inches below top of curb; and conduit placed under railroad tracks shall not be less than 36 inches nor more than 60 inches below bottom of ties.

In any case where a different depth is required to meet the controlling utility agency requirements, Contractor shall comply with said utility specifications at no additional cost to the City.

Conduit laid in open trench shall not be covered nor shall any trench or inspection hole be backfilled until the installation has been approved by the Engineer.

Conduit shall be placed under existing pavement by jacking or drilling methods. Pavement shall not be disturbed without permission from the Engineer. Jacking or drilling pits shall be kept 2 feet clear of the edge of any type of pavement wherever possible. Excessive use of water, such that pavement might be undermined, or softened, will not be permitted.

Jacking pits adjacent to railroad tracks shall be constructed not less than 12 feet from the center line of track or as otherwise required by the railroad agency concerned.

When the jacking pit is left overnight, it shall be covered with substantial planking.

Conduit shall be bent without crimping or flattening, and shall have a radius of not less than 6 times the inside diameter of the conduit.

Spare conduit stubs from foundations shall extend at least 6 inches from the face and at least 14 inches below the top of foundation and shall be capped on each end.

The ends of all conduits, whether shop or field cut, shall be reamed to remove burrs and rough edges. Cuts shall be made so that the ends will come together for the full circumference thereof. Slip joints or running threads shall not be used for coupling conduit.

All conduit fittings shall be galvanized steel. Couplings shall be securely tightened to provide a good electrical and mechanical connection throughout the entire length of the conduit run. When a standard coupling cannot be used, a threaded union coupling approved by the Engineer shall be used.

A No. 12 AWG pull wire or equivalent strength cord shall be installed in all conduits which are to receive future conductors. At least 2 feet of pull wire shall be extended beyond each end of the conduit run and secured.

All conduit ends shall be capped until the pulling of conductors is started. When caps are removed, the ends of metallic-type conduit shall be provided with threaded conduit busings.

Conduit shall be blown clean with compressed air prior to installing conductors. In the presence of the Engineer the Contractor may be required to pass a proper size-testing mandrel through all conduit.

Conduits terminating in street lighting standards shall not be transposed and shall terminate as near the door of the standard as possible with the end of the conduit below, but within 1 inch of the lower edge of the door. A line of prolongation of the conduit shall pass through the door opening.

Conduit terminating in traffic signal standards or pedestals shall extend vertically approximately 1 inch above the foundation cap and shall be centered within the bolt circle.

All conduit entering concrete pull boxes shall terminate within 2 to 4 inches inside the box wall and not be less than 2 inches above the bottom nor be less than 5 inches below the top. A line of prolongation of the conduit shall pass through the top of the box. Conduits shall enter from the direction of the run.

All conduit ends in pull boxes and standards shall be securely packed with an approved sealant after conductors are installed.

13-12 Wiring - Wiring shall be done in conformance with all applicable Regulations and Codes and the following additional requirements:

Connectors and terminals for use with aluminum utility power service conductors shall be aluminum and shall be greased with an approved inhibitor.

Where low-voltage conductors are run in standards containing high-voltage conductors, either the low-voltage or the high-voltage conductors shall be encased in flexible or rigid metallic conduit, to a point where the two types of conductors are no longer in the same raceway.

Conductors shall be pulled by hand. Winches or other power-actuated pulling equipment shall not be used. Only approved lubricants may be used in placing conductors in conduit.

Splices shall be made only in pull boxes and standard bases. Conductors shall be joined by the use of a connector approved by the Engineer. The splice shall be capable of satisfactory operation under continuous submersion in water.

Conductor insulation shall be well penciled, trimmed to conical shape, and roughened before applying splice insulation. Splice insulation shall consist of layers of vinyl chloride electrical insulating tape, conforming to ASTM D2301, Type I, applied to a thickness equal to and well lapped over the original insulation.

A total of 2 feet of slack shall be left at each standard, and within each pull box sufficient slack shall be left to extend 18 inches above the top of pull box grade.

Small permanent identification bands shall be marked as specified. The bands shall be securely attached to conductors in pull boxes and near the termination of each conductor. Where circuit and phase are clearly indicated by conductor insulation, bands

need not be used. Permanent identification bands shall be embossed, 6 mil, oil resistant polyvinyl chloride tape with pressure-sensitive backing. Tape shall be of a type such that symbols contrast with the background color.

13-13 Bonding and Grounding - Metallic cable sheaths, metallic conduit, non-metallic conduit grounding wire, ballast and transformer cases, service equipment, sign switches, anchor bolts, and metal standards that form a continuous system shall be effectively grounded. Bonding and grounding jumpers shall be copper wire or copper strap of the same cross-sectional area as No. 8 AWG for all systems, except where noted herein.

Grounding of metallic conduit, service equipment and neutral conductor at service points shall be accomplished as required by the applicable Code and the serving utility, except that grounding conductors shall be No. 6 AWG copper wire.

For bonding purposes in all non-metallic type conduit, a bare No. 8 AWG copper wire shall be run continuously in all circuits.

Bonding of standards shall be acocmplished by means of a No. 8 AWG bonding wire attached from a grounding bushing to a foundaiton bolt or to a 3/16 inch, or larger, brass or bronze bolt installed in the lower portion of the standard.

Bonding of metallic conduit in non-metalic pull boxes shall be by means of copper strap or galvanized grounding bushings and bonding jumpers.

The metallic conduit or bonding conductor system shall be securely grounded, at intervals not to exceed 500 feet, to one of the following:

1) A 1-inch galvanized pipe driven to a depth of 8 feet and having its upper end not more than 3 inches above the conduit, or

2) A minimum 1/2-inch by 8-foot copper weld rod driven to a depth of 7 feet 9 inches.

On wood poles, all equipment mounted less than 10 feet above ground surface shall be grounded.

13-14 Service - The Contractor shall furnish and install all material and equipment necesary to complete the electrical connection between the terminating point of the serving utility and the electrical system as shown on the plans or otherwise required.

13-15 Street Lighting

13-15.1 General - Street lighting construction shall conform to the specifications and plans.

13-15.2 Pull Box Covers - Concrete pull box covers shall be inscribed "STREET LIGHTING" "HIGH VOLTAGE" for circuits over 600 volts. For 120 volt or 480 volt circuits, cover shall be inscribed with the applicable voltage.

13-15.3 Wiring - For series circuit lighting conductor splices, sufficient synthetic oil-resistant rubber tape, conforming to the requirements of ASTM D119, shall be applied over the conductor to fill all voids before placing the vinyl chloride tape specified herein and then be well covered with a coating of approved insulating paint or similar material.

For multiple circuits, an approved fused disconnect splice connector shall be installed in each ungrounded conductor between the line and the ballast. The connector shall be installed in the base of the luminaire standard or in an adjacent pull box and be readily accessible.

13-15.4 Service - For series street lighting systems served from overhead circuits, a switch of 5,000-volt rating shall be connected to control each circuit. The switch shall be enclosed in a NEMA Type 3R, 18-inch by 24-inch by 6-inch terminal box. The terminal box shall be fitted with a cover permanently inscribed "DANGER - HIGH VOLTAGE". The cover shall be attached to the box to form a rain-tight plate and shall require tools for removal. The terminal box shall be installed not less than 10 feet above the ground.

13-16 Traffic Signals

13-16.1 General - Traffic signal construction shall conform to the plans and specifications.

13-16.2 Temporary Signal Systems - Temporary traffic signal heads shall provide a minimum of 2 clearly visible signal faces for traffic from each direction, one being adjacent to the left side of the traveled way and one being adjacent ot the right side of the traveled way. The exact location and any additional signal faces shall be determined by the Engineer. All temporary signals shall be securely mounted at approximately a 10 foot height on wood poles, platform standards, or semi-permanent structures. Mast arms, where required, shall provide a minimum clearance of 17 feet from the traveled way to the bottom of the signal. All primary and mast arm signals shall have backplates. All mast arm signals and arrow indications shall be 12-inch size and other signals shall be 8-inch size.

When traffic signal shutdown is permitted by the Engineer, it will be for a two hour period between 9 a.m. and 2 p.m. Work necessitating longer periods of time may be authorized by the Engineer. Preliminary work associated with the shutdown shall be done prior to the actual shutdown in order to minimize the amount of time necessary for the completion of the work. Sufficient manpower and equipment shall be employed by the Contractor to minimize the shutdown period. Once a shutdown is effected, all work shall be diligently pursued without interruption until the signals are back in normal operation. Delays in effecting the shutdown by the Engineer shall not constitute shutdown time for the Contractor.

In all cases, shutdown flashing operation, and turn-on must be requested at least 24 hours in advance and must be approved by the Engineer.

Contractor shall provide flagmen where necessary to handle traffic safely.

13-16.3 Controller Cabinet Wiring Diagrams - Prior to acceptance of the work, the Contractor shall furnish 5 sets of traffic signal controller cabinet schematic wiring diagrams which shall have the same phase designations required or as shown on the plans

for the intersection. The diagrams shall show the location of the installation and shall list all equipment installed in each cabinet. In addition, for each signal installation, the Contractor shall furnish an intersection sketch showing standards, detectors and phasing. One copy of the controller cabinet diagram and the intersection and phase diagram, as reviewed by the Engineer, shall be placed in a heavy-duty plastic envelope and attached to the inside of the door of each controller cabinet.

13-16.4 Pull Box Covers - Concrete pull box covers to be installed in signal systems, or combined signal and low voltage lighting systems, shall be inscribed "TRAFFIC SIGNALS". Concrete pull box covers for underground service points, where both traffic signals and street lighting jointly occupy the same box, shall be inscribed "TS-SL".

13-16.5 Wiring - Sufficient conductors shall be provided to perform the functional operation of the signal system and 3 spare No. 14 AWG conductors shall be provided throughout the signal light system. End of spare conductors shall be doubled back and taped.

The neutral for pedestrian push bottom circuits shall be separate from the signal light circuit neutral.

Interconnect conductors shall be continuous from controller to controller unless splices are specifically authorized by the Engineer. Splices shall be made only in pull boxes.

Where telephone circuits are installed adjacent to other electrical circuits, the telephone conductors shall be encased in UL approved metallic conduit to prevent electrical interference..

Wiring entering controller cabinets shall be neatly arranged laced and labeled.

All stranded conductors shall be terminated with approved terminal lugs.

13-16.6 Signal Heads - All new vehicle signal heads installed at any one intersection shall be of the same style and from the same manufacturer, except for programmed visibility heads.

All mast arm and arrow indications shall be 12-inch. All other signal indications shall be 8-inch. Visors are required on all signal heads.

Backplates shall be installed where shown on the plans. All pedestrian heads shall have a device approved by the Engineer to reduce sun glare.

Signal heads shall not be installed at any intersection until all other signal equipment, including the controller, is in place and ready for operation at thtat intersection, except that signal heads may be mounted if the faces are turned away from traffic or are covered.

Signal heads shall be located and aimed as shown on the plans or as directed by the Engineer. Mounting and location on standards shall be as shown or as directed by the Engineer.

13-16.7 Signal Head Mountings - Heads shall be supported by assemblies of 1-1/2-inch standard steel pipes with malleable iron or bronze fittings. All assemblies shall be installed plumb or level, as appicable, shall be symmetrically arranged, and securely tightened. Top horizontal members shall be approximately 12 inches in length. Construction shall be such that all conductors are concealed within standards or pipe assemblies.

Unless otherwise specified herein or on the plans, heads shall be installed with terminal compartment mountings. For top mounting of a one-way head and mast arm mountings, a slip-fitter without a terminal compartment shall be used. Clamp-type mounting may be used for installation of heads on existing concrete standards if inserts for terminal compartment mounting have not been provided. The terminal compartment shall be mounted on the standard on the side away from traffic and parallel with the prolongation of the nearest curb face.

13-16.8 Directional Louvers - Where shown on the plans or standard drawings, louvers shall be furnished and installed in the visors of the signal head sections designated.

13-16.9 Vehicle Detectors - General: Vehicle detectors shall be of the type or types shown on the plans. The location of each detector shall be as shown on the plan or as directed by the Engineer.

13-16.10 Sensor Units - A minimum of at least one sensor unit shall be provided for each approach for each separately controlled phase of operation unless otherwise specified. Sensor units shall be housed in the controller cabinet unless otherwise specified.

13-16.11 Inductive Loops - Detector loops shall conform to the following:

1) Detector loops, and their leads to the nearest pull box, shall be formed from a continuous conductor of No. 12 AWG solid or seven-strand minimum tinned copper wire, having 600-volt type USE cross-linked polyethylene insulation with a minimum thickness or 3/64 inch.

   The 2 leads for each loop shall be installed as a pair in a common saw slot. The detector loop leads may share a common saw slot with leads from other detector loops. However, the detector loop leads shall not cross any loops and shall not be installed within 20 inches of any other loop. The lead in cable shall consist of No. 21 AWG-UF twisted pair and be continuous from the pull box where connnections are made to the inductive detector loops to the cabinet containing the sensor units for the loops.

2) The Contractor shall make continuity and insulation resistance tests after installation on both inductive detector loops and lead-in cables. The measurement shall be made using the conduit system as ground and with the shield (if any) of the lead-in grounded.

   Slots 1/4-inch minimum width shall be cut in the pavement, blown clean and dried before installing inductive loop detectors. 18-inch corner cutoffs shall be provided on all loops.

After conductors are installed in the slots cut in the pavement, the slots shall be filled with epoxy sealant, "Epoxy Sealant for Inductive Loops (State Specification 8040-01E-06", to within 1/8 inch of the pavement surface. The sealant shall be at least 1/2 inch (13mm) thick above the top conductor in the saw cut. Before setting, surplus sealant shall be removed from the adjacent road surfaces without the use of solvents.

The loops shall be joined in the pull box in combination of series and parallel so that optimum sensitivity is obtained at the sensor unit. Final splices between loops and lead-in cable shall not be made until the operation of the loops under actual traffic conditions is approved by the Engineer.

13-17 Magnetometer Detectors - All magnetometer detectors to be installed at a particular intersection shall be of the same make and type.

Where an existing system is being modified and existing magnetometer detectors are to remain in use, new detection equipment shall be the same make and type as the existing, or approved alternate.

A separate channel shall be provided for each lane. Separate control units shall be provided for each approach.

A separate cable shall be provided for each magnetometer sensing element placed in the pavement. The cable shall be run continuously (without splices) to the lead-in cable.

The sensing elements shall be placed in vertically cut holes in the roadway at locations shown on the plans. Each hole shall be of a diameter large enough to accept the particular type of sensing element being used, with adequate space for the lead-in conductor cable. Holes shall be cut to a depth sufficient to provide a mounting depth of the sensing element as recommended by the manufacturer of the units provided.

Slots, 1/4 inch minimum width by 1 inch minimum depth, shall be cut in the pavement between the sensing element holes and the nearest pull box for the lead-in conductor cables.

Slots and holes cut in the pavement shall be blown clean and dried before installing lead-in conductor cables and sensing elements.

The sensing elements shall be placed in the bottom of the holes, in a vertical position, and the holes shall be filled with clean dry sand to approximately 3 inches below the pavement surface.

The epoxy sealant for the slots and holes shall be State Specification 8040-01E-06 and the holes shall be filled with the epoxy sealant.

13-17.1 Pedestrian Push Buttons - Pedestrian push buttons and signs shall be installed on the crosswalk side of the standard unless otherwise specified.

13-17.2 Controller Slab - In unpaved areas, a 4-inch thick Portland cement concrete slab shall be constructed in front of each controller cabinet. The slab shall extend the full width of the cabinet foundation and extend out 3 feet from the face of said foundation.

13-18 Inspection and Testing

13-18.1 General - Inspection or sampling of certain materials may be made at the factory or warehouse prior to delivery to the jobsite, when required by the Engineer.

13-18.2 Testing - Prior to acceptance to the completed work, the Contractor shall cause the following tests to be made on all electrical circuits, in the presence of the Engineer.

13-18.3 Continuity - Each circuit shall be tested for continuity.

13-18.4 Ground - Each circuit shall be tested for unintentional ground.

13-18.5 Megger - A megger test at 500 volts DC shall be made on each circuit between the circuit and a ground. The insulation resistance shall be not less than 10 megohms on all circuits, except for inductive loop detector circuits which shall have an insulation resistance value of not less than 100 megohms.

13-18.6 Functional - A functional test shall be made in which it is demonstrated that each and every part of the system functions as specified or intended. The test may commence only with the approval and in the presence of the Engineer.

The functional test for each new or modified electrical system shall consist of not less than 5 days of continuous, satisfactory operation. If unsatisfactory performance of the systems develops the condition shall be corrected and the test shall be repeated until the 5 days of continuous satisfactory operation are obtained.

Functional tests shall not start nor turn-ons be made on a Friday, or on the day preceding a legal holiday.

13-18.7 Faults - Any material revealed by these tests to be faulty in any part of the installation shall be replaced or corrected by the Contractor at his expense in a manner permitted by the Engineer, and the same test shall be repeated until no fault is evident.

13-19 Painting - All painted equipment which has been relocated shall be repainted. All paint used on the jobsite shall be provided in the original container identifying the grade, trade name, number and manufacturer, and shall coform to the requirements of specifications on painting.

All paint shall be applied evenly and smoothly by skilled craftsmen by either hand brushing or approved spraying equipment, allowing no surplus to accumulate, except that no spraying shall be done at the jobsite. The work shall be done in a neat and workmanlike manner, and the use of brushes for the application of paint shall be required when paint spraying proves to be unsatisfactory or otherwise objectionable.

The thickness of each paint coat (two required) shall be limited to that which will result in uniform drying throughout the paint film. Skips, holidays, thin areas, or other deficiencies in any one coat of paint shall be corrected before the succeeding coat is aplied.

The final coat of paint shall present a smooth surface, uniform in color, free of runs, sags or excessive brush marks.

13-20 Salvage - Unless otherwise specicified, conductors, standards, electrical equipment, and foundations not to be reused shall become the property of the Contractor and shall be removed from the jobsite. Any salvage value shall be reflected in the bid. All conduit abandoned in place shall be terminated at least 12 inches below the finished grade.

Care shall be exercised in removing equipment to be reused or salvaged so that it will remain in the condition existing prior to its removal. The Contractor will be required to replace, at its expense, any equipment which has been damaged or destroyed by its operations.

13-21 Measurement and Payment - The lump sum price or prices bid for traffic signals, flashing beacon systems, highway lighting systems, pedestrian structure lighting systems, sign illumination systems, lighting systems on structures, traffic count stations, communication conduit, or combinations thereof, modifying systems, temporary systems, removing systems, or the unit prices bid for various units of said systems shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing, modifying, or removing the systems or combinations thereof as shown on the plans, and as specified in these specifications and the Special Provisions, and as directed by the Engineer, including any necessary pull boxes; excavation and backfill; concrete foundations (including cast-in-drilled-hole concrete piles unless shown as a separate contract item); restoring sidewalk, pavement and appurtenances damaged or destroyed during construction; salvaging existing materials; and making all required tests and corrections.

Full compensation for all additional materials and labor, not shown on the plans or specified, which are necessary to complete the installation of the various systems, shall be considered as included in the prices paid for the systems, or units thereof, and no additional compensation will be allowed therefor.

Full compensation for concrete pile foundations shall be considered as included in the contract lump sum price paid for the item requiring foundations and no separate payment wil be made therefor.

Full compensation for furnishing, installing, maintaining and removing falsework lighting equipment shall be considered as included in the contract prices paid for the items of work involved in the structure which requires the falsework lighting and no additional compensation will be allowed therefor.

PART 2

SECTION 14.
MISCELLANEOUS WOOD AND METAL

14-1 Lumber and Plywood - Kinds.

14-1.1 General - Structural lumber shall be of the kinds and grades indicated on the plans or in the Special Provisions. Proper allowance for shrinkage in the lumber shall be made by the Contractor where it is necessary to meet definite dimensions shown on the drawings. All sizes shown on the plans or specified in the Special Provisions applying to lumber and timber refer to nominal sizes. Rough and dressed sizes shall conform to the sizes set forth in the American Lumber Standards.

14-1.2 Douglas Fir - Unless otherwise specified, all lumber shall be Douglas fir and shall be selected as to grade and shall conform in all particulars to the Standard Grading Rules for Western Lumber, published by the Western Wood Products Association and approved by the American Lumber Standards Committee.

14-1.3 Redwood - Redwood lumber shall conform in all particulars to the Standard Specifications for Grades of California Redwood of the Redwood Inspection Service.

14-1.4 Plywood - Plywood shall be manufactured and graded in accordance with the rules of the American Plywood Association and the latest Product Standard for Softwood Plywood, Construction and Industrial, of the National Bureau of Standards.

14-1.5 Lumber Uses and Grades - Unless otherwise specified, lumber quality for the uses listed shall not be less than the following grades:

Uses	Grades
Major permanent construction, such as bridges.	"Select Structural" for main structural members. "No. 1" for beams, stringers, joists, and planks. "Select Structural" when redwood is specified.
Minor permanent construction, such as bulkheads, retaining structures, headers for bituminous pavement, wooden warning rails, posts for metal beam guard rails.	"No. 1" for posts, joists, and planks. "Construction" for boards.
Wooden warning rail posts, guide posts, sight posts.	"Select Structural" redwood (No. 1 grade Douglas fir optional for wooden warning rail posts.)
Studs, headers, and wales for form-work. Form sheathing for non-showing surfaces of concrete.	"Standard," "No. 4 Common," or "No. 3"; any exterior-type grade of plywood optional for form sheathing.
All exposed surfaces of bridges, viaducts, and overcrossings; soffits and sides of beams and girders; slabs	"Exterior B-B" (concrete form) grade of plywood.

between beams and girders; headwalls and endwalls of culverts or covered conduits; form sheathing for showing surfaces of retaining walls, channel walls, etc.

14-1.6 Grade Marking

Lumber: All lumber shall be grade marked by a lumber grading agency certified by the American Lumber Standards Committee.

Plywood: Each sheet of plywood shall bear the official stamp of a quality control agency stating the grade of the sheet.

14-2 Preservatives - General: Lumber and timber or piling to be treated shall conform to the requirements of the various sections of these specifications.

All preservatives used shall comply with the applicable standards contained in the Manual of Recommended Practice of the American Wood Preservers' Association (AWPA).

Where practical, wood to be treated shall be cut to final size, trimmed, and have all holes drilled prior to treatment. All piling shall be machine peeled prior to treatment and shall have a minimum of 1 inch of sapwood.

Wood shall be conditioned, seasoned, prepared and treated by pressure process in accordance with the applicable standards contained in the AWPA Manual.

Wood measuring 3 inches or more in thickness shall be incised on all four sides by a machine having power driven rolls designed to incise to a uniform depth. The incisor teeth shall be either wedge-shaped or chisel-shaped with sharp points and edges so designed that, upon entering and leaving the wood, a separation and spreading of the fibers is accomplished.

14-2.1 Wood Preservatives - General: The preservative used shall be creosote except when one of the following water-borne salt preservatives is specified.

Chromated Zinc Chloride (CZC)
Tanalith (Wolman Salts)
Ammoniacal Copper Arsenite (Chemonite)
Chromated Zinc Arsenate (Boliden Salt)

Retention and Penetration for Creosote Treated Wood: The minimum amount of preservative to be retained in the wood and the depth of penetration shall be as shown in the following table:

	Land Use		Marine Use	
	lbs/cf	Depth	lbs/cf	Depth
Lumber and Timber	8*	5/8"	16	3/4"
Piles	12	3/4"	16	1"

* Empty Cell Process

Field Treatment of Cut Surfaces: When sawing or drilling is necessary after plant treatment, the cut surfaces shall be thoroughly brushed with two coats of the same kind of preservative in conformance with AWPA Specification M-4. The maximum protection requirement specified therein shall be met in all instances.

14-2.2 Inspection - All materials treated shall be subject to inspection. Defects that develop as a result of the treating operation may be cause for rejection.

Test cores to determine the depth of penetration shall be taken in frequency and locations determined by the Engineer. Penetration shall be measured radially or at right angles to the surface bored. After treatment with the preservative and prior to removal from the treating yard, the holes shall be swabbed with the same preservative used at the plant and filled with tight fitting, treated plugs.

All facilities and supplies that may be required for testing, marking, and for ascertaining compliance with the provisions of this specification, shall be furnished by the treating plant for use by the Engineer.

14-2.3 Marking - Each accepted pile and piece of lumber or timber shall be stamped with a readily legible stamp which will make an impression in the wood indicating acceptance by the Agency. This shall be done after treatment but before shipment. Piles shall be stamped on the butt end; lumber and timber shall be stamped on one end.

Upon request of the Engineer, a true impression of the stamp shall be delivered to the Engineer before delivery of the treated material, together with an itemized report of all lumber and piles inspected, giving temperatures, amount and grade of preservatives, time of treatment, lengths and sizes of material, total footage, and other pertinent data. Treated material which does not bear the stamp of the inspection in legible form will be rejected.

14-2.4 Handling and Protection of Treated Materials - In handling treated material, care shall be exercised so as not to damage the edges or abrade the surfaces to the extent of reducing the depth of treated wood or exposing any wood not penetrated by the preservative. The use of cant hooks, peavies, or sharp pointed tools, etc., for the handling of treated lumber, and the use of metal slings without protective guards will not be permitted.

Material that is stored on the site of work prior to its use shall be piled neatly on skids to raise it from the ground, and shall be protected from the sun and weather when required by the Engineer.

14-3 Piles - Piles shall be as shown and specified in the Special Provisions.

14-4 Miscellaneous Metal

14-4.1 General - All steel, the class of which is not definitely designated herein, in the Special Provisions, or on the plans, shall be structural steel and shall conform to the requirements of ASTM A36. Steel manufactured by the acid Bessemer process shall not be used.

14-4.2 Certification - The Contractor shall furnish to the Engineer, before fabrication, a mill certified report (in duplicate) of the tests for each heat of steel or iron from which the material is to be fabricated. The certification shall contain the results of chemical and physical tests required by the ASTM specifications for the materials.

Additional Tests: The City reserves the right to require or make additional mill and laboratory tests. The number of such additional tests will be limited as follows, except that in the case of failure of the material to comply with the ASTM requirements, more tests may be made or the material rejected:

1)	Structural steel	- One complete test for each heat number or each 10 tons of identifiable stock.
2)	Rivets	- One complete test for each size.
3)	Bolts	- One complete test for each lot.

"Identifiable stock" is material for which authentic records of the chemical and physical properties are available.

Test specimens shall be furnished, cut, and machined in accordance with the ASTM specifications for the material to be tested, as referred to herein.

14-4.3 Stock Material - When the Contractor proposes to use material already in stock, he shall notify the Engineer of such intention at least 10 days in advance of beginning fabrication.

14-4.4 Mill Tolerances - Rolling and cutting tolerances, permissible variations in weight and dimensions, defects, and imperfections shall not exceed the limits contained in ASTM A6.

14-5 Structural Steel

14-5.1 Stock Materials - The Contractor shall select the material intended for use from stock and place it in a location apart from other stock material and accessible for inspecting and sampling. The Contractor shall select the material from as few heat numbers as possible and shall furnish certified mill test reports for each of the heat numbers. Two samples shall be taken by the Engineer from each heat number; one for the tension test and one for the cold-bend test. If the heat numbers cannot be identified, the Engineer may select random test specimens from the unidentifiable heats.

14-5.2 High Strength Low-Alloy Structural Steel - The material shall conform to the requirements of ASTM A242, A440, A441, A606, A607, or A446 (Grades C, D, or E) as specified.

14-5.3 Copper Bearing Structural Steel - Copper bearing, structural steel shall conform to the requirements of ASTM A36, A245, A440, A446, or A570 as specified.

14-6 Rivets

14-6.1 Stock Material - Rivets taken from identifiable stock may be accepted by the Engineer based on certified mill test reports.

Rivets from unidentified stock shall not be used except where shown on the shop drawings.

14-6.2 High Strength Structural Steel Rivets - The material shall conform to the requirements of ASTM A502.

14-6.3 Structural Steel Rivets - The material shall conform to the requirements of ASTM A502, except that the test specimen shall be bent upon itself when performing the bend test.

14-7 Bolts

14-7.1 Unfinished Bolts - The bolts shall have square heads and square nuts unless otherwise specified. The bolts shall be long enough to extend entirely through the nut but not more than 1/4 inch beyond. Washers shall be furnished unless specified.

Bolts shall be of steel conforming to the requirements of ASTM A307.

14-7.2 High Strength Bolts - High strength bolts shall conform to the provisions of ASTM A325.

14-7.3 Anchor Bolts - Anchor bolts shall be manufactured from steel conforming to ASTM A36 or A307.

14-7.4 Mild Steel Forgings for Structural Purposes - Steel forgings shall conform to the requirements of ASTM A325. They shall be Class C forgings with a maximum carbon content of 0.35 percent and shall be given a thorough annealing. The metal shall have a minimum Brinell hardness of 130 and a maximum of 190, when tested in accordance with ASTM E10.

14-8 Steel Castings

14-8.1 General - Steel castings shall be true to pattern in form and dimension and free from defects that would affect the service value of the casting. Minor defects which do not impair the strength of a casting may be repaired with the approval of the Engineer. Castings which have been repaired without the permission of the Engineer may be rejected.

Chemical analysis shall be performed in accordance with ASTM E30.

14-8.2 Test Specimens - When required by the Agency, test coupons shall be poured monolithically with the castings. If, in the opinion of the manufacturer, the design of the casting is such that test coupons should not be attached thereto, the test coupons shall be cast attached to separate blocks. Two coupons shall be cast to represent each lot. A lot shall be considered as all castings from a melt which constitutes part or all of a charge. Coupons shall remain attached until properly identified by the Engineer. Where test coupons are cast separately from the castings, the Engineer shall be notified of the time of pouring so as to permit him to identify both coupons and castings. Coupons cast separately from the castings shall not be detached from the block to which they are fastened until identified by the Engineer.

Test specimens shall be furnished and machined in accordance with ASTM A370 at the Contractor's expense.

If the results of the tests for any lot do not conform to the requirements specified, the entire lot shall be rejected.

14-8.3 High Strength Steel Castings for Structural Purposes - Castings shall conform to ASTM A148, Grade 80-50, except that the steel shall contain not less than 0.60 percent of manganese and not less than 0.20 percent of silicon.

14-8.4 Mild-to-Medium Carbon-Steel Castings for General Application - Castings shall conform to ASTM A27, Grade 65-35. The metal shall have a minimum Brinell hardness number of 130 when tested in accordance with ASTM E10.

14-9 Gray Iron Castings

14-9.1 General - Gray iron castings shall be true to pattern in form and dimension and free from defects that would affect the service value of the casting. Minor defects may be repaired with the approval of the Engineer. Castings which have been repaired without the permission of the Engineer may be rejected. Castings that show injurious defects revealed by X-ray or machining operations will be rejected.

The casting shall be filleted boldly at angles, and the arrises shall be sharp and true.

Before the castings are removed from the foundry, they shall be thoroughly cleaned and the parting lines, gates, and risers ground flush.

All castings not specifically classified shall conform to the requirements of ASTM A48, Class 30.

14-9.2 Testing Requirements - Testing shall be performed in accordance with ASTM A48.

The Engineer shall be notified of the time a melt is to be poured to permit identification of both coupons and castings. The test specimens shall be provided and machined by the manufacturer to the dimensions specified for Specimen B of ASTM A48 at the Contractor's expense.

14-9.3 Manhole Frame and Cover Sets - Castings shall conform to ASTM A48, Class 35. The bearing surfaces of the frames and covers shall be machined and the cover shall seat firmly into the frame without rocking.

14-9.4 Railings, Railing Posts, and Wheel Guards - Castings shall conform to ASTM A48, Class 40.

14-9.5 Rockers, Rocker Plate Bearings, and Bearing Plates for Bridges - Castings shall conform to ASTM A48, Class 50.

Castings shall be machined and finished as required by the Engineer.

14-9.6 Asphalt Coating - Unless otherwise specified, castings shall be painted or dipped in a commercial quality asphalt paint.

14-10 Bronze Castings

14-10.1 General - Bronze castings shall be true to pattern in form and dimension and free from defects that would affect the service value of the casting. Minor defects may be repaired with the approval of the Engineer. Castings which have been repaired without the permission of the Engineer may be rejected. Castings that show injurious defects revealed by machining operations or by X-ray will be rejected.

14-10.2 Testing Requirements - Chemical analysis shall be made in accordance with ASTM E54.

14-10.3 Expansion and Bearing Plates - Expansion and bearing plates shall conform to the requirements of ASTM B22, Alloy C. The sliding contact faces shall be machined smooth to true planes. If practicable, one plate shall be machined at right angles to the other plate in the set.

14-10.4 Ornamental Tablets and Miscellaneous Castings - Ornamental tablets, railings, miscellaneous ornaments and fixtures shall conform to the chemical requirements of ASTM B143, Alloy 1B.

The letters shall be heavily raised and spaced carefully to secure a uniform and balanced effect over the entire area of the panel. The background of the letter panel shall have a finely pebbled surface. The model of the tablet shall be submitted to the Engineer for approval before castings are made.

Castings shall be boldly filleted at angles, and the arrises shall be sharp and true.

The faces and edges of all lettering and ornaments shall be tooled sharp and clean. Beveled edges shall be tooled smooth and true. Outside borders shall be straight and true and shall be thoroughly polished. Filing and other tool marks shall be removed.

Ornaments, lettering, and the beveled edges shall be given a fine satin hand finish. Lettering, bevels, and rosettes shall be highlighted; leaves and scrolls slightly highlighted, but well polished. The pebble background shall be finished in dark statuary bronze and polished.

14-11 Metal Railings

14-11.1 Metal Hand Railings Materials - Steel railings materials shall be welded or seamless steel pipe conforming to the requirements of ASTM A120, structural steel conforming to ASTM A36, or tubular sections of hot rolled mild steel, conforming to ASTM A501.

The base metal for aluminum railing shall be ASA alloy designation 6063-T6. Pipe and tubing shall be extruded conforming to the requirements of ASTM B429, plates and sheets shall be rolled conforming to ASTM B209, and rods, bars or shapes shall be extruded conforming to ASTM B221.

14-11.2 Flexible Metal Guardrail Materials - Unless otherwise provided on the plans or in the Special Provisions, materials and construction for the railings shall conform to the following requirements:

The rail elements, terminal sections, bolts, nuts, and other fittings shall conform to the specifications of AASHTO M-180, except as modified in this subsection. The edges and center of the rail element shall contact each post or block. Rail element joints shall be lapped not less than 12-1/2 inches and bolted. The rail metal shall be open hearth, oxygen furnace, or electric furnace steel and, in addition to conforming to the requirements of AASHTO M-180, shall withstand without cracking, a cold bend of 180° around a mandrel of a diameter equal to 2-1/2 times the thickness of the plate.

Two certified copies of mill test reports of each heat, from which the rail element is formed, shall be furnished to the Engineer.

The ends of each length of railing shall be fitted with terminal sections.

Workmanship shall be equivalent to commercial practice and all edges, bolt holes and surfaces shall be free of torn metal, burrs, sharp edges and protrusions.

Bolts shall have shoulders of such shape that will prevent them from turning.

Rail elements shall be fabricated for splicing at wood posts at intervals not to exceed 12 feet, 6 inches.

The rail element shall have full bearing at joints. When the radius of curvature is 150 feet or less, the rail element shall be shaped in the shop.

Railing parts furnished under these specifications shall be interchangeable with similar parts regardless of source.

Posts, including blocks, shall be "Construction" grade, Douglas fir, free of heart center.

The posts and blocks shall be pressure treated after fabrication with creosote, creosote-coal tar solution, creosote-petroleum solution (50-50), pentachlorophenol (oil borne), or copper-naphthenate (oil borne).

14-12 Chain Link Fence

14-12.1 General - All materials and fittings shall be new, and all ferrous materials shall be galvanized. The base material for the manufacture of steel pipe used for posts, braces, top rail, and gate frames shall conform to the requirements of ASTM A120, and the base material for the manufacture of other steel sections used for posts and braces shall be commercial quality, weldable steel.

14-12.2 Materials - Materials shall be as shown in Section 80 of the State Specifications.

14-12.3 Chain Link Fabric - Chain link fabric shall conform to the requirements of ASTM A392. The fabric shall be 11-gage for all fence 60 inches or less in height and shall be 9-gage for all fence over 60 inches in height unless otherwise specified.

All chain link fabric shall be woven into approximately 2-inch mesh and galvanized after fabrication. Fabric less than 60 inches wide shall have knuckled finish on the top edge and bottom edge.

Barbed wire shall be installed on the fence only when specifically required by the plans or project specifications.

14-12.4 Tension Wires and Fabric Ties - Tension wires shall be at least 7-gage galvanized coil spring steel wire.

Ties used to fasten the fabric to posts, rails, and gate frames shall be not smaller than 11-gage galvanized steel, 6-gage aluminum wire, or approved non-corrosive metal bands.

Tension bars used in fastening fabric to end and corner posts and gate frames shall be galvanized high carbon steel bars not smaller than 3/16 x 3/4 inch.

14-12.5 Truss or Tension Rods - Truss or tension rods used in trussing gate frames and line posts adjacent to end, corner, slope, or gate posts shall be adjustable 3/8-inch diameter galvanized steel rod. When used in trussing line posts, adjustment shall be provided by means of galvanized turnbuckles or other suitable tightening devices.

14-12.6 Fittings - All required fittings and hardware shall be galvanized.

Couplings to connect the individual lengths of top rail shall be of the outside sleeve type and at least 7 inches long. The bore of the sleeves shall be sufficiently true to maintain adjacent lengths of rail in alignment.

Extension arms for barbed wire shall be of a type that can be attached to the tops of the posts and carry three wires at approximately 5-1/2-inch centers in a plane approximately 45 degrees from the vertical, inclined as shown on the plans or as directed by the Engineer.

14-12.7 Barbed Wire - Barbed wire shall be 4-point pattern, composed of two strands of 12-1/2-gage galvanized steel wire with barbs spaced 5 inches apart and shall coform to ASTM A121.

14-12.8 Repair of Damaged Coatings - All welds made after galvanizing shall be ground smooth and wire brushed to remove loose or burned zinc coating, after which the cleaned areas shall be prepared and neatly coated with 50-50 solder. Repairs to abraded or otherwise damaged zinc coating shall be made in a similar manner.

14-13 Construction - The construction of items using wood or metal shall conform to the plans, specifications, Special Provisions and appropriate industry standards covering the items involved.

14-14 Measurement and Payment - The measurement of the items requiring or utilizing the wood or metal items shall be basis of measurement for payment. No separate measurement shall be made for elements or accessories unless specified in the Special Provisions.

Payment shall be at the price bid for the item using or requiring the miscellaneous wood or metal and such price bid shall include full compensation for all processing, treating, coating, fabrication, erecting, furnishing, installing and any and all costs of whatever nature to complete the various items of work and no additional compensation shall be made therefor.

PART 2

SECTION 15.
LANDSCAPING AND IRRIGATION

15-1 General - Contractor shall furnish all labor, equipment, materials, sevice, and incidentals necessary for the completion of planting and irrigation work in accordance with the applicable provisions of Section 20 of the State Specifications, as shown on the plans and as specified herein.

15-2 Protection - Contractor shall provide necessary safeguards and shall exercise caution against injury or defacement of any existing site improvements and plantings. Contractor shall be responsible for any damage resulting from his operations and shall repair or replace such damage at his own expense. No trucks or vehicles of any kind shall be allowed to pass over sidewalks, curbs, etc., unless adequate protection is provided.

15-3 Grading - Contractor shall be responsible for maintaining finish grades in all planting areas, and for executing any fine grading as may be necessary or incidental to all planting operations.

15-4 Soil and Soil Treatment

15-4.1 Topsoil - On-site topsoil capable of sustaining healthy plant life without admixture of subsoil, free from rocks, sticks, and other foreign matter.

15-4.2 Commercial Fertilizer - Controlled release commercial fertilizer (18-12-6) shall be used for turf and groundcover, as specified on the plans and in these provisions. Fertilizer shall be in granular form.

15-4.3 Soil Amendment - Nitrified redwood or cedar (1-0-0) sawdust, well aged, shall be used as soil amendment for turf, groundcover, and tree and shrub planting as specified on the plans and in these provisions.

15-4.4 Planting Tablets shall be "Agriform" 20-10-5 composition, slow release, 21 gram in weight.

15-4.5 Bark Mulch - 3/4" maximum size "Vita Bark" "ground cover size" or approved equal. In no case shall the maximum size be larger than 3/4".

15-5 Staking of Trees - As detailed on the plans.

15-6 Miscellaneous Plant Requirements - Quality and size shall conform to the State of California Grading Code of Nursery Stock, No. 1 Grade. Nursery-grown stock only shall be used. Secure Engineer's approval for quality and size of all plant materials.

Measurements shall be as shown; where not shown, shall be of uniform and standard size - neither overgrown and root bound nor too recently canned so that the root system is not thoroughly established throughout the can. Pruning shall not be done prior to delivery except by approval.

Contractor shall be responsible for the plants delivered and approved by the Engineer. Inspection of plant materials may occur at any time before and during progress of the work. Rejected plants shall be removed from the site immediately.

Contractor shall adequately protect plants from sun, wind, on-site, in transit, and in storage.

Plant label shall identify each plant by specie and variety. Substitutions are not permitted without permission. Requests for substitution shall be made at least thirty (30) days prior to planting.

Quantities necessary to complete the work as shown in detail on the drawings shall be furnished. Quantities shown on Plant List are approximate only and shown for convenience of the Contractor.

15-6.1 Freedom from Pests - All plants shall meet the specifications of Federal, State and County regulations requiring inspection for plant diseases, insects, noxious weeds, other pests and abnormalities. Any inspection certificates required by law must accompany each shipment, invoice, manifest, or order of stock. Upon arrival at delivery point, the necessary nursery stock certificates of inspection shall be delivered to the Engineer.

15-6.2 Freedom from Root Defects - All plants shall have healthy, vigorous root systems free from serious kinking, circling, potbinding, damage or other defects, to be determined by inspection by the Engineer at the time of delivery.

Container-grown plants shall meet each of the following:

1) Sufficient root development: When carefully lifted by the trunk, the trunk shall rise not more than one inch (1") before the soil surface of the rootball begins to rise.

2) When unsupported, the trunk of trees shall lean no more than thirty (30) degrees from the vertical measured within four inches (4") of the soil ball.

3) The trunk-surface-root zone shall be free of roots that are seriously kinked, circling or girdling. One-third (1/3) of the soil at the top of the root ball may need to be washed from the trunk root for this inspection. A soil mix shall be available to replace that removed.

4) There shall be no roots at the periphery of the rootball larger than one-fourth inch (1/4") diameter.

15-7 Acceptance at Delivery - Prior to the date of delivery, the Contractor shall notify the Engineer of the time of delivery.

All plants shall be inspected and approved at the site upon delivery based upon the aforementioned criteria. Rejected plants shall be removed immediately from the site.

No plants shall be planted until they have been approved by the Engineer. Such approval shall not preclude the right of inspection and rejection at the site during progress of work for injuries, latent defects, or unseen condition of rootball.

Contractor shall allow in his bid price for the uprooting and replanting of five 15-g.c. tree and ten 5-g.c. shrubs during the "Pre-maintenance Observation". Selection of the uprooted plants shall be made by the Engineer. Should the uprooted plant(s) be determined to be in an unacceptable condition, all plants of that variety shall be replaced at the Contractor's expense.

15-8 Turf and Groundcover Planting

15-8.1 Sod Warrens - Shall be A-34 or an approved equal.

15-8.2 Soil Preparation and Planting - All planting areas shall receive six (6) inches of imported topsoil. Finish grade all areas prior to application of soil ammendment.

Scarify planting area and completely break up soil to a depth of six (6) inches unless otherwise noted.

Evenly spread soil amendment at the rate of six (6) cubic yards per 1,000 sq. ft. and commercial fertilizer at the rate of twenty (20) pounds per 1,000 sq. ft. Cultivate uniformly to a depth of six (6) inches.

Rake all areas to remove rock one (1) inch or larger in size, sticks, debris, and grade to a smooth, even surface. Grade to form all swales, pitch to catchbasins, street, curbs, etc., to insure proper surface drainage.

Lightly roll surface and reshape surface as necessary to level humps and hollows.

Sodding shall be done by experienced workmen. Sod shall be laid smoothly, edge to edge, on the prepared sod bed and pressed firmly into contact with bed by rolling and hand tamping to eliminate air pockets and to provide a true and even surface. Depressions or irregularities in the surface shall be corrected. Sod shall be thoroughly and evenly watered for a period of seven days.

In turf areas, sow seed with an approved seeder at the rate of six (6) pounds per 1,000 sq. ft., sowing one-half (1/2) of the amount in each direction during a windless period. Lightly rake to cover seed. Wet seeded areas slowly but thoroughly and keep moist but not saturated at all times until the grass is up.

In groundcover areas, plant groundcover plants in evenly spaced rows at staggered intervals and rake to a smooth surface. Moisten soil to a depth of eight (8) inches.

Protect turf and groundcover areas by erecting such fences, barriers, signs, etc., as necessary to prevent trespass.

15-8.3 Weed Control - All planted areas shall be kept weed free.

Weeds shall be completely removed including roots by hand within the maintenance period. Care shall be used to prevent disturbance of the plant material.

15-9 Tree and Shrub Planting - Place trees and shrubs in designated locations and secure Engineer's approval before excavating pits, making such adjustments as may be required.

Dig pits circular in outline with vertical sides as detailed on the drawings. After pits are dug, break sides to open wall of pit for root penetration. Backfill in planting holes shall be a mixture of 3/4 loose soil in a finely divided condition, free from rocks, clods or lumpy material, thoroughly mixed with 1/4 soil amendment. Each tree shall receive five planting tablets at one half point of backfill and each shrub shall receive three tablets.

Plants shall be set in backfill mixture, in flat bottom holes, to such depth that the top of the plant ball will be two (2) inches above finish grade.

Backfill shall be watered until the backfill is saturated to the full depth of the hole.

Build basins around plant except in lawn areas. Basins shall be formed with level bottom and four (4) inch high berm as detailed.

All trees shall be staked as detailed on the plans.

All planting areas except those planted with Gazinias and sod shall receive 1-1/2 inches of bark mulch.

15-10 Maintenance and Plant Establishment

15-10.1 General - Unless specified otherwise in the Special Provision, State Specification Type I, Section 20-4.08 thereof establishment will be used. When all landscaping has been planted, the Contractor shall request in writing, five (5) days prior to anticipated date, a planting review and preliminary inspection to determine the condition of grass and all plant materials. Providing all planting meets the approval of the Engineer, a written confirmation will be made and the maintenance period for planting shall begin and continue through sixty (60) calendar days unless otherwise specified.

No partial approval of the planting will be granted.

15-10.2 Maintenance Requirements - During the sixty (60) day maintenance period, the Contractor shall maintain the planting as follows:

15-10.3 Turf and Groundcover - Maintain constant moisture to a depth of eight (8) inches.

Keep areas free of undesirable weeds and grasses by application of suitable weed killers or root removal by hand pulling. Maintain by watering, weeding, replanting, reseeding, mowing, fertilizing, rolling and top dressing, and other necessary operations to establish an even, thick, and vigorous stand of grass and groundcover. Maintenance work shall be prescheduled and approved by Engineer.

Fertilize turf and groundcover area with commercial fertilizer at the rate of fifteen (15) pounds per 1,000 sq. ft. forty-five (45) days after commencement of maintenance period. Water thoroughly into soil.

Protect areas against all damage, including erosion, and trespass, and provide safeguards.

Protect against turf insects and diseases as may be required for a healthy turf.

Replant damaged areas and plants promptly as specified.

Fertilize turf and groundcover areas at end of maintenance period with commercial fertilizer at the rate of fifteen (15) pounds per 1,000 sq. ft.

15-10.4 Trees and Shrubs - Keep area free of undesirable weeds and grasses. Maintain in vigorous thriving condition, by watering, cultivating, spraying and other necessary operations.

Protect from damage by erosion or trespass and provide safeguards.

Replace unhealthy, damaged, or dead trees and shrubs promptly with material as specified.

15-10.5 Clean-up and Final Inspection - Final inspection for approval and acceptance shall be made at the conclusion of the maintenance period. Written notice requesting such inspection shall be submitted at least ten (10) days before the anticipated date.

Prior to being considered ready for inspection, the Contractor shall have made all corrections and repairs, have the job cleared of all weeds and debris and presented in a neat, orderly fashion. The turf and the plants shall be healthy and free of harmful insects and diseases.

15-11 Guarantee and Replacement - The health of all trees, shrubs, turf, plants and other landscaping shall be guaranteed for a period of ninety (90) days following the sixty (60) day maintenance period.

Contractor shall replace all dead plants and plants not in a vigorous condition, or damaged, as soon as directed by the Engineer. Plants used for replacement must be of the same kind and size as specified, planted, and maintained as outlined above. All replacement of plants shall be done before the final acceptance. All replacement of plants shall be at the sole expense of the Contractor and guaranteed for ninety (90) days after replacement.

Work under the contract will not be accepted by the City Council until all of the maintenance period has been successfully completed.

15-12 Measurement and Payment - Measurement for landscape planting shall be as provided in the Bid Proposal. The contract lump sum or unit prices shall include full compensation for furnishing all labor, materials, tools and equipment and performing all work necessary to complete and maintain the landscape work shown described and specified in the contract documents and no additional compensation will be made therefor.

15-13 Irrigation Systems

15-13.1 General - The Contractor shall furnish and install all irrigation equipment and the electrical services and connections necessary to make the irrigation system operable and as shown on the plans. The work includes, but is not limited to, the following:

Trenching, stockpiling excavation, materials, refilling trenches, pipe, connections, conduit, fittings, controls, and all appurtenances.

Furnishing materials and installation for complete system including piping, backflow prevention devices, pressure reducing valves, valves, fittings, sprinkler heads, automatic controls and final adjustment of heads to insure complete coverage as specified.

Line voltage connections to the irrigation controllers and low voltage control wiring from controllers to remote control valves.

Replacement of unsatisfactory materials as determined by Engineer.

Clean-up, inspection and approval.

All work of every description mentioned in the specifications and all other labor and materials incidental to the satisfactory completion of the work, including clean-up of the site, as directed by the Engineer.

Pressure tests as specified herein.

Furnishing and installation of the electrical meter bases and disconnects as required.

15-13.2 Damages - The Contractor shall be responsible for damage caused by leaks in the piping systems being installed or having been installed by him. He shall repair, at his own expense, all damage caused by the Contractor's operation in a manner satisfactory to the Engineer.

15-13.3 Instruction - After the system has been installed and approved, the Contractor shall instruct the Engineer and designated personnel in complete operation and maintenance of the irrigation system.

15-14 Pipe and Fittings

15-14.1 Main Lines (Constant Pressure) - As indicated on the drawings.

15-14.2 Lateral Lines (Non Pressure) - As indicated on the drawings.

15-14.3 Pipe Fittings - Schedule 40 unless otherwise detailed.

15-14.4 Valves and Valve Boxes - Pressure reducing valves shall be as shown on the drawings.

Quick coupler valves shall be as indicated on the drawings.

Remote control valves and controllers shall be as indicated on the drawings.

Boxes to remote control and quick-coupler valves shall be Ametek 12 inches (12") green plastic or approved precast concrete and set at grade. All lids shall be marked "Irrigation".

15-14.5 Sprinkler Heads - Sprinkler heads shall be as listed on the drawings. Shrubbery and bubbler heads shall be adjustable from full flow to shut off.

15-14.6 Backflow Prevention - As specified and detailed on the drawings.

15-14.7 Controllers and Control Wire - Controllers and valves shall be as specified on the drawings. Controllers shall be automatic, 7 day, 24 hour programmable, vandal proof.

Provide and install automatic irrigation controller in locations shown on Drawings. The exact location will be determined on the site by the Engineer.

Control low voltage wire shall be solid single conductor copper with UL-approval for direct burial in ground. Common ground wire shall have white insulating jacket; control wire shall have jacket of color other than white. Splices shall be made with Rain-Bird Pen-Tite type connectors or equal.

15-14.8 Miscellaneous Equipment and Materials - Solvent cement for solvent weld joints shall be of make and type approved by manufacturer of pipe and fittings involved. Cement shall be maintained at proper consistency throughout use.

Lubricant for assembling rubber ring seal joints shall be of make and type approved by manufacturer of pipe.

Pipe joint compound shall be non-hardening, non-toxic materials designed specifically for use on threaded connections in water carrying pipe.

Provide all equipment called for by the drawings and specifications.

Provide to the Engineer, at completion of the maintenance period, three (3) each of all operating and servicing instruction, keys and wrenches required for complete maintenance and operation of all heads and valves. Include all wrenches necessary for complete disassembly of all heads and valves.

15.14.9 Emitter Hose and Heads - As specified and detailed on the drawings.

15-15 Installation - The Contractor shall stake out the irrigation system as shown on the drawings. These areas shall be checked by the Contractor and the Engineer before construction is started. Any changes, deletions or additions shall be determined at this check.

Plastic pipe shall be handled carefully, and protected from prolonged exposure to sunlight.

Where site conditions do not permit locating piping, valves and heads where shown, notify Engineer immediately and determine relocation.

Run main lines and automatic control low voltage wiring in common trenches.

15-16 Excavating and Trenching - Trench width shall be at least three inches (3") clear of the pipe. Trench depth shall be deep enough to provide minimum cover from finish grade as follows:

Twenty-four inch (24") minimum cover over main lines to control valves and quick coupling valves.

Twenty-four inch (24") minimum cover over control wires from controller to valves.

Fourteen inch (14") minimum cover over RCV-controlled lines to sprinklers.

Where other utilities interfere with irrigation trenching and pipe work adjust the trench depth as directed by the Engineer.

15-17 Assembling Pipe Lines - All pipe shall be assembled free from dirt and pipe scale. Field cut ends shall be reamed to full pipe diameter with rough edges and burrs removed.

All joint material shall be factory made and installed according to manufacturer's specifications unless otherwise approved by the Engineer.

15-18 Remote Control Valves - Install where shown and group together where practicable.

Install valves no closer than eighteen inches (18") from main line. Valves shall be installed with unions on both sides to facilitate valve removal and replacement.

Locate valves no closer than twelve inches (12") from walk edges, building and walls.

Thoroughly flush main line before installing valve.

Center valve marker overflow adjustment valve.

15-19 Automatic Control Wiring - Run lines along mains. Tie wires in bundles with pipe wrapping tape at ten (10) foot intervals and allow slack for contraction between strappings (PVC Type Electrical "Scotch Brand" or approved equal). All wire locations are to be shown on the "as built" drawings.

Loop a minimum of three (3) feet of extra wire in each valve box, both control wire and ground wire.

Connections shall be made by crimping bare wires with brass connectors and sealing with Pen-Tite type connectors or equal.

Splicing will be permitted only on runs exceeding five hundred (500) feet. Locate all splices at valve connection locations.

15-20 Automatic Controller - Locate controllers as shown on the plans with exact placement to be determined by the Engineer.

Connect control lines to controller in sequential arrangement according to assigned identification number of valve.

Control lines shall be labeled at controller with permanent non-fading labels indicating identification number of valve controlled.

15-21 Backflow Prevention Device - Install as detailed.

15-22 Backfilling - Backfill only after piping has been inspected and approved.

Backfilling material shall be the earth excavated from the trenches, free from rocks, concrete chunks, and other foreign or coarse materials. Carefully select backfill that is to be placed next to plastic pipe to avoid any sharp objects which may damage the pipe. If such material is not available sand bedding is required two (2) inches minimum all around one (1) inch and larger diameter pipe at no extra cost to the City.

All pipe under asphalt paving shall be backfilled with four (4) inches of clean sand on all sides of pipe or sleeved where shown and detailed.

Place backfill materials in six (6) inch layers and compact same in compliance with City Standard detail for trench excavation and backfill.

Dress off areas to finish grades and remove excess soil, rocks or debris remaining after backfill is completed and dispose of same off-site.

If settlement occurs along trenches and adjustments in pipes, valves and sprinkler heads, soil, sod or paving are necessary to bring the system, soil, sod or paving to the proper level of the permanent grade, the Contractor, as part of the work under this Contract, shall make all adjustments without extra cost to the City.

15-23 Tests - The Contractor shall provide the following:

Test all lines hydrostatically at the pressure class required and not less than 125 psi. Lines will be approved if test pressure is maintained for four (4) hours. The Contractor shall make tests and repairs as necessary until test conditions are met.

Test RCV-controlled lines with water at line pressure and visually inspect for leaks. Retest after correcting defects. Plugs or caps shall be used at sprinkler head locations.

15-24 Measurement and Payment - Measurement for irrigation items or system shall be as provided in the Bid Proposal.

The Contract unit price lump sum price for the complete irrigation system or the contract unit prices for the various irrigation items shall be considered as full compensation for furnishing all labor, materials, tools, equipment, testing, and incidentals required to complete the entire irrigation system as shown on the plans, as specified herein and provided for in the Special Provisions, and no additional compensation shall be made therefor.

PART 2

SECTION 16.
FINISHING PROJECT

16-1 Description - Upon completion of all construction operations the entire project shall be finished as specified in these specifications.

This work shall consist of trimming, shaping, cleaning, and in general finishing the project and disposing of all debris and surplus material. All debris and surplus materials resulting from the specified finishing operations shall be disposed of outside the project area.

The entire project shall be left in a neat and presentable condition subject to the approval of the City Engineer.

16-2 Method Construction

16-2.1 Shoulders - The roadbed shoulders shall be trimmed and shaped to the finished cross section to produce smooth surfaces and slopes, and uniform cross sections. In the case of a graded roadbed without surfacing or pavement, the entire roadbed shall be trimmed and shaped to uniform cross sections and slopes. Stockpiling of material on the finished pavement and drifting of material across the pavement will not be permitted. The finished pavement shall be cleaned of all dirt and foreign material.

16-2.2 Slopes - The slopes of embankments, excavations, road approaches, road connections, ditches, channel changes, and material sites within or adjacent to the right-of-way shall be trimmed and finished to the lines and grades called for by the plans and as specified in other sections of the specifications. Ditches and channels within or adjacent to the right-of-way shall be cleared of debris and obstructions. Slopes of gutters shall be trimmed to the required grade and cross section. Excess earth, debris, or other waste material adjacent to culvert headwalls and endwalls, bridge ends, poles, posts, trees, or other objects, shall be removed and the areas shaped and trimmed as directed by the Engineer and left in a neat and orderly condition. All stones, roots and other waste material exposed on slopes which are liable to become loosened shall be removed and disposed of. All materials and debris resulting from clearing and grubbing operations not previously removed, shall be removed and disposed of. All loose rocks larger than 0.25 foot in maximum dimension, shall be removed from the finished project area and disposed of. All weeds and other objectionable growths shall be removed and disposed of from areas which were previously cleared and grubbed by the Contractor.

16-2.3 Drains and Sewers - All sewers, drains, culverts, and their appurtenant structures constructed under the contract, as well as existing drainage facilities within the project, shall be cleaned out.

16-2.4 Conforms - Earth conforms for back of sidewalks shall be formed to produce a smooth and uniform slope.

16-2.5 Storage Areas - All storage facilities, sheds, yards, equipment, tools, and devices used as temporary installations during construction such as, but not restricted to, fences, barricades, signs, guard rails, and A. C. berms, shall be removed and disposed of from the project area.

16-3 Measurement - Finishing project shall not separately measured for payment.

16-4 Payment - Payment for finishing project shall be included in the prices paid for the various items of work to which finishing project is related and said payment shall constitute full compensation for furnishing all labor, materials, tools, equipment, and incidentals required to complete the work of finishing project as specified and not separate compensation will be made therefor.