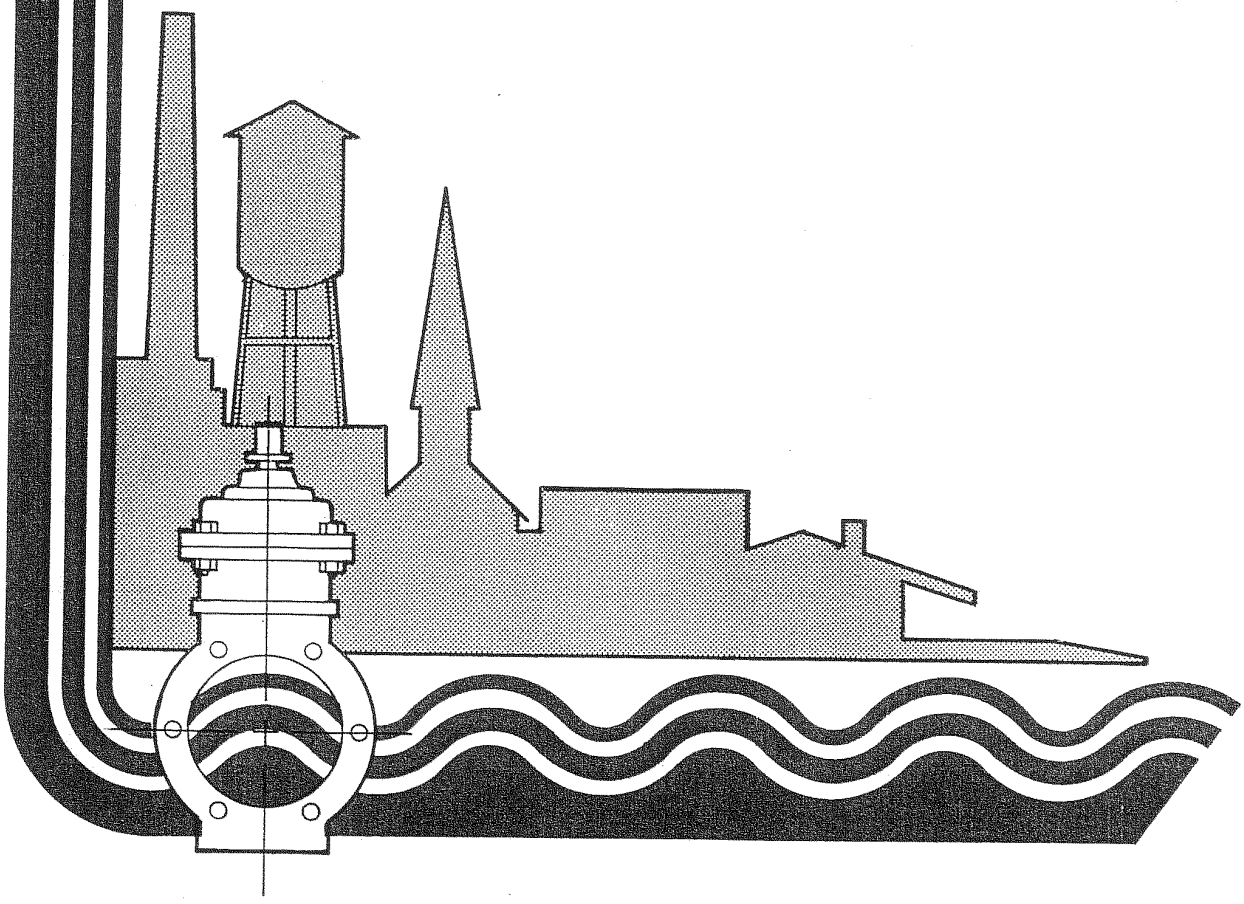
CITY OF HANFORD
CALIFORNIA



public works standard specifications

RESOLUTION NO. 06-33-R

RESOLUTIONS OF THE CITY COUNCIL OF THE CITY OF HANFORD ADOPTING "CONSTRUCTION STANDARDS AND SPECIFICATIONS" PERTAINING TO SUBDIVISION DESIGN AND IMPROVEMENTS

At a regular meeting of the City Council of the City of Hanford, duly called and held on April 4, 2006, at the hour of 7:30 p.m., and upon a motion by Council Member AYERS and seconded by Council Member GONZALES and duly carried, the following resolutions were adopted:

WHEREAS, California Government Code Section 66411, and Chapter 16.04 of Title 16 of the Hanford Municipal Code provides the City Council with the authority to adopt "construction standards and specifications" pertaining to the design and improvement of subdivisions;

WHEREAS, the Public Works Department of the City of Hanford has determined that the current construction standards and specifications are in need of modification and as a result have prepared new construction standards and specifications which are included in documents entitled "Public Works Construction Standards" and "Public Works Standard Specifications";

WHEREAS, the Planning Commission of the City of Hanford has reviewed the proposed construction standards and specifications and has recommended adoption and approval of the same by the City Council of the City of Hanford.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Hanford hereby adopts as construction standards and specifications of the City of Hanford to be used to regulate and control the design and improvement of subdivisions those

construction standards and specifications set forth in certain documents entitled "Public Works Construction Standards" and "Public Works Standard Specifications" to be dated April 4, 2006.

Passed and adopted at a regular meeting of the City Council of the City of Hanford, held on the 4th day of April, 2006, by the following vote:

AYES	Council Members	AYERS
		GONZALES
		BUFORD
		GALLEGOS
		CHIN
NOES:	Council Members	NONE
ABSTAIN:	Council Members	NONE
ABSENT:	Council Members	NONE
	APPROVED	Dan Chin
		MAYOR

ATTEST: Karen McAlister
City Clerk

ATTORNEY
F HANFORD

STATE OF CALIFORNIA)
COUNTY OF KINGS) ss
CITY OF HANFORD)

I, KAREN McALISTER, City Clerk of the City of Hanford, do hereby certify the foregoing Resolution was duly passed and adopted by the City Council of the City of Hanford at a regular meeting thereof held on the 4th day of April, 2006.

Dated: April 5, 2006

Karen McAlister
City Clerk

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CITY OF HANFORD
PUBLIC WORKS CONSTRUCTION SPECIFICATIONS

SECTION I - GENERAL CONDITIONS

1. DEFINITIONS

1.01 GENERAL

Whenever in the City Specifications or other contract documents the following terms, or pronouns in place of them, are used, the intent and meaning shall be interpreted as follows:

ADDENDA - Written interpretations or revisions to any of the contract documents issued by the City before the bid opening.

BID - The proposal submitted by the Contractor in response to the invitation to bid made by the City.

BIDDER - Any individual, firm, partnership, corporation, or combination thereof, submitting a proposal for the work contemplated, acting directly or through a duly authorized representative.

CHANGE ORDER - An order approved by the Engineer and issued to the Contractor amending the contract documents.

CITY - The City of Hanford, Kings County, California.

CITY CLERK - The legally authorized City Clerk of the City of Hanford.

CITY COUNCIL - The legally authorized governing body of the City of Hanford.

CITY SPECIFICATIONS - City of Hanford, California, Department of Public Works Standard Specifications, as amended from time to time.

CITY STANDARD DRAWINGS - City of Hanford, California, Department of Public Works Standard Drawings, as amended from time to time.

CONTRACT DOCUMENTS - The contract documents include without limitation, the Construction Agreement, Plans, Specifications, Contract Bonds, Addenda to the Construction Agreement, and Change Orders.

CONTRACTOR - The individual, firm, partnership, corporation, or combination thereof, whose proposal to construct any part of the contemplated work has been accepted.

ENGINEER - The Engineer, Architect or persons appointed by the City Council, or properly authorized employees of the City, acting within the scope of the particular duties delegated to them.

FINISHED GRADE - The top of the surface layer of asphalt and/or concrete upon which vehicles travel and/or park.

PLANS - The official plans, profiles, typical cross sections, general cross sections, elevations and details which show the locations, character, dimensions and details of the work to be performed.

SPECIAL PROVISIONS - Specific Clauses setting forth conditions or requirements peculiar to the work and supplementary to the City Specifications.

SPECIFICATIONS - A set of documents issued for the intended work which includes the City Specifications, Special Provisions, Notice to Contractors, Proposal, and Contract Form.

STATE SPECIFICATIONS - State of California, Department of Public Works, CalTrans Standard Specifications, being the current issue in use by the State.

STATE STANDARD PLANS - State of California, Department of Public Works, CalTrans Standard Plans, being the current issue in use by the State.

SUBGRADE - The level of embankment, native material and/or import upon which the first layer of the street structural section (either aggregate, subbase, aggregate base lime treated or cement treated base [plant mixed], or asphalt concrete is placed).

2. PROPOSAL AND CONTRACT

2.01 PROPOSAL FORM

All proposals must be made upon the proposal form attached in the specifications. The proposal form is bound in a book together with the Notice to Contractor and Special Provisions. The bidder shall completely fill out the form in a clear and legible manner. Should there be any conflict between the unit price and the total shown by the bidder on the proposal form for any individual item, the unit price shall govern.

2.02 APPROXIMATE QUANTITIES

The quantities given in the proposal form are approximate and are given only as a basis for the comparison of bids, unless the Special Provisions specifically fix the quantity. The City does not expressly, nor by implication, represent that the actual amount of work will correspond to the estimate.

2.03 BIDDER′S GUARANTY

All bids shall be presented under sealed cover and shall be accompanied by cash, cashiers or certified check or a bidder′s bond executed by a corporate surety insurer. The bidder′s guaranty shall be in an amount equal to at least ten percent of the amount bid and made payable to the City of Hanford.

2.04 RETURN OF BIDDER′S GUARANTY

Within ten calendar days after the award of contract by the City Council, the City Clerk will return to the unsuccessful bidders the bidder′s guaranty accompanying their respective bids.

2.05 CONTRACT BONDS

The Contractor shall furnish two good and sufficient bonds. One bond shall be a faithful performance bond and the other a labor and materials bond. Each of the said bonds shall be executed in a sum of not less than 100% of the total contract price and shall be issued by an ″Admitted Surety Insurer″, listed in the Federal Register. Pursuant to California Code of Civil Procedure Section 995.120, an ″Admitted Surety Insurer″ is defined as a corporate insurer or a reciprocal or inter insurance exchange to which the Insurance Commissioner of the State of California has issued a certificate of authority to transact surety insurance in the State of California.

Whenever any surety on any such bonds becomes insufficient, or the City Council has reasonable cause to believe that such surety or sureties have become insufficient, a demand in writing may be made of the Contractor to furnish good and sufficient bond as required by the terms of the contract. Thereafter, no payment shall be made upon such contract to the Contractor or any assignee of the Contractor until such further bond or bonds or additional surety has been furnished.

All alterations, extensions of time, extra and additional work, and other changes authorized by the contract documents may be made without securing the consent of the surety or sureties on the contract bonds.

2.06 REJECTION OF PROPOSALS CONTAINING ALTERATIONS, ERASURES OR IRREGULARITIES

Any proposal may be rejected by the City Council if such proposal shows any alterations of form, additions not called for, conditional or alternative bids, incomplete bids, or substantial irregularities of any kind.

The right is reserved by the City Council to reject all proposals at its discretion.

2.07 AWARD OF CONTRACT

The award of the contract, if it be awarded, will be made within sixty calendar days after the opening of the proposals. The award of the contract will be to the lowest responsible bidder whose proposal complies with all the requirements prescribed. Such time for the award of the contract may be extended by the City Council.

2.08 EXECUTION OF CONTRACT

The contract shall be signed by the successful bidder and returned, together with the contract bonds, within twenty calendar days after the Contractor has received the contract. Failure to execute a contract and file acceptable bonds and certificates of insurance as provided herein shall be just cause for the annulment of the award and the forfeiture of the proposal guaranty.

2.09 EXAMINATION OF PLANS, SPECIFICATIONS, SPECIAL PROVISIONS AND SITE OF WORK

The bidder is required to examine carefully the site of the work contemplated, the Proposal, Plans, Specifications and contract forms and it will be assumed that the bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and quantities of work to be performed and materials to be furnished, and as to the requirements of the Proposal, the Specifications, Plans, Special Provisions, and the Contract. It is mutually agreed that submission of a Proposal by the bidder shall be considered prima facie evidence that the bidder has made such examination.

2.10 ADDENDA

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

2.11 WITHDRAWAL OF BIDS

Any bid may be withdrawn at any time prior to the time fixed in the public notice for the opening of bids only by filing written request for the withdrawal of the bid filed with the City Clerk. The request shall be executed by the bidder or his representative. The withdrawal of a bid prior to the bid opening does not prejudice the right of the bidder to file a new bid. No bids may be withdrawn after the time fixed in the public notice for opening of bids.

3. SCOPE OF WORK

3.01 WORK TO BE DONE

The work to be done consists of furnishing all labor, materials, methods and processes, implements, tools and machinery, except as otherwise specified, which are necessary and required to construct and put in complete order for use the work designated in the contract and to leave the grounds in a neat condition.

3.02 CHANGES

The City reserves the right to make such alterations, deviations, additions to or omissions from the Plans and Specifications, including the right to increase or decrease the quantity of any item or portion of the work or to omit any item or portion of the work, as may be deemed by the Engineer to be necessary or advisable and to require extra work as may be determined by the Engineer to be required for the proper completion or construction of the whole work contemplated.

Any such change will be set forth in a contract change order which will specify, in addition to the work to be done in connection with the change made, adjustment of contract time, if any, and the basis of compensation for such work. A contract change order will not become effective until the Engineer approves it.

If an urgency does not exist or the proposed change order does not constitute work which is in the City′s best interest and affects the public health, safety or general welfare, then such change order must be presented to the City Council for approval prior to any work being accomplished in connection therewith.

(A) Procedure. A contract change order may be issued to the Contractor at any time. Should the contractor disagree with any terms or conditions set forth in a contract change order, he shall submit a written protest to the Engineer within 15 calendar days after the receipt of such contract change order. The protest shall state the points of disagreement, and if possible, the contract specification references, quantities, and costs involved.

When the protest concerning a contract change order relates to compensation, the compensation payable for all work specified or required by said contract change order to which such protest relates will be determined as provided in Section I 3.02(B) ″Increased or Decreased Quantities″ through 3.02(D) ″Extra Work″, inclusive. The Contractor shall keep full and complete records of the cost of such work and shall permit the Engineer to have such access thereto as may be necessary to assist in the determination of the compensation payable for such work.

Where the protest concerning an approved contract change order relates to the adjustment of contract time for the completion of the work, the time to be allowed therefor will be determined as provided in Section I 7.06 ″Liquidated Damages.″

If the Contractor signifies his acceptance of the terms and conditions of a contract change order by executing such document and if such change order is approved by the Engineer and issued to the Contractor, payment in accordance with the Provisions as to compensation therein set forth shall constitute full compensation for all work included therein or required thereby.

Upon receipt of an approved contract change order, the Contractor shall proceed with the ordered work. If ordered in writing by the Engineer, the Contractor shall proceed with the work so ordered prior to actual receipt of an approved contract change order therefor. In such cases, the Engineer will, as soon as practicable, issue an approved contract change order for such work.

(B) Increased or Decreased Quantities. Increases or decreases in the quantity of a contract item of work will be determined by comparing the total pay quantity of such item of work with the quantity shown on the bid proposal therefor.

(1) Increases or Decreases of Less than 25 Percent. If the total pay quantity of any item of work required under the contract varies from the quantity shown on the bid proposal therefor by 25 percent or less, payment will be made for the quantity of work of said item performed at the contract unit price therefor unless eligible for adjustment pursuant to Section I (3.02)(C) ″Changes in Character of Work″.

(2) Increases More than 25 Percent. Should the total pay quantity of any item of work required under the contract exceed the quantity shown on the bid proposal therefor by more than 25 percent, the work in excess of 125 percent of such proposal quantity will be paid for by adjusting the contract unit price (as hereinafter provided) or at the option of the Engineer, payment for the work involved in such excess will be made on the basis of force account as provided in Section I(8.03) ″Force Account Payment.″

Such adjustment of the contract unit price will be the difference between the contract unit price and the actual unit cost (which will be determined as hereinafter provided) of the total pay quantity of the item. If the costs applicable to such item of work include fixed costs, such fixed costs will be deemed to have been recovered by the Contractor by the payments made for 125 percent of the contract quantity for such item, and in computing the actual unit cost, such fixed cost will be determined by the Engineer in the same manner as if the actual work were to be paid for on a force account basis as provided in Section I(8.03) ″Force Account Payment″; or such adjustment will be as agreed to by the Contractor and the Engineer.

(3) Decreases of More than 25 Percent. Should the total pay quantity of any item of work required under the contract be less than 75 percent of the quantity shown on the bid proposal therefor, the quantity of said item performed will be paid for by adjusting the contract unit prices (as hereinafter provided), or at the option of the Engineer, payment for the quantity of the work of such item performed will be made on the basis of force account as provided in Section I(8.03) ″Force Account Payment″, provided however, that in no case shall the payment for such work be less than that which would be made at the contract unit price.

Such adjustment of the contract unit price will be the difference between the contract unit price and the actual cost (which will be determined as hereinafter provided) of the total pay quantity of the item, including fixed costs. Such actual cost will be determined by the Engineer in the same manner as if the work were to be paid for on a force account basis as provided in Section I(8.03) ″Force Account Payment″; or such adjustment will be as agreed by the Contractor and the Engineer.

The payment for the total pay quantity of such item of work will in no case exceed the payment which would be made for the performance of 75 percent of the bid proposal quantity for such item at the original contract unit price.

(4) Eliminated Items. Should any contract item of the work be eliminated in its entirety, payment will be made to the Contractor for actual costs to the date of notification in writing by the Engineer of such elimination.

If acceptable material is ordered by the Contractor for the eliminated item prior to the date of notification of such elimination by the Engineer, and if orders for such material cannot be cancelled, it will be paid for at the actual cost to the Contractor. In such case, the material paid for shall become the property of the City and the actual cost of any further handling will be paid for. If the material is returnable to the vendor and if the Engineer so directs, the material shall be returned and the Contractor will be paid for the actual cost of charges made by the vendor for returning the material. The actual cost of handling returned material will be paid for.

The actual costs or charges to be paid by the City to the Contractor as provided in this Section I(3.02)(B)(4) ″Eliminated Items″ will be computed in the same manner as if

the work were to be paid for on a force account basis as provided in Section I(8.03) ″Force Account Payment.″

(C) Changes in Character of Work. If an ordered change in the Plans or Specifications materially changes the character of the work of a contract item from that on which the Contractor based his bid price, and if the change increases or decreases the actual unit cost of such changed item as compared to the actual or estimated actual unit cost of performing the work of said item in accordance with the Plans and Specifications originally applicable thereto, an adjustment in compensation therefor will be made in accordance with the following.

The basis of such adjustment in compensation will be the difference between the actual unit cost to perform the work of said item or portion thereof involved in the change as originally planned and the actual unit cost of performing the work of said item or portion thereof involved in the change, as changed. Actual unit costs will be determined by the Engineer in the same manner as if the work were to be paid for on a force account basis as provided in Section I(8.03) ″Force Account Payment″, or such adjustment will be as agreed by the Contractor and the Engineer. Any such adjustment will apply only to the portion of work of said item actually changed in character. At the option of the Engineer, the work of said item or portion of item which is changed in character will be paid for by force account as provided in Section I(8.03) ″Force Account Payment.″

If the compensation for an item of work is adjusted under this Section I(3.02)(C) ″Changes in Character of Work″, the costs recognized in determining such adjustment shall be excluded from consideration in making an adjustment for such item or work under the provisions in Section I(3.02)(B) ″Increased or Decreased Quantities.″

Failure of the Engineer to recognize a change in character of the work at the time the approved contract change order is issued shall in no way be construed as relieving the Contractor of his duty and responsibility of filing a written protest within 15 calendar days limit as provided in Section I(3.02)(A) ″Procedure.″

(D) 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 some of the various items for which there is a bid price or 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 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, and in the absence of such approved contract change order or other written order of the Engineer, he shall not be entitled to payment for such extra work.

Payment for extra work will be made by force account as provided in Section I(8.03) ″Force Account Payment″, or as agreed to by the Contractor and the Engineer.

3.03 FINAL CLEANING UP

Upon completion and before making application for acceptance of the work, the Contractor shall clean all ground occupied by him in connection with the work, including all facilities existing at the start of his operations, of all rubbish, excess materials, temporary structures, and equipment; and all parts of the work shall be left in a neat and presentable condition.

4 CONTROL OF WORK

4.01 AUTHORITY OF THE ENGINEER

The Engineer shall decide any and all questions which may arise as to the quality and acceptability of materials furnished and work performed, rate of progress of the work, all questions which arise as to interpretation of the Plans and Specifications, all questions as to the satisfaction of the terms and conditions of the contract documents on the part of the Contractor, and all questions as to claims and compensation. The Engineer′s decision shall be final and binding on the Contractor and his subcontractors and the Engineer shall have executive authority to enforce and make effective such decisions and orders which the Contractor fails to properly carry out.

4.02 PLANS

All authorized alterations affecting the requirements and information given on the approved plans shall be in writing. No changes shall be made on any plan or drawing after the same has been approved by the Engineer, except by direction of the Engineer. Working drawings or plans for any structure not included in the plans furnished by the Engineer shall be approved by the Engineer before any work involving these plans shall be performed, unless approval be waived in writing by the Engineer. The City assumes no responsibility for ″as built″ or other plans prepared by other political entities or individuals other than those prepared under the supervision of the City.

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

4.03 TRENCH DRAWINGS

The Contractor shall submit for acceptance by the Engineer a detailed plan showing the shoring, bracing, sloping or other provisions to be made to facilitate excavation of all trenches exceeding five (5) feet in depth. Said acceptance shall be made prior to start of excavation.

4.04 SHOP OR MANUFACTURER′S DRAWINGS

The Contractor shall furnish such drawings and other descriptive material as are necessary to adequately describe items proposed to be furnished and to determine their compliance with the specifications and with the design and arrangement shown on the contract drawings. These shall cover, but not be limited to, all mechanical and electrical equipment, reinforcing steel, fabricated items, and piping details. Five copies of all such submittals shall be furnished, two of which will be promptly returned with approval, rejection, or necessary changes indicated.

No change shall be made by the Contractor in any drawing after it has been approved, and the equipment or material shall not deviate in any way therefrom except with written approval by the Engineer. Fabrication or other work performed in advance of approval shall be done entirely at the Contractor′s risk.

The approval of the Contractor′s drawings or other descriptive materials shall not relieve the Contractor of any obligation for accuracy of dimensions and details, for agreement and conformity with the contract drawings and specifications, or responsibility to fulfill the contract as prescribed.

For use in the subsequent operations, the Contractor shall furnish two copies of maintenance and operation instructions supplied by the manufacturer for all equipment items. They shall be bound and suitably indexed in a loose leaf binder. All warranties and guarantees shall be delivered to the Engineer by the Contractor

4.05 CONFORMITY WITH PLANS AND ALLOWABLE DEVIATION

Finished surfaces in all cases shall conform with the lines, grades, cross-sections, dimensions and tolerance shown on the approved plans and in these specifications and in the Special Provisions. Deviations from the approved plans, as may be required by the exigencies of construction, will be determined by the Engineer and authorized in writing.

4.06 PRECEDENCE OF PLANS, SPECIFICATIONS, AND SPECIAL PROVISIONS

The specifications, the plans, special provisions, and all supplementary documents are essential parts of the contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be cooperative, to describe, and to provide for a complete work. Plans shall govern over both City Specifications and Standard Plans; Special Provisions shall govern over both City Specifications and Plans. City Specifications shall govern over Standard Plans.

4.07 INTERPRETATION OF PLANS AND SPECIFICATIONS

Should it appear that the work to be done, or any matter relative thereto, is not sufficiently detailed or explained in these Specifications, Plans, and the Special Provisions, the Contractor shall apply to the Engineer for such further explanations as may be necessary, and shall conform to such explanation or interpretation as part of the contract, so far as may be consistent with the intent of the original Specifications. In the event of doubt or question relative to the true meaning of the Specifications, reference shall be made to the Engineer, whose decisions thereon shall be final.

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

4.08 STANDARDS

The Engineer shall establish such standards as may be deemed necessary for the proper construction of a finished product. In the absence of specific standards, recognized standards of construction or approved practices shall govern the work.

4.09 SUPERINTENDENCE AND PERSONNEL

Whenever the Contractor is not present on any part of the work when it may be desired to give directions, orders will be given by the Engineer or his designee to the Superintendent or Foreman in charge of the particular work in reference to which the orders are given, and such Superintendent or Foreman shall receive and obey orders as though the orders were given by the Contractor. It shall be the duty of the Contractor to ensure that he provides for adequate supervision of the work when he is not himself present at the site of work. The Contractor shall notify the Engineer of the name, address, and telephone number of the Superintendent or Foreman who is in charge of the work in the Contractor′s absence. If any Subcontractor or person shall fail or refuse to carry out the directions of the Engineer, or, in the considered opinion of the Engineer, appears to be incompetent or to act in a disorderly manner, he shall be removed from the work immediately upon notice by the Engineer and such person may not be employed again on the work under the contract.

The Contractor′s name and emergency telephone numbers shall be painted on a barricade or sign at each end of the project in letters of sufficient height and weight to be clearly legible from the traveled way.

4.10 SUITABLE METHODS AND EQUIPMENT

The Contractor shall use such methods and equipment for the performance of the work embraced under these Specifications as will secure a satisfactory quality of work and rate of progress. Such methods and equipment shall meet the approval of the Engineer, and shall be submitted for his approval before being used on the work. The Engineer reserves the right, during the progress of the work, to make suggestions and revisions in the methods and equipment in order that a high quality of work and satisfactory rate of progress may be obtained.

When ordered by the Engineer, the Contractor shall remove unsuitable equipment from the work and/or discontinue unsuitable methods of work.

4.11 LINES AND GRADES

Stakes will be set by the Engineer in conformance with good engineering practice to fit the needs of the Contractor.

The Contractor shall preserve all stakes and points set for lines, grades, or measurements of the work in their proper place until authorized to remove them by the Engineer. All expenses incurred in replacing stakes that have been removed due to negligence by the Contractor shall be paid for by the Contractor.

4.12 INSPECTION

Whether work during construction will be inspected by the Engineer shall be determined by the Engineer prior to the commencement of the work. The City shall not be obligated to inspect the work. The Engineer, or designated assignee, shall at all times have access to the work during construction and the Contractor shall cooperate with and assist the Engineer as may be requested by the Engineer in order to ascertain any and all information that the Engineer may require respecting the progress, workmanship and character of materials used and employed in the work.

Whenever the Contractor varies the period during which work is carried on each day, he shall give due notice to the Engineer, so that proper inspection may be provided. Any work done without the required inspections will be subject to rejection.

The inspection of the work or the decision not to inspect the work, shall not, in any way, relieve the Contractor of any of his obligations to fulfill the Contract Documents as prescribed. Defective work shall be made good, and unsuitable materials may be rejected, notwithstanding the fact that such defective work and unsuitable materials have been previously overlooked by the Engineer or not inspected by the Engineer and notwithstanding that such defective work or unsuitable materials were discovered prior to or subsequent to acceptance and completion of the project.

4.13 REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK

All work which is defective in its construction or deficient in any of the requirements of these Specifications shall be remedied, removed or replaced by the Contractor in a manner acceptable to the Engineer, and no compensation will be paid for such correction.

Any work done beyond the lines and grades shown on the Plans or reestablished by the Engineer, or any extra work done without written authorization, will be considered 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, removed or replaced, and unauthorized work to be removed, and to deduct the cost thereof from any monies due or to become due the Contractor.

4.14 RESTORATION OF SURFACES

The Contractor shall replace all graded surface material, such as lawns, and shall restore paving (unless otherwise specified), curbing, sidewalks, gutters, shrubbery, fences, sod and other surfaces disturbed, to a condition equal to that before the work began, furnishing all labor, and material incidental thereto.

4.15 FINAL INSPECTION

Whenever the work provided and contemplated by the Contract Documents shall have been completed and the final clean up performed, the Contractor shall request in writing a final inspection. The Engineer will make the final inspection.

5. CONTROL OF MATERIALS

5.01 SAMPLES AND TESTS

The source of supply of each material to be used on the work shall be furnished in writing and shall be subject to prior approval by the Engineer before delivery is started and the material is actually incorporated in the work. The Contractor shall furnish without charge such samples as may be required by the Engineer. The Engineer may examine such samples by such test procedures as he may deem necessary to determine the conformance of the materials with the Plans and Specifications. Tests will be conducted in accordance with commonly recognized procedures and standards set by the California Department of Transportation. If no such procedures or standards exist, tests will be conducted in accordance with nationally recognized standards. The Engineer may require tests and/or certificates of compliance before, during and after incorporation of a particular material in the work. Where a material must be tested in place in the work, the Contractor shall not cover the material with any other material until approval is given by the Engineer. Should the Contractor cover the material with another before such approval is given, he shall uncover the materials for testing as required by the Engineer and then re-cover it after approval is given, all at no cost to the City. All tested materials failing to meet the Specifications for quality and workmanship shall be retested at the expense of the Contractor.

Whenever reference is made to standards of nationally recognized organizations, the reference shall mean the standard that is in effect on the day the Notice to Contractors for the work is dated.

All sampling and testing made at the request of or for the benefit of the Contractor, shall be paid for by the Contractor. The Engineer shall select and oversee the sampling and testing personnel.

The failure of the Engineer to test any material to be used on the work shall not relieve the Contractor from his obligation to use materials which specifically conform with the Plans and Specifications and the Contract Documents.

5.02 DEFECTIVE MATERIALS

All materials not conforming to the requirements of these Specifications shall be considered as defective and all such materials whether in place or not, shall be rejected and shall be removed immediately from the site of the work unless otherwise permitted by the Engineer. No rejected materials, the defects of which have been subsequently corrected, shall be used until approved in writing by the Engineer.

Upon failure on the part of the Contractor to comply with any order of the Engineer made under the Provisions of this article, the Engineer shall have authority to remove and replace defective material and to deduct the cost of removal and replacement from any monies due or to become due the Contractor.

5.03 SUBSTITUTION OF EQUALS

Whenever in the Plans and Specifications any material, equipment or process is indicated or specified by patent or proprietary name and/or by name of manufacturer, and the Contractor desires to offer a substitute material, equipment or process as the case may be, on the basis that the

substitute is the equal in every respect to that so indicated or specified, the burden of proof as to the quality and suitability of the substitute material shall be upon the Contractor and he shall furnish all information necessary as required by the Engineer. Requests for the substitution of equivalent materials and data substantiating said request shall be made in ample time to permit approval without delaying the work, but need not be made in less than 35 days after award of the contract.

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

If the material, equipment, or process offered by the Contractor is, in the opinion of the Engineer, equal in every respect to that specified, and is approved for substitution then the City shall receive one half of the benefit of any saving in cost to the Contractor, which might result in such substitution.

In the event that a material, equipment, or process is substituted in place of that specified, in accordance with the above, and such substitution, in the opinion of the Engineer, makes it necessary to change, alter, modify or redesign any unit or part of the plant or project, of which the substitution is a part, then the Contractor shall pay all costs, including engineering cost, occasioned by such change, alteration, modification or redesign.

5.04 QUALITY OF MATERIALS

The materials to be incorporated into the work shall be new, unless otherwise specified. The materials shall be manufactured and handled carefully to ensure the completed work will be in accordance with the Plans and Specifications.

6. LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

6.01 LAWS TO BE OBSERVED

The Contractor shall keep himself fully informed of all existing and future State and National Laws and County and Municipal Ordinances and Regulations of the City of Hanford 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. He shall at all times observe and comply with, and shall cause all his agents and employees to observe and comply with all such existing and future laws, ordinances, regulations, orders, and decrees of bodies or tribunals having any jurisdiction or authority over the work, and shall protect and indemnify the City of Hanford and all officers and employees thereof connected with the work, against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by himself or his employees. If any discrepancy or inconsistency is discovered in the Plans, drawings, regulations, order or decree, the Contractor shall forthwith report the same to the Engineer in writing.

6.02 HOURS OF LABOR

Eight hours labor constitutes a legal day′s work. The Contractor shall forfeit as a penalty to the City of Hanford, $25.00 for each workman employed in the execution of the contract by the Contractor or any subcontractor under him for each calendar day during which such workman is required or permitted to work more than 8 hours in any one calendar day and 40 hours in any one calendar week in violation of the Provisions of the California Labor Code. Except that work performed by employees of Contractor in excess of 8 hours per day, and 40 hours during any one week, shall be permitted upon compensation for all hours worked in excess of 8 hours per day at not less than one and one-half times the basic rate of pay, as provided in the California Labor Code.

6.03 TRAVEL AND SUBSISTENCE PAYMENTS

The Contractor shall provide for travel and subsistence payments to each workman needed to execute the work as such travel and subsistence payments are defined in any collective bargaining filed with the State Department of Industrial Relations in accordance with Section 1773.8 of the California Labor Code.

6.04 PREVAILING WAGE

The Contractor shall forfeit as a penalty to the City of Hanford, $25.00 for each calendar day or portion thereof, for each workman paid less than the stipulated prevailing rates for such work or craft in which such workman is employed for any work done under the contract by him or by any subcontractor under him in violation of the Provisions of the California Labor Code. In addition to said penalty and pursuant to the California Labor Code, the difference between such stipulated prevailing wage rates and the amount paid to each workman for each calendar day or portion thereof for which each workman was paid less than the stipulated prevailing wage rate shall be paid to each workman by the Contractor.

The City will not recognize any claim for additional compensation because of the payment by the Contractor of any wage rate in excess of the prevailing wage set forth in the contract. The

possibility of wage increases is one of the elements to be considered by the Contractor in determining his bid, and will not under any circumstances be considered as the basis of a claim against the City on the contract.

6.05 CONTRACTOR LICENSING LAWS

Attention is directed to the Provisions of the California Business and Professions Code concerning the licensing of Contractors. All bidders and Contractors shall be licensed in accordance with the laws of the State of California and any bidder or Contractor not so licensed is subject to the penalties imposed by such laws.

6.06 DOMESTIC MATERIALS

In accordance with California Government Code, the Contractor shall use and supply in the performance of the contract only such non-manufactured materials as have been produced in the United States, and only such manufactured materials as have been manufactured in the United States, substantially all from materials produced in the United States.

Any person, firm or corporation who fails to comply with the Provisions of the said Government Code shall not be awarded any contract to which the Code applied for a period of 3 years from the date of the violation.

The City desires to promote the industries and economies of the City of Hanford and the County of Kings and the Contractor, therefore, agrees to use the projects, workmen laborers and mechanics of the said City and County in every case where the price, fitness and quality are equal.

6.07 DESIGNATION OF SUBCONTRACTORS

All persons submitting bids for City work shall list the name and location of the place of business of each subcontractor on forms provided with the bid document, regardless of the character of work. All other requirements of the California Government Code concerning the listing of subcontractors shall make him liable for the penalty and disciplinary action stated therein.

6.08 WEIGHT LIMITATIONS

Unless expressly permitted in the Special Provisions, construction equipment or vehicles of any kind which, laden or unladen, exceed the maximum weight limitations set forth in the California Vehicle Code and Hanford Municipal Code, shall not be operated over completed or existing treated base, surfacing, pavement or structures in any area within the limits of the project, except as hereinafter provided in this Subsection.

Within the limits of the project and subject to the control of the Engineer, and subject to providing such protective measures as are deemed necessary by the Engineer, the Contractor will be permitted to make transverse crossing of such portions of an existing public road or street as are within the right-of-way, and to make transverse crossings of treated bases, surfacing, or pavement which are under construction or which have been completed, with construction equipment which exceed the size or weight limitations set forth in the California Vehicle Code and Hanford Municipal Code, provided that the Contractor at his expense shall provide any necessary protective measures and shall repair any damage caused by such operations.

The Contractor will not be permitted to cross bridge structures, culverts and pipes with pneumatic tired construction equipment which exceed the size or weight limitations set forth in the California Vehicle Code and the Hanford Municipal Code, without prior approval of the Engineer. Such approval of the Engineer, will not relieve the Contractor of the responsibility to repair at his expense any damage caused by such operations.

6.09 PAYMENT OF TAXES

The contract prices paid for the work shall include full compensation for all taxes which the Contractor is required to pay whether imposed by Federal, State or Local government, including, without being limited to, Federal Excise Tax. The City will not furnish any tax exemption certificate nor sign any document designed to exempt the Contractor from payment of any tax.

6.10 PERMITS OR 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, including a City of Hanford business license.

6.11 PATENTS

The Contractor shall assume all costs arising from 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 Hanford, the Engineer and their duly authorized representatives, from all suits at law, or actions of every nature for, or on account of the use of any patented materials, equipment, devices or processes.

6.12 SAFETY PROVISIONS

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

6.13 TOILET FACILITIES

The Contractor shall provide temporary toilet facilities at the site of the work.

6.14 PUBLIC CONVENIENCE

This subsection defines the Contractor′s responsibility with regard to convenience of the public and public traffic in connection with his operations.

Attention is directed to Section I(6.15) ″Public Safety″ for provisions relating to the Contractor's responsibility for the safety of the public.

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 rights of the public.

Unless otherwise provided in the Special Provisions, all public traffic shall be permitted to pass through the work with as little inconvenience and delay as possible.

Mail boxes and access to them shall be maintained at all times. If temporary relocation is necessary the location shall be in a convenient location.

No separate payment shall be made for conformance to the requirements of this section.

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 highway lighting systems shall be kept in operation for the benefit of the traveling public during progress of the work, and other forces will continue routine maintenance of existing systems.

Convenient access to driveways, houses, and buildings along the line of the work shall be maintained and temporary approaches to crossings or intersecting highways shall be provided and kept in good condition. At least one half of an existing driveway shall be kept open to vehicular traffic at all times.

When ordered by the Engineer, roadway or culvert construction shall be conducted on one side 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.

Upon completion of rough grading, or placing any subsequent layer thereon, the surface of the roadbed shall be brought to a smooth, even condition free of humps and depressions, satisfactory for the use of public traffic.

After the surface of the roadbed has been brought to a smooth and even condition for the passage of public traffic as above provided, any work ordered by the Engineer for the accommodation of public traffic prior to commencing subgrade operations will be paid for as extra work.

After subgrade preparation for a specified layer of materials has been completed, the Contractor shall, at his expense, repair any damage to the roadbed or completed subgrade, including damage caused by his operations or use by public traffic.

In order to expedite the passage of public traffic through or around the work, and where ordered by the Engineer, the Contractor shall install guide signs, lights, flares, barricades, and informational signs and other facilities for the sole convenience and direction of public traffic, advising traffic of destinations, alternate routes, detours, delays, etc.

In addition to the requirements hereinbefore specified for furnishing facilities for expediting the passage of public traffic through or around the work, the Contractor shall erect, within or adjacent to the limits of the contract such warning, regulatory, and guide signs and barricades as may be furnished by the City. The Engineer will inform the Contractor where such signs and barricades are stored. The Contractor shall load and haul the signs and barricades from such storage to the site of the work and erect them, including any necessary framing. The Contractor shall also return and unload said signs and barricades at the storage location designated by the Engineer at the completion of the contract.

The Contractor will be required to pay the cost of replacing or repairing all facilities installed for the convenience, direction or warning of public traffic whether furnished and installed by the Contractor, or furnished by the City and installed by the Contractor, as above specified, that are lost while in his custody, or are damaged by reason of his operations to such an extent as to require replacement or repair, and deductions from any monies due or to become due the Contractor will be made to cover such cost. The Contractor shall keep all such facilities clean, securely mounted, properly positioned and in good repair at all times. Whenever the Contractor discovers that such facilities have been damaged or lost, he shall immediately notify the Engineer.

Attention is directed to Section I(6.15) ″Public Safety.″ By reason of his conformance to any of the provisions in this Section, the Contractor will not be relieved of his responsibility as set forth in Section I(6.15) ″Public Safety.″

(A) Measurement and Payment. The initial installation of a barricade (including hauling from the storage to the site of work), each move required for public convenience as directed by the Engineer, and the removal (including hauling from the site of work to storage) of a barricade will each be measured as one move, and paid for at the contract unit price for moving barricades.

The initial installation of signs (including hauling from storage to the site of work), removal and reinstallation as directed by the Engineer, and final removal (including hauling from the site of work to storage) of a sign will each be measured as one move, and paid for at the contract unit price for moving barricades.

The above payments for moving barricades and installing signs shall include full compensation for furnishing all labor, materials, (including supports and fastenings) tools, equipment and incidentals and for doing all work involved in the operations as specified. When there are no contract items for moving barricades or installing signs, payment will be made by extra work as provided in Section I(8.03) ″Force Account Payment.″

In lieu of the Provisions of Section I(3.02)(B) ″Increased or Decreased Quantities″, applicable to the work covered in the above described payments, no adjustment to the unit price will be made because of an increase or decrease of more than 25 percent in the contract quantities.

6.15 PUBLIC SAFETY

This Subsection defines the Contractor′s responsibility with regard to providing for the safety of the public during construction.

Attention is directed to Section I(6.19) ″Responsibility for Damage.″ Attention is directed to Section I(6.14) ″Public Convenience″, for Provisions relating to the Contractor′s responsibility of providing for the convenience of the public in connection with his operation.

Whenever the Contractor′s operations create a condition hazardous to traffic or to the public, or whenever temporary relocation, removal or closure at roadways, sidewalks, crosswalks, signs, signals or other existing facilities are required in conjunction with the work he shall furnish, erect, and maintain at his expense and without cost to the City, such fences, barricades, signs, lights and other devices as are necessary to prevent accidents, damage, or injury to the public. These shall normally be considered to include all regulatory and warning signs, including parking signs, necessitated by the Contractor′s operations, by relocation, removal or closure of existing facilities. All signs shall be reflectorized unless otherwise specified. The Contractor shall also furnish such flagmen and guards as are necessary to give adequate warning to traffic and to the public of any dangerous conditions to be encountered at times and locations in accordance with the ″Manual for Traffic Control in the Vicinity of Construction and Maintenance Operations″, and payment therefor will be made as provided in Sub-Section 6.16 ″Flagging Costs.″ Flagmen and guards, while on duty and assigned to give warning to the public that the highway is under construction or of any dangerous conditions to be encountered, shall perform their duties and shall be provided with the necessary equipment in accordance with the above mentioned manual. The equipment shall be furnished and kept clean and in good repair by the Contractor at his expense. Signs, lights, flags and other warning and safety devices shall conform to the requirements set forth in the above mentioned manual or the California Department of Transportation requirements, whichever is more stringent.

Any signs furnished and erected by the Contractor at his expense as above provided, shall be in addition to such signs as provided in Section I(6.14) ″Public Convenience″, and they shall not obscure the visibility of nor conflict in interest and meaning with the City furnished signs and shall be approved by the Engineer as to size and wording.

If, in the opinion of the Engineer, the Contractor appears 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 his expense without cost to the City. If the Contractor refuses or fails to provide such warning or protective measures, the City may take steps to furnish same and charge the resultant cost thereof to the Contractor. 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.

No material or equipment shall be stored where it will interfere with the free and safe passage of public traffic, 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 use by public traffic. Material and equipment brought to the job site may be stored only in areas approved by the Engineer.

Provisions for the payment for hauling and erecting such signs as provided in Section I(6.14) ″Public Convenience″ shall in no way relieve the Contractor from his responsibility as provided in this Section.

Except as otherwise provided in this Section, compensation for conforming to all of the Provisions in this Section shall be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed therefor.

6.16 FLAGGING COSTS

The cost of furnishing all flagmen and guards under the Provisions of Section I(6.15) ″Public Safety″ will be borne by the Contractor. The Provisions of this Subsection shall in no way relieve the Contractor from his responsibility for providing for the safety of the public as provided in Section I(6.15) ″Public Safety″, nor relieve the Contractor from his responsibility for damage as provided in Section I(6.19) ″Responsibility for Damage.″

6.17 USE OF EXPLOSIVES

No explosives shall be stored or used within the City without prior approval of the Engineer.

6.18 PRESERVATION OF PROPERTY

Attention is directed to Section I(6.19) ″Responsibility for Damage.″ The Contractor shall exercise due care to avoid injury to existing improvements or facilities, utility facilities, adjacent property, and trees and shrubbery that are not to be removed.

Trees and shrubbery that are not to be removed and pole lines, fences, signs, markers and monuments, buildings and structures, conduits, pipe lines under or above ground, sewer and water lines, all highway facilities, and any other improvements or facilities within or adjacent to the right-of-way shall be protected from injury and damage and if ordered by the Engineer the Contractor shall provide and install suitable safeguards, approved by the Engineer to protect such objects from injury or damage. If such objects are injured or damaged by reason of the Contractor′s operations, they shall be replaced or restored to a condition as good as when the Contractor entered upon the work, or as good as required by the Specifications accompanying the contract. The Engineer may make or cause to be made such temporary repairs as are necessary to restore to service any damaged facility. The cost of such repairs shall be borne by the Contractor and may be deducted from any monies due or to become due to the Contractor under the contract.

The City shall be responsible for the removal, relocation, or protection of existing utilities located on the site of the construction project, if such utilities are not identified by the City in the Plans and Specifications.

Full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in protecting or repairing property as specified in this Subsection, shall be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed therefor.

6.19 RESPONSIBILITY FOR DAMAGE

The City of Hanford and all officers and employees therefor connected with the work, shall not be liable in any manner for any loss or damage that may happen to the work or any part hereof; 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.

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 his performance of the work or from defects or obstructions or from any cause whatsoever and in any way related to construction of the work during the progress of the work or any time before its completion and final acceptance.

The Contractor shall indemnify, defend, and save harmless the City of Hanford and all officials, officers, and employees thereof, 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, his subcontractors, or his agents.

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 Engineer may be retained by the City of Hanford until disposition has been made of such suits or claims for damages as aforesaid.

The Contractor shall not be responsible for the removal, relocation or protection of existing utilities located on the site of the construction project, if such utilities are not identified in the Plans and Specifications.

6.20 DISPOSAL OF MATERIAL OUTSIDE THE RIGHT-OF-WAY

The Contractor shall make his own arrangements for disposing of materials outside the right-of-way and he shall pay all costs involved.

When any materials 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 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 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 hauling, 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.

6.21 COOPERATION

Should construction be under way by other forces within or adjacent to the limits of the work 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 forces to the end that any delay or hindrance to their work will be minimized. The City reserves the right to perform other or additional work at or near the site (including designated material sources) at any time, by the use of other forces.

In street construction areas containing water main facilities, the Contractor shall notify the Hanford Water Utility prior to commencing excavation. The Water Utility will reference valve box locations and cut boxes below subgrade. Upon completion of paving, the Contractor will adjust valve boxes and pave around them. Valve boxes shall not be removed by the Contractor. The Water Utility shall be allowed access to valve boxes for emergency valve operations.

6.22 RELIEF FROM MAINTENANCE AND RESPONSIBILITY

Upon request of the Contractor, the City may relieve him of the duty of maintaining and protecting certain portions of the work as described below, which have been completed in all respects in accordance with the requirements of the contract and to the satisfaction of the Engineer, and thereafter except with his consent, 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.

Portions of the work for which the Contractor may be relieved of the duty of maintenance and protection as provided in the above paragraph include but are not limited to the following:

(A) The completion of one-quarter mile of roadway or one-quarter mile of one roadway of a divided roadway or a frontage road including the traveled way, shoulders, drainage control facilities, lighting and any required traffic control and access facilities.

(B) A bridge or other structure of major importance.

(C) A complete unit of a traffic control signal system or of a highway lighting system.

(D) Any required traffic control and access facilities if the roadway or structure is to be used by public traffic before completion of the contract.

(E) Landscaping if completed in its entirety.

However, nothing in this Subsection providing for relief from maintenance and responsibility will be construed as relieving the Contractor of responsibility for making good defective work or materials in accordance with Section I, 6.26 ″Defective Material and Workmanship Guarantee.″

6.23 CONTRACTOR′S RESPONSIBILITY FOR THE WORK AND

MATERIALS

Until completion and acceptance of all 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 as provided in Sub-Section 8 ″Measurement and 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. 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 and shall bear the expense thereof. Where necessary to protect the work or materials from damage, the Contractor shall, at his expense, provide suitable drainage 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.

6.24 PERSONAL LIABILITY

No officer or authorized employee of the City of Hanford shall be personally responsible for any liability arising under or by virtue of the Contract Documents or the construction of the work.

6.25 ACCEPTANCE OF CONTRACT

When the Engineer has made the final inspection as provided in Section 4-15 and if as a result of the final inspection it appears that the work has been completed in all respects in accordance with the Contract Documents and the Contractor has requested in writing that the project be accepted, the Engineer will recommend that the City Council formally accept the work, and after such acceptance by the City Council, the Contractor will be relieved of the duty of protecting the work as a whole, and he will not be required to perform any further work thereon, except as may be required in the compliance of Sub-Section 6-26 ″Defective Material and Workmanship Guarantee″. The final inspection and acceptance of the work does not in any way relieve the Contractor from its obligations to construct the work in accordance with the Contract Documents or its obligations under Sub-Section 6-26 hereof.

6.26 DEFECTIVE MATERIAL AND WORKMANSHIP GUARANTEE

The Contractor shall guarantee all its work for a period of one year after the date of acceptance by the City Council, against defective material or equipment, or faulty workmanship.

The Contractor shall repair or replace, to the satisfaction of the Engineer, and at no cost to the City, any or all such work that may prove defective in workmanship, material, or equipment within that period, including but not limited to, leaks or breaks, settlement of backfill with resultant damage to any structures, or to resurfacing and/or new pavements, together with any other work or property which may be damaged in so doing (ordinary wear and tear, vandalism, or other unusual abuse or neglect excepted.)

In the event of failure to comply with the above mentioned conditions within five days after being notified in writing, the City is authorized to perform or cause to be performed, the necessary work, and the Contractor shall pay to the City the actual cost of such work plus fifteen percent. The Contractor and his sureties shall pay all costs and expenses incurred to satisfy Contractor′s obligations under this paragraph.

As a condition precedent to the completion of this contract, the Contractor shall furnish to the City a Defective Material and Workmanship Bond, of a surety company acceptable to the Engineer, and payable to the City of Hanford, in an amount not less than ten percent of the total construction contract price, as identified in this agreement. This bond shall cover a period of one year from and after the completion of the work and acceptance thereof by the City, to protect the City against the results of defective material, workmanship, or equipment which becomes apparent during said one year time period. This bond shall be delivered to the Engineer before the final payment under this contract will be made.

If performance of this contract by Contractor is subject to an encroachment permit issued by the California Department of Transportation, (″CalTrans″), CalTrans shall have the unilateral right to correct any defect in workmanship, material and equipment and Contractor and its surety shall reimburse the City any and all costs and expenses incurred by the CalTrans in correcting any such defect in workmanship, material or equipment. The City will request that CalTrans contact the Contractor and request that Contractor correct the defective workmanship, material or equipment. However, Contractor acknowledges and understands that the decision of whether the Contractor is contacted is within the sole discretion of CalTrans.

6.27 RESPONSIBILITY OF CITY

The City of Hanford shall not be held responsible for the care or protection of any material or parts of the work prior to final acceptance, except as expressly provided in these Specifications.

6.28 WORKMEN′S COMPENSATION INSURANCE

The Contractor shall at all times upon demand of the City Council or its properly authorized agent, furnish proof that Workmen′s Compensation Insurance is being maintained by him in force and effect in accordance with the Provisions of the California Labor Code. By execution of a contract covering the work to be performed hereunder, the Contractor certifies that he is aware of the Provisions of Section 3700 of the Labor Code requiring every employer to be insured against liability for Workmen′s Compensation or he will undertake self insurance in accordance with said Section 3700 and will comply with such Provisions before commencing the performance of the work required by the contract.

6.29 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 insofar as such Section is applicable.

6.30 PROPERTY DAMAGE AND PUBLIC LIABILITY INSURANCE

The Contractor shall at all times, upon demand of the City Council or its properly authorized agent, furnish proof that Property Damage and Public Liability Insurance is being maintained by him in force and effect. The combined single limit of liability per occurrence for property damage, bodily injury, and personal injury shall not be less than $1,000,000. Insurance issued under this Subsection shall require the insurer to give the City thirty (30) days written notice prior to cancellation of the policy. The City of Hanford, its officials, officers, employees and agents shall be named as additional insured under such policies.

6.31 POLICIES AND CERTIFICATES

The policies mentioned in this Section shall be issued by an insurance carrier satisfactory to the City and shall be delivered to the City at the time of the delivery of the 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 may be delivered to the City. Should any such policies be cancelled before final completion of the work herein contemplated and the Contractor fails to immediately procure other insurance as herein required, then the City may procure such insurance and deduct the cost thereof from the amount due the Contractor.

6.32 DETOUR MAINTENANCE

The Contractor shall be responsible for the maintenance and protection of all detours shown on the plans which are to be constructed. The scope of work shall include, but not be limited to, shoulders, pavement, signing and barricades, slope banks, and drainage facilities. Striping shall be excluded from the requirements of this section.

All work (including trench construction and street reconstruction) done by utility companies shall be specifically excluded from the requirements of this section and shall be maintained by the specific utility company.

No special payment will be made for detour maintenance and full compensation for such work shall be considered as included in price of the work for detour construction.

7. PROSECUTION AND PROGRESS

7.01 SUBLETTING AND ASSIGNMENT

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

Subcontractors will not be recognized as such, and all persons engaged in the work of construction will be considered as employees of the contractor, and their work shall be subject to the Provisions of the contract and specifications.

Where a portion of the work sublet by the Contractor is not being prosecuted in a manner satisfactory to the Engineer, the Subcontractor shall be removed immediately on the request of the Engineer and shall not again be employed on the work.

The Contract may be assigned only upon written consent of the City Council.

7.02 PROGRESS SCHEDULE

If required by the Special Provisions or requested by the Engineer, the Contractor shall, within fifteen days after receiving notice to do so, submit to the Engineer a practicable schedule on a form to be furnished by the City 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.

If required by the Engineer, the Contractor shall submit supplementary progress schedules which shall be on the form above described to indicate approximately the percentage of work scheduled for completion at any time.

The progress schedule and supplementary progress schedules submitted shall be consistent, in all respects, with the time and order of work requirements of the contract.

7.03 PROGRESS OF THE WORK AND TIME FOR COMPLETION

The Contractor shall begin work within ten days after receipt of notice to proceed from the City and shall diligently prosecute the same to completion before the expiration of the number of calendar days as specified in the Special Provisions. The Engineer will furnish the Contractor a weekly statement showing the number of calendar days charged to the contract for the preceding week, the number of calendar days of time extensions being considered or approved, the number of calendar days originally specified for the completion of the contract and the number of calendar days remaining to complete the contract and the extended date for completion thereof, except when calendar days are not being charged in accordance with the Provisions in Section I, 7.05 ″Temporary Suspension of Work.″

7.04 CALENDAR DAYS

(A) Time shall be of the essence of the contract. The Contractor shall promptly start the work after the date of the notice to proceed and shall prosecute the work so that portions of the project shall be complete within the calendar days time specified.

During periods when weather or other conditions are unfavorable for construction, the Contractor shall pursue only such portions of the work as shall not be damaged thereby. No portions of the work where acceptable quality or efficiency will be affected by unfavorable conditions shall be constructed while those conditions exist. It is expressly understood and agreed by and between the Contractor and the City of Hanford that the contract time for completion of the work described herein is a reasonable time taking into consideration the average climatic and economic conditions and other factors prevailing in the Hanford area.

Because of the calendar day method, the Contractor shall provide a construction schedule and reports for continuous scheduling and coordinating the work within the contract time. Failure of the Contractor to comply with these requirements for submittal of the construction schedule and reports shall be cause for delay in review of progress payments by the City.

The Contractor shall furnish such manpower, materials, facilities and equipment as may be necessary to ensure the prosecution and completion of the work in accordance with the acceptable schedule. If work falls 14 days or more behind the accepted construction schedule, the Contractor agrees that he will take some or all of the following actions to return the project to the accepted schedule. These actions may include the following:

1. Increase manpower in quantities and crafts.

2. Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of equipment, or any combination of the foregoing.

3. Reschedule activities.

If requested by the City, the Contractor shall prepare a proposed schedule revision demonstrating a plan to make up the lag in progress and ensure completion of the work within the contract time. The proposed revision shall be submitted to the City Engineer or designated assignee. Upon receipt of an acceptable proposed schedule, the revision to the construction schedule shall be made. All actions to return the project to the accepted schedule are at the Contractor′s expense.

The Contractor shall pay all costs incurred by the City which result from the Contractor′s action to return the project to its accepted schedule. Contractor agrees that the City shall deduct such charges from payments due the Contractor. It is further understood and agreed that none of the services performed by the City in monitoring, reviewing and reporting project status and progress shall relieve the Contractor of responsibility for planning and managing construction work in conformance with the construction schedule.

(B) NOTICE OF DELAYS. When the Contractor foresees a delay in the prosecution of the work and, in the event, immediately upon the occurrence of a delay which the Contractor regards as unavoidable, he shall notify the City Engineer in writing of the probability of the occurrence of such delay, the extent of the delay, and its possible cause. The Contractor shall take immediate steps to prevent, if possible, the occurrence or continuance of the delay. If this cannot be done, the City

Engineer shall determine how long the delay shall continue and to what extent the prosecution and completion of the work are being delayed thereby. He shall also determine whether the delay is to be considered avoidable or unavoidable and shall notify the Contractor of his determination. The Contractor agrees that no claim shall be made for delays which are not called to the attention of the City Engineer at the time of their occurrence.

(C) AVOIDABLE DELAYS. Avoidable delays in the prosecution of the work shall include delays which could have been avoided by the exercise of care, prudence, foresight and diligence on the part of the Contractor or his subcontractors. Avoidable delays include:

1. Delays which may in themselves be unavoidable but which affect only a portion of the work and do not necessarily prevent or delay the prosecution of other parts of the work nor the completion of the whole work within the contract time.

2. Time associated with the reasonable interference of other contractors employed by the City which do not necessarily prevent the completion of the whole work within the contract time.

(D) TIME EXTENSIONS FOR AVOIDABLE DELAYS. In case the work is not completed in the time specified, including extension of time as may have been granted for unavoidable delays, the Contractor will be assessed liquidated damages as identified in Section 7.06, ″Liquidated Damages″ hereof, for each day that the work remains incomplete.

The City may grant an extension of time for avoidable delay if deemed in its best interest. If the City grants an extension of time for avoidable delay, the Contractor agrees to pay actual costs, including, without limitation, charges for engineering, inspection and administration incurred by the City during the extension. These costs will be deducted from the amounts owed the Contractor.

(E) UNAVOIDABLE DELAYS. Unavoidable delays in the prosecution or completion of the work shall include delays which result from causes beyond the control of the Contractor and which could not have been avoided by the exercise of care, prudence, foresight and diligence on the part of the Contractor or his subcontractors employed by the City will be considered unavoidable delays insofar as they interfere with the Contractor′s completion of the work. Delays due to normal weather conditions shall not be regarded as unavoidable as the Contractor agrees to plan his work with prudent allowances for interferences by normal weather conditions.

Delays caused by acts of God, fire, unusual storms, floods, earthquake, strikes, labor disputes, freight embargoes and shortages of materials shall be considered as unavoidable delays insofar as they prevent the Contractor with proceeding with at least seventy-five percent (75%) of the normal labor and equipment force for at least five hours per day toward completion of the current controlling item on the accepted critical path schedule.

Should abnormal conditions prevent the work from beginning at the usual starting time, or prevent the Contractor from proceeding with seventy-five (75%) of the normal labor and equipment force for a period of at least five hours per day, and the crew is dismissed as a result thereof, he will not be charged for a calendar day whether or not conditions change so that the major portion of the day could be considered to be suitable for work on the controlling item.

(F) TIME EXTENSIONS FOR UNAVOIDABLE DELAYS. For delays which the Contractor considers to be unavoidable, he shall submit to the City Engineer complete information demonstrating the effect of the delay on the controlling operation in his construction schedule. The submission shall be made within 30 calendar days of the occurrence which is claimed to be responsible for the unavoidable delay. The City Engineer shall review the Contractor′s submission and determine the number of days of unavoidable delay and the effect of such unavoidable delay on controlling operations of the work. The City agrees to grant an extension of time to the extent that unavoidable delays affect the controlling operations in the construction schedule. During such extension of time, neither extra compensation or engineering inspection and administration nor damages for delay will be charged to the Contractor. It is understood and agreed by the Contractor and City that time extensions due to unavoidable delays will be granted only if such unavoidable delay involves controlling operations which would prevent completion of the whole work within the specified contract time.

(G) DAMAGES FOR DELAYS. For the period of time that any portion of the work remains unfinished after the time fixed for completion in the contract documents, as modified by extensions of time granted by the City, if any, it is understood and agreed by the Contractor and the City that the Contractor shall pay to the City the amount of liquidated damages as defined by Section 7.06, ″Liquidated Damages″ hereof, which are due because of the failure of the Contractor to complete the work within the stipulated time.

7.05 TEMPORARY SUSPENSION OF WORK

The work may be suspended in whole or in part, when in the Engineer′s opinion the suspension is necessary in the interest of the City. The Contractor shall comply immediately with any written order of the Engineer suspending work. If a temporary suspension of work is ordered by the Engineer, due to the failure on the part of the Contractor to carry out orders given or to perform any provision of the contract, the days on which the suspension order is in effect shall be considered calendar days if such days are within the meaning of the definition set forth in Section I, 7.04, ″Calendar Days.″

In the event of a temporary suspension of work, such suspension of work shall not relieve the Contractor of his responsibilities as set forth in Section I(6) ″Legal Relations and Responsibilities to the Public.″

Suspended work shall be resumed upon written order of the Engineer.

If a temporary suspension of work is ordered by the Engineer, and if, in the sole opinion of the Engineer, the Contractor has not diligently prosecuted the work, then the Contractor, at his expense, shall do all the work necessary to provide a safe, smooth and unobstructed passageway through construction for use by public traffic. However, if a temporary suspension of work is ordered by the Engineer due to unsuitable weather conditions and in the sole opinion of the Engineer, the Contractor has prosecuted the work with energy and diligence prior to the time that operations were suspended, the cost of providing a smooth and unobstructed passageway through the work will be paid for as extra work as provided in Section I(8.03) ″Force Account Payment.″

7.06 LIQUIDATED DAMAGES

Failure of the Contractor to complete the work within the time period specified in the Contract Documents will result in damages being sustained by the City. Such damages are, and will continue to be, impracticable and extremely difficult to determine. Unless otherwise provided in the Special Provisions, the Contractor will pay to the City one hundred dollars ($100.00) for each day of delay in finishing the work in excess of time specified for completion, including approved time extensions.

Execution of the contract under these Specifications shall constitute agreement by the City and Contractor that one hundred dollars ($100.00) per day is the minimum value of the costs and actual damage caused by failure of the Contractor to complete the work within the allotted time, that such sum is liquidated damages and shall not be construed as a penalty, and that such sum may be deducted from payments due the Contractor if such delay occurs.

7.07 SUSPENSION OF CONTRACT

If any time in the opinion of the Engineer, the Contractor has failed to supply an adequate working force, or material of proper quality, or has failed in any respect to diligently prosecute the work of the contract, notice thereof in writing will be served upon him and should he neglect or refuse to cure said non-compliance with the contract, as directed by the Engineer, within the time specified in such notice, the City shall have the power to suspend the operation of the contract. Upon receiving notice of such suspension, the Contractor shall discontinue said work or such parts of it as the City may designate. The City or its duly authorized representative may take possession of all materials located at the job site, and use the same for the purpose of completing the work, and hire such force and buy or rent such machinery, tools, appliances, and equipment, 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, machinery or materials, and purchase the materials contracted for, in such manner as the City may deem proper; or the City 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 suspension, all money due the Contractor or retained under the terms of this contract shall be retained by the City and used to complete the work. However, such retention will not release the Contractor or his sureties from liability or failure to fulfill the contract.

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

7.08 UTILITY RELOCATION

When feasible, the owners responsible for utilities within the area affected by the work will complete their necessary installation, relocation, repairs or replacements before commencement of work by the Contractor. 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 cost to the Contractor.

Utilities uncovered and not damaged by the Contractor must be brought to the immediate attention of the Engineer by the Contractor. The Contractor shall notify the owner of the utility whereby any necessary relocation will be at no cost to the Contractor. Utilities damaged by the Contractor will be relocated or repaired by the owners at the Contractor′s expense, or by the Contractor at his expense when ordered by the Engineer, if said utilities were shown on the Plans and in the Specifications. If the utilities were not shown on the Plans and in the Specifications, the City shall be responsible for said repairs.

When the Plans and Specifications provide for the Contractor to alter, relocate, or reconstruct a utility, payment for such work shall be as specified in the Special Provisions. If there is no separate bid item for such work, payment therefor shall be considered as included in the payment for the other various items of work.

Temporary or permanent relocations 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.

7.09 RIGHT-OF-WAY

The right-of-way for the work to be constructed will be provided by the City. The Contractor shall make his own arrangements and pay all expenses for additional area required by him outside the limits of right-of-way unless otherwise provided in the Special Provisions.

7.10 FAILURE TO PERFORM

If the City sues to compel performance or sues for breach of this contract, or to recover the cost of completing the work, the Contractor shall pay all the City′s reasonable attorney′s fees, costs of suit, and all its other expenses of litigation.

7.11 WORK ON WEEKENDS AND HOLIDAYS

The City of Hanford will allow certain construction procedures on weekends and holidays. No procedure that requires inspection by the City of Hanford will be permitted unless arranged with the City Engineer. These include, but are not limited to, installation of pipe and related appurtenances, construction of street section (base rock and A.C. paving), and pouring of concrete facilities. If any procedure that requires inspection is performed unless approved by the City Engineer, that installation/construction will be rejected, removed and re-installed/re-constructed no matter what subsequent tests indicate.

Those procedures permitted on weekends and holidays include clean-up of site, finish grading of site in areas where ″live mains″ are not present and forming for concrete facilities. Any procedure not listed above must be approved by the City Engineer prior to installation/ construction.

Approval may be granted based on available manpower and must be in writing. If construction on weekends or holidays is denied, the Contractor understands that a claim for damages or delay will be automatically denied.

8. MEASUREMENT AND PAYMENT

8.01 MEASUREMENT OF QUANTITIES

All work to be paid for at a contract price per unit of measurement will be measured by the Engineer in accordance with United States Standard Measures. A ton shall consist of 2,000 pounds avoirdupois.

Unless shipped by rail, material paid for by weight shall be weighed on scales furnished by and at expense of the Contractor or on other sealed scales regularly inspected by the State of California, Department of Food & Agriculture, Division of Measurements & Standards or its designated representative. All scales shall be suitable for the purpose intended and shall conform to the specifications of the State of California, Department of Food & Agriculture, Division of Measurements & Standards. The scales shall be operated by a weighmaster licensed in accordance with the provisions of the California Business and Professions Code. The Contractor shall furnish a Public Weighmaster′s certificate, or a Private Weighmaster′s certificate or certified daily summary weight sheets. The operator of each vehicle shall obtain a weight or load slip from the weigher and deliver said slip to the Engineer at the point of delivery of the material.

Whenever metering devices are used to measure the quality of liquids used in the work, the metering devices shall conform to the Specifications of the State Bureau of Weights and Measures.

If material is shipped by rail, the car weights will be accepted provided that actual weight of material only will be paid for and not minimum car weight used for assessing freight tariff, and provided further that car weights will not be acceptable for material to be passed through mixing plants.

Trucks used to haul material being paid for by weight shall be weighed empty daily and at such additional times as the Engineer may direct. Each truck shall bear a plainly legible identification mark.

Unless otherwise provided in these Specifications or in the Special Provisions, material paid for by the cubic yard will be measured in the vehicle at the point of delivery on the roadbed or at a mixing plant, as the case may be. All materials which are specified for measurement by the cubic yard ″measured in the vehicle″ shall be hauled in vehicles of such type and size that the actual contents may be readily and accurately determined. Unless all vehicles are of uniform capacity, each vehicle must bear a plainly legible identification mark indicating its water level capacity. All vehicles shall be loaded to at least their water level capacity and all loads shall be leveled when the vehicles arrive at the point of delivery. Loads hauled in vehicles not meeting the above requirements or loads of a quantity less than the capacity of the vehicle, measured after being leveled off as above provided, will be subject to rejections and no compensation will be allowed for such material.

When material is to be measured and paid for on a volume basis and it is impractical to determine the volume by the specified method of measurement, or when requested by the Contractor in writing and approved by the Engineer in writing, the material will be weighed in accordance with

the requirements specified for weight measurement and such weights will be converted to volume measurements 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.

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 of the lines indicated on the plans or established by the Engineer; or material remaining on hand after completion of the work; will not be paid for and such quantities will be deducted from the final quantities. No compensation will be allowed for hauling and disposing of rejected material.

Full compensation for all expense involved in conforming to the requirements specified in this Subsection for measuring and weighing materials shall be considered as included in the unit price paid for the materials being measured or weighed and no additional compensation will be allowed therefor.

8.02 SCOPE OF PAYMENT

The Contractor shall accept the compensation provided in the contract as full payment for furnishing all labor, materials, tools, equipment, and incidentals necessary to the completed work; for performing all work contemplated and embraced under the contract; also for loss or damage arising from the nature of the difficulties which may be encountered during the prosecution of the work until the acceptance by the City Council and for all risks of every description connected with the prosecution of the work; also for the expenses incurred in consequence of the suspension or discontinuance of the work as provided in the contract; and for completing the work according to the Plans and Specifications. 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.

No compensation will be made in any case for loss of anticipated profits.

8.03 FORCE ACCOUNT PAYMENT

When extra work is to be paid for on a force account basis, the labor, materials, and equipment used in the performance of such work shall be subject to the approval of the Engineer and compensation will be determined as follows:

(A) Work Performed by Contractor. The Contractor will be paid the direct costs for labor, materials and equipment used in performing the work determined as hereinafter provided, except where agreement has been reached to pay in accordance with Subsection 8.03(B) "Work Performed by Special Forces."

To the total of the direct costs computed as hereinafter provided, there will be added a markup of 33 percent to the cost of labor, 15 percent to the cost of materials, and 15 percent to the equipment rental.

The total payment made as provided above shall be deemed to be the actual cost of such work and shall constitute full compensation therefor.

When extra work paid for on a force account basis is performed by forces other than the Contractor′s organization, the Contractor shall reach agreement which such other forces as to the distribution of the payment made by the City for such work. No additional payment therefor will be made by the City by reason of the performance of the work by a Subcontractor or other forces.

(1) Labor. The Contractor will be paid the cost of labor for the workmen (including foremen when authorized by the Engineer), used in the actual and direct performance of the work. The direct cost of labor, whether the employer is the Contractor, Subcontractor, or other forces, will be the sum of the following:

(a) The actual wages paid (which shall include any employer payments for health and welfare, pension, vacation and similar purposes).

(b) To the actual wages will be added a labor surcharge as set forth in the Department of Transportation publication entitled ″Labor Surcharge and Equipment Rental Rates″, which is in effect on the date upon which the work is accomplished. The labor surcharge shall constitute full compensation for all payments imposed by State and Federal laws and for all other payments made to, or on behalf of the workers, other than actual wages and subsistence and travel allowance.

(c) The actual subsistence and travel allowance paid to the workers.

(2) Materials. The City reserves the right to furnish such materials as it deems advisable, and the Contractor shall have no claims for costs and markup on such materials.

Only materials furnished by the Contractor and necessarily used in the performance of the work will be paid for. The cost of such materials will be the cost to the purchaser, whether Contractor, Subcontractor or other forces, from the supplier thereof.

(3) Equipment Rental. The Contractor will be paid for the use of equipment at the rental rates applicable to such equipment regardless of ownership or any rental or other agreement (if such may exist) for the use of such equipment entered into by the Contractor. The rental rates to be used are as listed for that equipment in the Department of Transportation publication entitled ″Labor Surcharge and Equipment Rental Rates″, which is in effect on the date which the work is accomplished. If it is deemed necessary to the Engineer to use equipment not listed, a suitable rental rate for such equipment will be established by the Engineer. The Contractor may furnish any cost data which might assist the Engineer in establishment of such rental rate.

The rental rates paid as above provided 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.

All equipment shall, in the opinion of the Engineer, be in good working condition and suitable for the purpose for which the equipment is being used.

Individual pieces of equipment or tools having a replacement value of $500 or less, whether or not consumed by use, shall be considered to be small tools and no payment will be made therefor. Rental time will not be allowed while equipment is inoperative due to breakdown.

(a) Equipment On the Work. The rental time to be paid for equipment on the work shall be the time the equipment is in operation on the extra work being performed, and in addition, shall include the time required to move the equipment to the location of the extra work and return it to the original location (or to another location requiring no more time than that required to return it to its original location) except that moving time will not be paid for if the equipment is used at the site of the extra work in lieu of moving time, when the equipment is moved by means other than its own power, except that no payment will be made if the equipment is used at the site of the extra work on other than such extra work.

(b) Equipment Not On the Work. For the use of equipment moved in on the work and used exclusively for extra work paid for on a force account basis, the Contractor will be paid the rental rates and the cost of transporting the equipment to the location of the work and its return to its original location, (or to another location requiring no more time than that required to return it to its original location), all in accordance with the following provisions:

(1) The City will pay the costs of loading and unloading such equipment.

(2) The rental period shall begin at the time the equipment is unloaded at the site of the extra work, shall include each day that the equipment is at the site of the extra work, excluding Saturdays, Sundays and legal holidays unless the extra work is performed on such days, and shall terminate at the end of the day on which the Engineer directs the Contractor to discontinue the use of such equipment.

(3) Payment for transporting, and loading and unloading equipment as above provided, will not be made if the equipment is used on work in any other way than upon extra work paid for on a force account basis.

(B) Work Performed by Special Forces. When the Engineer and the Contractor agree that a special service or an item of extra work cannot be performed by the forces of the Contractor or those of any of his Subcontractors, such service or extra work item may be performed by a specialist. Invoices for such service or item of extra work on the basis of the current market price thereof may be accepted without complete itemization of labor, material, and equipment rental costs when it is impracticable and not in accordance with the established practice of the special service industry to provide such itemization.

To the specialist invoice price, a markup of 15 percent will be added in lieu of the percentages provided in Section I(8.03)(A) ″Work Performed by Contractor.″

(C) Records. The Contractor shall maintain his records in such a manner as to provide a clear distinction between the costs of extra work for on a force account basis and the costs of other operations.

The Contractor shall submit to the Engineer daily an itemized report of labor, materials, and equipment used in the performance of the work to be paid for on a force account basis. Such daily report shall be signed by the Contractor and the Engineer and shall become the basis of payment for the work performed.

The Contractor shall calculate monthly (on forms furnished by the Engineer) the costs of the work to be paid for on a force account basis, in conformance with the previously agreed upon daily reports. Material charges shall be substantiated by copies of vendor′s invoices.

8.04 PARTIAL PAYMENTS

(A) The Contractor shall, once each month, prepare an estimate (on forms furnished by the Engineer) of the total amount of work done and acceptable materials on hand (materials furnished and delivered by the Contractor on the ground and not used). The Engineer shall review the Contractor′s monthly estimate for compliance with the Provisions of the contract. Upon the Engineer′s approval of the Contractor′s monthly estimate, the City of Hanford shall retain 10 percent of such estimated value of the work done and materials on hand, 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. For traffic signal projects or other projects designated by the City Engineer, cost of materials stored shall be paid without retaining 10 percent of value. 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 five hundred dollars ($500.00).

(B) Pursuant to Section 4590 of Chapter 13 of Division 5 of Title 1 of the Government Code of the State of California, Contractor has the option to deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by City. When Contractor deposits the securities as a substitute for Contract earnings, the Escrow Agent shall notify the City within ten (10) days of the deposit. The market value of the securities at the time of the substitution shall be at least equal to the cash amount then required to be withheld as a retention under the terms of the Contract between the City and Contractor. Securities shall designate the Contractor as the beneficial owner.

The City shall make progress payments to the Contractor for such funds which otherwise would be withheld from progress payments pursuant to the Contract provisions, provided that the Escrow Agent holds securities in the form and amount specified above. Alternatively, the City may make payments directly to Escrow Agent in the amount of retention for the benefit of the City until such time as the escrow created hereunder is terminated.

Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the escrow account. These expenses and payment terms shall be determined by the Contractor and Escrow Agent.

The interest earned on the securities or the money market accounts held in escrow and all interest earned on that interest shall be for the sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to the City.

Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from City to Escrow Agent that City consents to the withdrawal of the amount sought to be withdrawn by Contractor.

The City shall have a right to draw upon the securities in the event of default by the Contractor. Upon seven days′ written notice to the Escrow Agent from the City of the default, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by the City.

Upon receipt of written notification from the City certifying that the Contract is final and complete, and that the Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payments of fees and charges.

8.05 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 for material or labor;
(D) Reasonable doubt that the work can be completed for the balance then unpaid; or
(E) Damage to another Contractor, or third party.

8.06 CONTRACTOR′S FINANCIAL OBLIGATION

The Contractor shall promptly make payment to all persons supplying labor and material, and before final acceptance of the work and final payment to the Contractor, including all sums retained by the City, the Contractor shall furnish to the City Council, satisfactory evidence that all claims for labor and material furnished and used in the construction of said work have been settled and that no legal claim can be filed against the City for such labor or material.

8.07 FINAL PAYMENT

The Engineer shall, after the completion of the work, make a final estimate of the amount of work done. Upon the Contractor′s acceptance and approval of the final estimate, the City of Hanford shall pay the entire sum so found to be due after deducting therefrom all previous payments, and all amounts to be retained under the Provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment. The final payment of retained amounts shall not be due and payable until the expiration of thirty-five (35) calendar days after the City files its notice of completion with the County Recorder.

It is mutually agreed between the parties to the contract that no certificate given or payments made under the contract, except the final certificate or final payment, shall be conclusive evidence of the performance of the contract, either wholly or in part, against any claim of the City of Hanford, and no payment shall be construed to be an acceptance of any defective work or improper materials.

The Contractor further agrees that his acceptance of the final estimate shall release the City of Hanford from any and all claims or liability on account of work performed under the contract or any alteration thereof.

SECTION II - SUBDIVISION AND STREET ENCROACHMENT WORK

1. GENERAL REQUIREMENTS FOR SUBDIVISIONS AND STREET ENCROACHMENTS

1.01 GENERAL

The Provisions of this Section shall apply to all improvements constructed pursuant to the following sections of the Hanford Municipal Code: TITLE 9, Chapter 2 - Subdivision, and TITLE 7, Public Works (inclusive). Encroachment.

Unless otherwise specified in this Section, the Provisions of Section I(2) ″Proposal and Contract″ through Section I(8) ″Measurement and Payment″ of these Specifications shall not apply to the above mentioned improvement work.

The Provisions of Section III(1) ″Clearing and Grubbing″ through Section X ″Water Systems″ of these Specifications shall apply to the above mentioned improvement work, except that the provisions for measurement and payment shall not apply.

The Provisions of this Section shall not apply to improvements constructed under contracts which have been publicly advertised and awarded to the lowest responsible bidder.

Upon completion of the work, the Subdivider shall furnish to the Engineer (prior to the acceptance of the work by the City Council) ″as-built″ drawings of the work.

1.02 DEFINITION OF TERMS

In lieu of the Provisions of Section I(1) ″Definitions″, whenever the word ″Contractor″ is used in these specifications, it shall be understood to mean the Subdivider or Permittee responsible for the work.

Whenever reference is made to standards of nationally recognized organizations, the reference shall mean the standard that is in effect at the date of the Subdivision Agreement or at the date of the Encroachment Permit.

1.03 CONTROL OF THE WORK

The Provisions of Section I(4) ″Control of the Work″ of these Specifications shall be applicable subject to the following modifications:

(A) The City shall be notified at least 24 hours before any work is commenced (or resumed after a shutdown) and before each phase of work being inspected.

(B) The Subdivider′s Engineer shall do all necessary surveying to lay out the work for construction.

(C) All property corners, monuments, bench marks or other survey points of permanent interest which are damaged or destroyed in the course of construction work shall be replaced at no cost to the City.

(D) The City may, for cause, require or order that any or all work being performed by or for a Subdivider or Permittee shall cease until proper safety precautions are observed, traffic is properly controlled or protected, the conditions of the Permit or requirements of the Plans and Specifications observed, a hazardous condition is corrected, defective work or materials are replaced, or any other deficiency for which work was stopped has been corrected.

1.04 CONTROL OF MATERIALS AND TESTING

The Provisions of Section I(5) ″Control of Materials″″ of these Specifications shall be applicable as to source and quality of all materials in the work subject to the following conditions:

(A) The Contractor shall furnish all materials.

(B) All materials shall be adequately identified (by tags or other means) as that material which has been tested and approved. Lack of proper identification shall be considered adequate cause for rejection of any material.

(C) The Contractor shall give the City sufficient advance notice of his construction schedule to permit time for adequate testing and plant inspection of materials prior to placing of any materials in the work.

(1) For asphalt concrete, aggregate base and Portland cement concrete from recognized commercial sources, not less than 2 days advance notice shall be given.

(2) For imported aggregate subbase materials and any other material from other than the usual commercial sources, not less than 4 days advance notice shall be given.

(D) Prior to beginning work on lime treatment, the Contractor shall submit his proposed mix design to the Engineer for review. Such submittal shall be made in ample time to permit review without delaying the work.

(E) The cost of all retesting and all testing in addition to the normal City practice shall be borne by the Contractor.

(F) The Contractor shall furnish Certificates of Compliance for all materials used.

1.05 TRAFFIC CONTROL AND WARNING DEVICES

The City of Hanford ″Manual for Traffic Control in the Vicinity of Construction and Maintenance Operations″ outlines the minimum provisions for convenience and safety of the public in and about the Contractor′s operations. The Contractor shall familiarize himself with this Manual and determine if its provisions are adequate for the particular circumstances and if additional provisions are necessary. In no case shall lesser provisions be made than are specified in the said Manual.

Public traffic shall be permitted to pass through construction operations on public streets at all times with as little inconvenience and delay as possible, except that during the time that major operations interfere with the unobstructed passage through the work, traffic may be detoured over other streets with the prior written approved of the Engineer.

The Contractor′s failure to inspect frequently and maintain signs and barricades in proper operating condition when in use on the street, or his failure to respond promptly to notification of

improper operating equipment, will be sufficient cause for suspension of the work until such defects are corrected.

Unless otherwise provided by the plans or permit, construction operations on City streets shall be performed in such a manner that there will be at least two 10-foot wide traffic lanes open to the public traffic at all times. At the end of each working day, and whenever construction operations are suspended, a passageway of sufficient width to provide two 10-foot traffic lanes for public traffic shall be maintained through the working area.

Attention is directed to ″Watch″″, work area traffic control handbook, published by Building News, Inc., of Los Angeles, for provisions relating to the Contractor′s responsibility for providing for the convenience and safety of the public in connection with his operations.

1.06 PROTECTION OF PROPERTY

Utility facilities, street improvements, and private property shall be protected from damage. The Contractor shall secure from owners of utility lines all information necessary to establish the existence and location of all existing underground facilities. It shall be the Contractor′s responsibility to arrange for the removal, rearrangement, and protection of all utilities. If any objects are damaged by reason of the Contractor′s operations, they shall be replaced or restored without expense to the City to a condition satisfactory to the owner of the object. The City or owner of the object may make, or cause to be made, such temporary repairs as are necessary to restore any damaged object to service. The cost of such repairs shall be borne by the Contractor. The Contractor shall be responsible for any damage to public or private property resulting from a break in a utility line by reason of the work done by him or his agents.

Written approval shall be obtained from any adjacent property owners if any work is proposed to be done on their property.

1.07 INSTALLATION OF UTILITIES

In new streets, all underground installations beneath the area to be paved shall be completed and tested before asphalt concrete is placed.

1.08 STREET LIGHTING SYSTEMS

Street lighting systems shall conform to Southern California Edison Company Standards. Poles shall be octagon marbelite or approved equal and shall not be painted. Luminaires shall be high pressure sodium type, and shall be horizontal or vertically mounted, as approved by the Engineer.

SECTION III - EXCAVATION AND GRADING

1. CLEARING AND GRUBBING

1.01 GENERAL

This work shall consist of removing all objectional material from within the limits of the project as specified in the City Specifications.

1.02 CONSTRUCTION

The area shown above and below the natural ground surface shall be cleared of all vegetable growth and deleterious material such as trees, logs, up-turned stumps, roots of down trees, brush, grass, weeds, and all other objectionable material to a minimum depth of 12″ below subgrade or 12″ 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 shall be cut off not more than one foot above the 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.

If it is specified by the Special Provisions or directed by the Engineer that certain shade and ornamental trees and plants shall be preserved, such trees and plants shall be fully protected from injury by the Contractor at his expense. Trees shall be felled in such a manner as to not injure standing trees, plants and improvements which are to be preserved.

1.03 REMOVAL AND DISPOSAL OF MATERIALS

All materials removed shall be disposed of in accordance with Section I, Sub-Section 6.20, ″Disposal of Materials Outside the Right-of-Way.″ The contract work shall be left with a neat and finished appearance.

1.04 SALVAGING OF MATERIALS

Any existing materials that are designated to be salvaged shall be removed, cleaned and hauled to the City Corporation Yard, 900 South 10th Avenue, Hanford, by the Contractor.

1.05 ABANDONING OF STRUCTURES

When existing pipes or structures are to be abandoned, the ends of all pipes shall be plugged with a wall of concrete not less than 0.5 feet thick. Structures shall be demolished to an elevation three feet below finished grade, their bottom (if any remain) broken to prevent entrapment of water and the resultant void backfilled with natural ground.

1.06 MEASUREMENT

Quantities of clearing and grubbing will be measured on a lump sum basis.

1.07 PAYMENT

Clearing and grubbing shall be paid for at the contract lump sum price, which price shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing work involved in clearing and grubbing as shown on the plans, as specified in these Specifications and in the Special Provisions and as directed by the Engineer, including the removal and disposal of all the resulting material.

When there is no separate item for the clearing and grubbing, payment shall be considered as included in the prices paid for various contract items of work and no separate payment will be made therefor.

2. DUST CONTROL

2.01 GENERAL

This work shall consist of the application of materials to the area of work including haul roads for the purpose of alleviation or prevention of dust nuisance, as specified in the City Specifications.

2.02 APPLICATION

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 the Engineer, the operations of the Contractor are creating a dust nuisance, the Engineer will notify the Contractor and the Contractor shall apply dust control materials as necessary to alleviate the problem.

2.03 MEASUREMENT AND PAYMENT

No separate measurement or payment shall be made for the application of materials for dust control and full compensation for furnishing all labor, materials, tools, equipment, and incidentals and doing all the work involved in applying the materials as specified shall be considered as included in the prices paid for various contract items of work and no separate measurement or payment will be made therefor.

3. EXCAVATION AND EMBANKMENT

3.01 GENERAL

This work shall consist of all operations of excavating or filling earth or rock except as covered in Section III, Sub-Section 4, ″Structure and Trench Excavation and Backfill, and Pavement Replacement.″ Examples of work covered under this section are the following: to build embankments; to backfill depressions caused by the removal of obstructions; to grade ditches and channels; to grade road connections; all as specified in the City Specifications.

3.02 EXCAVATION

All material shall be excavated as shown on the plans.

All existing concrete and pavement shall be removed to an elevation three feet below finished grade.

Soft or spongy material, or other deleterious substances encountered below the base or foundation course shall be removed. Replacement may be made with approved material available from excavation on the job or with imported material, as directed by the Engineer.

When undesirable material is removed and disposed of and the resulting space refilled with approved material as specified, the approved material shall be placed and compacted in layers in accordance with the applicable requirements hereinafter specified for constructing embankments.

3.03 EMBANKMENTS

Embankment construction shall include the preparation of the areas upon which they are to be placed. The area to be filled shall have all concrete and pavement removed from it that lies within three feet of finished grade.

The surface of the area to be filled shall be plowed, scarified, and finely broken up in order to allow new fill material to bond with the old earth.

Embankments shall be constructed in layers of uniform thickness. The loose thickness of each layer of embankment material shall be moisture conditioned to within two percent of optimum moisture content and compacted in thin lifts not to exceed eight inches maximum compacted thickness. The relative compaction of each layer within 2.5 feet of finished subgrade shall not be less than 95 percent of maximum density and the relative compaction of the layers of embankment below a plane 2.5 feet below finished subgrade shall not be less than 90 percent. Relative Compaction shall be determined in accordance with Test Method No. California 216 and/or Test Method No. California 231. A sand cone verification test will be required for each set of nuclear method tests performed at intervals as determined by the City Engineer.

The maximum size of rocks, broken concrete or broken asphalt which may be incorporated into embankments shall not exceed 0.5 foot in greatest dimension.

Embankment material which does not contain sufficient moisture to compact properly shall be sprinkled with water, either during excavation or while being placed in the embankment. Material containing an excess of moisture shall be permitted to dry to the proper consistency before being compacted.

3.04 SLOPES

The slopes of excavations and embankments shall be dressed and 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 slopes by more than 0.5 foot measured at right angles to the slope.

Slope rounding, if required, shall be constructed as shown on the plans.

3.05 DISPOSAL OF WASTE EXCAVATION

Excavated materials determined unsuitable for embankment shall be disposed of as provided in Section I, Sub-Section 6.20 ″Disposal of Material Outside the Right-of-Way.″

3.06 MEASUREMENT

Quantities of excavation will be measured by the cubic yard. Quantities of excavation will be computed by means of average and areas and distances between these areas. Quantities of concrete removed in conjunction with the construction of embankments will not be measured.

3.07 PAYMENT

Excavation, concrete and pavement removal, including excavating, sloping, rounding, loading, hauling, depositing, spreading and compacting shall be paid for at the contract unit price per cubic yard which price shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in performing excavation work completely as specified.

Quantities of removed deleterious substances (including the material used as replacement) shall be paid for as excavation if there is a cubic yard bid item for excavation. In the absence of a cubic yard bid item, this removal shall be paid for as extra work as provided in Section I, Sub-Section 8.03, ″Force Account Payment.″

Full compensation for constructing embankments as specified, including the removal of existing concrete and pavement within three feet of finished grade, shall be considered as included in the contract price paid per cubic yard for excavating the material and no separate payment shall be made therefor.

4. STRUCTURE AND TRENCH EXCAVATION AND BACKFILL AND PAVEMENT REPLACEMENT

4.01 GENERAL

This work shall consist of the removal and replacement of material necessary for the construction of all structures, pipes and appurtenant facilities as specified in these Specifications.

4.02 EXCAVATION

(A) General. The depths of foundations, footings, sumps, and trenches, are approximately as indicated on the drawings, but the engineer reserves the right to increase or decrease the width or depth of any foundation, footing, trench or other excavation as made necessary by conditions encountered during the prosecution of the work.

(1) Water. The accumulation of water in excavated areas shall be prevented by means of pumping or other approved methods. At no time will ground or storm water be allowed to flow down sanitary sewer lines.

(2) Overcut. Excavations shall be carried to the exact depth indicated on the drawings or as specified. Should the Contractor, through his negligence or other fault, excavate below the designated lines, he shall replace such excavations with approved materials and shall compact said material to the requirements as specified on plans.

(3) Protection of excavation. The Contractor shall, where necessary, protect excavations from caving by installing suitable shoring. Any damage resulting from the failure to adequately protect the excavation shall be repaired by the Contractor at his own expense. All shoring shall be removed except as provided in Section III, Sub-Section, 4.02 (C)(9) ″Bracing Trenches.″

The Contractor's attention is directed to the ″Trench Construction Safety Orders″ of the State Department of Industrial Relations (Cal-OSHA) which the Contractor is required by law to obey.

(4) Disposal of Waste Excavations. Excavated material determined unsuitable for use as backfill or in excess of the amount required for backfill shall be disposed of as provided in Section I, Sub-Section, 6.20, ″Disposal of Material Outside the Right-of-Way.″

(5) Approval of Excavations. The Contractor shall notify the Engineer when excavations for structures or pipes are completed, and no concrete shall be deposited or pipes laid until the excavations are approved.

(6) Removal of Concrete. If concrete is encountered while excavating, it shall be removed to allow for the completion of the excavation to the lines and grade as shown on the plans. No additional compensation will be allowed for any work which may be necessary to do when concrete is encountered.

(7) Excavation in Paved Areas. Where excavations occur in paved areas, the pavement shall be blade cut or scored and broken ahead of the excavation operations and shall be cut or trimmed to a near edge after backfilling and prior to paving. The pavement will be cut accurately and on neat lines parallel to the excavation. Any pavement damages outside these lines shall be re-cut and restored at the expense of the Contractor.

(B) Structure Excavation. Excavation for structures including box culverts, headwalls, retaining walls and foundations for bridges shall be of sufficient size to permit installing and removing forms. Surfaces against which concrete is placed shall be prepared in a manner suitable for forming a foundation.

Should the foundation material found at the required elevations for supporting structure prove to be soft, spongy or otherwise unsuitable, the Contractor shall obtain a written order from the Engineer for such additional excavation as may be necessary to obtain a foundation suitable for the structure to be supported. This additional excavation shall be replaced by the Contractor with aggregate subbase material in accordance with the provisions of Section III, Sub-Section 4.03, ″Structure Backfill.″

(1) Measurement. Quantities of structure excavation will be measured by the cubic yard. The limits for payment for structure excavation shall be as shown on the Plans or as indicated in the Special Provisions.

(2) Payment. Quantities of structure excavation shall be paid for at the contract unit price per cubic yard, which price shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in performing the structure excavation as specified.

No compensation will be made for the removal and use or disposal of materials which may come into an excavation from outside the designated limits.

Additional excavation and replacement with aggregate subbase as described in this sub-section shall be paid for at the contract unit prices per cubic yard of structure excavation and structure backfill, or, in the absence of contract prices, payment shall be made on a force account basis as provided in Section I, Sub-Section 8.03, ″Force Account Payment.″ If the character of the work is changed by the additional excavation, payment shall be made as provided in Section I, Sub-Section 3.02, ″Changes in Character of Work.″

(C) Trench Excavation. Excavations for laying pipe shall, unless otherwise directed, be made in open cut. All trenches shall have vertical sides from the bottom to a point at least six inches above the top of the pipe. Above this point in unstable ground, with the written consent of the Engineer, the trench banks may be sloped as directed. Trench widths shall conform to City Construction Standards and Manufacturer Specifications. In the event that sheeting is required, the width of the trench shall be increased sufficiently to accommodate the sheeting.

The excavation for pipe within an existing street right-of-way shall not be made in advance of laying the pipe further than is practical to complete the pipe laying and backfill operations each day, unless otherwise provided in the Special Provisions. The bottom of the excavation shall be level with exterior bottom of the body of the pipe and shall conform to the grade as shown by the Plans.

While excavating bad ground, such as running sand, etc., the work must be prosecuted vigorously without interruption when ordered by the Engineer.

(1) Trenching by Machine or by Hand. The use of trench-digging machinery will be permitted except in places where the operation of same will cause damage to trees, buildings or existing structures above or below ground, in which case hand methods shall be employed.

(2) Manner of Piling Excavated Material. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways

and will not restrict sight distance of motorists. Gutters shall be kept clear or other satisfactory provisions shall be made for street drainage.

(3) Foundation. Where a firm foundation is not encountered due to soft, spongy or other unsuitable material, and when directed by the Engineer, the material under the pipe shall be removed to a depth of not less than six (6″) inches below the bottom of the pipe and the space backfilled with one and one-half (1-1/2″) inch maximum aggregate drain rock, compacted to ninety (90%) percent relative compaction as determined by Test Method Calif. 216 Relative Compaction shall be determined in accordance with Test Method No. Calif. 216 and/or Test Method No. Calif. 231. A sand cone verification test will be provided for each set of nuclear method tests performed at intervals as determined by the City Engineer.

(4) Trenches in Rock. In rock, the trench shall be carried six (6″) inches below the external diameter of the pipe when no underdrain is required; if an underdrain is required, the trench shall be carried to the depth required by the underdrain. In either case, pipe bedding material shall be placed, spread and compacted to provide a firm, uniform bed for supporting the pipe.

(5) Fill Areas or Embankments. Before excavation of the pipe trench in fill areas or roadway embankments, the fill area or embankment shall be completed to a height, above the pipe invert grade line, of not less than twice the internal pipe diameter and to a distance on each side of the pipe of not less than five times the internal pipe diameter.

(6) Trenches for House Sewers. Trenches shall not be opened on both sides of the street at the same time unless permission has been previously obtained to close the street. Unless otherwise directed, each trench for house sewer shall be excavated for its entire length within the street lines before any pipe is laid therein.

(7) Protecting Underground and Surface Structures. The attention of the Contractor is directed to the provisions of Section I, Sub-Section 7.08, ″Utility Relocation″ and Section III, Sub-Section 1.05, ″Abandoning of Structures.″

(8) Railroad, Highway and Utility Crossings. When any railroad, state highway, private or public utility is crossed, all precautionary construction measures required by the owner of the railroad, highway or utility shall be followed by the Contractor.

(9) Bracing Trenches. The sides of the trench excavations shall be supported with sheet planking and bracing and all tunnels shall be timbered whenever the ground will not stand unsupported. The sheet planking shall not be driven below the invert grade of the pipe, unless absolutely necessary due to ground conditions. The sheet planking shall be removed as the backfilling progresses in such a manner as to prevent the caving in of the sides of the trench. If sheeting is drived below the invert grade of the pipe, it shall remain in place, except for that portion two (2') feet above the top of the pipe, which shall be cut off and removed as the backfilling is completed. All openings caused by such removal shall be backfilled in the manner hereinafter specified.

(10) Special Trench Excavation. Trenches for vitrified clay sanitary sewer pipes shall be overexcavated for a distance of four inches below the bottom of the barrel of the pipe.

(11) Measurement and Payment. No separate measurement or payment shall be made for trench excavation and full compensation for furnishing all labor, materials, tools, equipment, and incidentals and doing all the work involved in excavating trenches as specified shall be considered as included in the prices paid for the installation of the pipe for which the trench was excavated.

No compensation will be made for the removal and disposal of material which may come into an excavation from outside of the designated limits.

Additional excavation and backfilling with rock as described in Section III, Sub-Section 4.02 (C)(3) ″Foundation″ and Section III, Sub-Section 4.02 (C)(4) ″Trenches in Rock″ shall be paid for at the contract price per ton of rock backfill. In the absence of a contract price payment shall be made on a force account basis as provided in Section I, Sub-Section 8.03 ″Force Account Payment.″

4.03 STRUCTURE BACKFILL

All debris from lumber and similar material in the area around structures shall be removed prior to placing the backfill. The backfill material shall be placed to the original ground line or to the limits designated on the Plans. No material shall be deposited against the back of concrete abutments or concrete retaining walls until the test samples indicate that the concrete has developed a minimum strength of 2500 lbs. per square inch in compression.

Structure backfill shall conform to the provisions of Section IV(1) ″Aggregate Subbase″ in roadway areas and Section III, Sub-Section 4.04 (A)(1), ″Type I Backfill″ in non-roadway areas, and shall be placed in horizontal, uniform layers not exceeding eight inches in thickness before compaction, and shall be brought up uniformly on all sides of the structure each layer being compacted to a relative compaction of not less than 95 percent as determined by Test Method No. Calif. 216 relative compaction shall be determined in accordance with Test Method No. Calif. 216 and/or Test Method No. Calif. 231. A sand cone verification test will be required for each set of nuclear method tests performed at intervals as determined by the Engineer. Compaction equipment or methods that produce horizontal or vertical earth pressures which may cause excessive displacement or may damage structures shall not be used. Compaction by ponding shall not be permitted. Jetting shall be permitted.

(1) Measurement. Quantities of structure backfill will be measured by the cubic yard. The limits for payment for structure backfill shall be as shown on the Plans or as indicated in the Special Provisions.

(2) Payment. Quantities of structure backfill shall be paid for at the contract price per cubic yard which price shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in backfilling structures complete in place as specified.

No deduction in structure backfill pay quantities will be made where the Contractor does not elect to excavate materials which is outside the limits of the actual structure but within the designated limits.

No compensation will be made for the volume of backfill occupied by the new structure or for furnishing and placing backfill material in an excavation that is below or outside the designated limits, and such quantities will not be included in the quantities or structure backfill to be paid for.

4.04 TRENCH BACKFILL

Backfill is the material used to fill the portion of the trench between the bottom of the trench and the subgrade or existing ground. Backfill shall be placed and consolidated in a manner which will prevent damage to the roadbed, road surfacing, or public or private property, and which will cause a minimum of interference with passage of traffic through the construction zone. All trench backfill shall be Type I unless otherwise specified and shall be compacted in accordance with the Standard Drawings.

(A) Materials Classification.

(1) Type I Backfill. Material for Type I Backfill shall be free from stones, lumps, broken concrete, or bituminous surfacing exceeding 4 inches in greatest dimensions, vegetable matter, or other unsatisfactory material, and may be obtained from the trench excavation. Stones, broken concrete or bituminous surfacing larger than 2 inches in greatest dimension shall not be placed next to the pipe.

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.

(2) Type II Backfill. Materials for Type II Backfill shall conform to the requirements of Type I Backfill except that there shall be no stones, lumps, broken concrete, or bituminous surfacing exceeding one inch in greatest dimension.

(3) Special Pipe Bedding. Trenches for vitrified clay sanitary sewer pipe and other rigid pipe materials shall be over-excavated for a distance of four inches below the bottom of the barrel of the pipe and refilled with material conforming to the requirements listed below to a height as shown on the Plans.

(a) Quality. Special pipe bedding shall be free from vegetable matter and other deleterious substances.

Tests	Test Method No. Calif.	Requirements
R-Value	301	78 Min.
Sand Equivalent	217	30 Min.

(b) Gradation

Sieve Sizes	Percentage Passing Sieves
1″	100
3/4″	90 – 100
No. 4	35 – 55
No. 30	10 – 30
No. 20	2 – 9

In streets under construction, the requirements for special pipe bedding shall only apply to the pipes mentioned above. The trench bottom for all other pipes shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe. In existing streets, the special pipe bedding shall apply to all trench installations.

Pipe bedding material shall conform to those Specifications adopted by the public agency or utility having jurisdiction over such pipe or conduit installation unless the requirements of the City are more restrictive.

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.

(4) Water in the Trench. Where free water is present in the trench, including the conditions as described in Section III, Sub-Section 4.02, (C)(3) ″Foundation″, the use of Type I Backfill and/or Type II Backfill will not be permitted. The trench shall be backfilled with aggregate subbase material from the firm trench bottom, the top of the drain rock (as described in Section III, Sub-Section 4.02 (C)(3), ″Foundation″) or the top of the special pipe bedding to an elevation where there is no longer any free water present. The remainder of the trench shall then be backfilled in accordance with the provisions in this Section III, Sub-Section 4.04.

In no case shall ″pea gravel″ and/or sand be used for backfill material unless approved in writing by the Engineer.

(B) Placing of Trench Backfill.

(1) Backfilling Completely Each Day. All trenches within the existing traveled way shall be backfilled completely and the roadway made passable to traffic at the end of each day′s operation.

(2) Compaction Requirements. The relative compaction of trench backfill shall be as shown on the Plans.

(3) Compaction Procedure.

(a) General. Backfill materials shall be compacted by impact vibration, wheel rolling, jetting per approval of City Engineer, or a combination of these methods. Type I or Type II Backfill may be jetted with the approval of the Engineer.

(b) Jetting. Jetting will be permitted when the trench backfill is composed of material which will not absorb or retain water and when the surrounding ground is of such character that it will not soften or be damaged by the applied water.

Material for use as trench backfill in the intermediate zone of trench shall be placed and compacted in layers not exceeding two (2) feet in thickness. Jetting any trench backfill within the upper two (2) feet of the trench or in the pipe embedment zone will not be permitted.

Jetting shall be supplemented by the use of approved mechanical compaction equipment to obtain the required relative compaction throughout the trench.

(4) Special Requirements for Short Trenches. In instances where a water, gas, electric, telephone, sewer, etc. lateral or service is being installed or wherever a hole is dug in an existing street at an isolated location, the backfill shall conform to the following:

(a) Aggregate Subbase or Aggregate Base shall be placed in the trench and compacted in layers not exceeding two (2) feet in thickness to 90% relative compaction as determined by Test Method No. Calif. 216 relative compaction shall be determined in accordance with Test Method No. 216 and/or Test Method No. Calif. 231. A sand cone verification test will be required for each set of nuclear method tests performed at intervals as determined by the Engineer below two (2) feet of final grade. Within two (2) feet of final grade the Aggregate Subbase or Base shall be compacted to at least 95% relative compaction as determined by Test Method No. Calif. 216 relative compaction shall be determined in accordance with Test Method No. 216 and/or Test method No. Calif. 231. A sand cone verification test will be required for each set of nuclear method tests performed at intervals as determined by the Engineer. Pieces of Aggregate Subbase greater than one inch greatest dimension shall not be placed so that they rest against the pipeline.

(C) Temporary Trench Paving. After the trench is backfilled, it shall be paved the same day with temporary paving or permanent paving and maintained in first class condition. Temporary paving shall consist of not less than 1 inch of premixed bituminous (MC Cutback) and shall be removed and replaced with permanent paving within 14 days from the date of backfilling.

(D) Measurement and Payment. No separate measurement or payment shall be made for trench backfill if the native excavated material is used as the backfill, and full compensation for furnishing all labor, materials, tools, equipment and incidentals and doing all the work involved in backfilling trenches, including special pipe bedding, complete in place, as specified, shall be considered as included in the prices paid for the installation of the pipe for which the trench was excavated.

No compensation will be made for the volume of backfill occupied by the new pipe or for furnishing and placing backfill material in an excavation that is below or outside the designated limits.

When it is determined by the Engineer that the native excavated material cannot be used as the trench backfill, the material used as the trench backfill shall be paid for at the contract price per cubic yard. In the absence of a contract price, payment shall be made on a force account basis as provided in Section I, Sub-Section 8.03, ″Force Account Payment.″ The limits for payment for the imported trench backfill shall be as shown on the plans or as indicated in the Special Provisions.

4.05 PAVEMENT REPLACEMENT

Minimum pavement replacement shall be in accordance with Standard Drawing ST-8 or ST1-10 as applicable that will restore areas to is former condition of stability and smoothness.

5. SUBGRADE

5.01 GENERAL

The work specified in this Section includes the preparation of the ground on which the subbase, base or pavement is placed, as specified in these Specifications. The finished subgrade plane lies between the subgrade and the lowest element of any surfacing material placed on it.

5.02 SUBGRADE PREPARATION

The finished subgrade immediately prior to placing subsequent material thereon shall have a relative compaction of not less than 95 percent for a depth as specified in construction standards as determined by Test Method No. Calif. 216 relative compaction shall be determined in accordance with Test Method No. 216 and/or Test Method No. Calif. 231. A sand cone verification test will be required for each set of nuclear method tests performed at intervals as determined by the Engineer. The subgrade shall be smooth and uniform, free of all deleterious material and true to the required grade and cross section, and shall be within the tolerance specified in the Specifications or as shown on the Plans. The Contractor shall repair at his expense any damage to a prepared subgrade caused by his operations or by use of public traffic. No material shall be placed upon the prepared subgrade until the subgrade is in a condition meeting the requirements specified.

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

If the Contractor elects, he may remove rocks, lumps or break up hardened material and ribs in order to facilitate the preparation of subgrade. Any material so removed shall be disposed of as directed by the Engineer. The 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 of that determined by Test Method No. Calif. 216 relative compaction shall be determined in accordance with Test Method No. 216 and/or Test Method No. Calif. 231. A sand cone verification test will be required for each set of nuclear method tests performed at intervals as determined by the Engineer. Any such work, including the removal and disposal of said material, shall be at the expense of the Contractor.

In order to facilitate the preparation of subgrade, the Contractor may, if he elects, temporarily construct a rough grading plane below subgrade elevation, provided he subsequently

brings such rough grading plane up to subgrade elevation with suitable material approved by the Engineer and if said material is compacted to a relative compaction of not less than 95 percent of that determined by Test Method No. Calif. 216 relative compaction shall be determined in accordance with Test Method No. 216 and/or Test Method No. Calif. 231. A sand cone verification test will be required for each set of nuclear method tests performed at intervals as determined by the Engineer.

5.03 SUBGRADE TOLERANCE

Subgrade shall not vary more than 0.10 foot from the specified grade and cross section. Variations within the above specified tolerance shall be compensating so that the average grade and cross section specified are met.

5.04 PAYMENT

No separate measurement or payment will be made for preparing subgrade, and full compensation for furnishing all labor, material, 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 material to be placed on the subgrade.

Any subgrade damaged by utility work not performed by the Contractor and previously having been acceptable to the Engineer, shall be repaired by the utility company.

SECTION IV - SUBBASES AND BASES

1. AGGREGATE SUBBASE

1.01 GENERAL

The work specified in this Section includes furnishing, spreading and compacting mineral aggregate on the subgrade in accordance with these Specifications.

1.02 MATERIALS

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

(A) 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.

(B) Gradation. The percentage composition by weight of aggregate subbase shall conform to the following grading when determined by Test Method No. Calif. 202.

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

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.

(C) Tests. The aggregate subbase shall conform to the following tests:

	Test Method No. Calif.	Requirements
Resistance (R-value)	301	50 Minimum
Sand Equivalent	217	21 Minimum

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

1.03 SPREADING

Aggregates for subbases shall be delivered to the roadbed as uniform mixtures and shall be spread in layers or windows. Segregation of aggregates shall be avoided and material as spread shall be free from pockets of large or fine material. Segregated materials shall be remixed until uniform.

Where the required thickness is 0.50 foot or less, the aggregate subbase may be spread and compacted in one layer. Where the required thickness is more than 0.50 foot, the subbase aggregate shall be spread and compacted in two or more layers of approximately equal thickness, the maximum compacted thickness of any one layer not to exceed 0.50 foot. Each layer shall be spread and compacted in a similar manner.

1.04 COMPACTING

The relative compaction of each layer of compacted aggregate shall not be less than 95 percent as determined by Test Method No. Calif. 216 (maximum density determination - 6″ cone) and in place densities as determined using the Sand Cone Method ASTM D-1556 or Nuclear Method ASTM D-2922. The finished surface of the aggregate subbase shall not vary more than 0.08 foot from the specified grade and cross section. Variations within the above specified tolerance shall be compensating so that the average grade and cross section specified are met.

1.05 MEASUREMENT

Quantities of aggregate subbase will be measured by the ton. The weight of aggregate subbase to be paid for will be determined by deducting the weight of water in the aggregate subbase at the time of weighing in excess of six (6) percent of the dry weight of aggregate subbase. The percentage of water in the aggregate subbase shall be determined by Test Method No. Calif. 226.

1.06 PAYMENT

Quantities of aggregate subbase shall be paid for at the contract price per ton, which price shall include full compensation for furnishing all labor, materials (or processing selected materials), tools, equipment, and incidentals, and for doing all the work involved in furnishing and applying water, hauling, and constructing aggregate subbase, complete in place as specified.

2. LIME TREATMENT

2.01 GENERAL

This work shall consist of the breaking up of the native material, mixing it with the lime and water then spreading and compacting the mixed material as specified in these Specifications.

2.02 LIME

Lime shall be a commercial, dry, hydrated lime conforming to the definitions in ASTM Designation; C-51, and at the time of placement, shall not contain less than 85% of calcium hydroxide, Ca(OH)2, as determined by Test Method No. Calif. 414. The amount of lime to be mixed shall be determined by the Contractor after reviewing the minimum amount of lime in percent of dry weight set forth in the Special Provisions.

A ″Certificate of Compliance″ shall be furnished for all lime used.

2.03 PREPARATION

The material to be treated in place shall be thoroughly and uniformly broken up for the specified thickness. All roots, wood and other deleterious material shall be removed and disposed together with rocks larger than two and one-half (2-1/2″) inches in largest dimension.

2.04 MIXING

The mixing shall be accomplished with a traveling mixer which performs in such a manner as to produce a homogeneous, uniform mixture of lime, water and the material being treated. Observations of streaks and pockets of lime and the absence of color reaction when sprayed by a Phenolphalene alcohol indicator shall be considered evidence of inadequate mixing and the mixture shall be remixed as directed by the Engineer at no additional cost to the City.

2.05 SPREADING AND COMPACTING

After spreading the lime on the grade, initial scarification shall be made before water is applied to the lime-treated surface. After water is applied, complete mixing procedure shall begin. Initial compaction shall be by means of a sheepsfoot or segmented tired rollers conforming to the Provisions of Section 39-05.02 ″Rolling Equipment″ of the State Specifications.

At the end of each day′s work, a construction joint shall be made in thoroughly compacted material normal to the centerline of the roadbed, with a vertical face.

After a part section has been completed, the longitudinal joint against which additional material is to be placed shall be trimmed approximately 3 inches into treated material, to the neat line of the section, with a vertical edge. The material so trimmed shall be incorporated in the adjacent material to be treated.

The finished surface of the lime treated material shall not vary more than 0.10 foot for subbase and 0.05 foot for base courses 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. Where the required thickness is greater than seven (7″) inches, the mixture shall be spread and compacted in two or more layers of approximate equal thickness. The surface of intermediate layers of the compacted material shall be kept moist or prevented from drying out until covered by the next layer. The entire lime treating operation shall be carried out in such a manner that it does not create excessive dust. Whenever necessary, the Contractor shall apply water to alleviate the dust nuisance.

All corrective work, if necessary, to bring the lime treated material within the surface tolerance, shall be completed within 54 hours of start of mixing.

2.06 TESTING

The testing for lime treated material shall be on a random basis on each test section. Test sections shall be every 40,000 square feet unless otherwise shown on the Plan or Special Provisions with a minimum of three tests per section. The tests are composed of both R-Value and compaction as stated below. In the event that any of the following tests fail, the Contractor may rework the entire test section and add additional lime as necessary to meet the requirements at no additional cost

to the City; or the Contractor may pay for additional testing to delineate the area of failure. When the failed areas are delineated, the Contractor shall perform all necessary remedial work to correct such failures. Such work may include, but not be limited to the following: adding lime and/or water, additional compactive effort and/or mixing, or removal and replacement. All testing of reworked areas and testing to delineate areas of failure shall be paid for by the Contractor.

A-1 R-Value. The lime treated material when utilized as subbase shall have a minimum average R-Value of not less than 60 with the lowest R-Value of not less than 50, as determined by Test Method No. Calif. 301. The average R-Value shall be the arithmetical mean.

A-2 R-Value. The lime treated material when utilized as base shall have a minimum R-Value of not less than 85 with the lowest R-Value of not less than 78, as determined by Test Method No. Calif. 301. The average R-Value shall be the arithmetical mean.

B-1 Compaction. The relative compaction of the lime treated material shall not be less than 95% of that determined by Test Method No. Calif. 216 (maximum density determination - 6″ cone) and in place densities as determined using the Sand Cone Method ASTM D-1556 or Nuclear Method ASTM D-2922.

2.07 MEASUREMENT

Quantities of lime treated material shall be measured on an area basis of the finished surface of the lime treated material.

2.08 PAYMENT

Quantities of lime treated material will be paid for at the contract price per square foot which price shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals, and for doing all work involved in breaking up the native material, spreading, watering, mixing, grading and compacting the lime treated material complete in place.

3. AGGREGATE BASE

3.01 GENERAL

The work specified in this Section includes furnishing, spreading and compacting mineral aggregate on the subgrade or subbase in accordance with these Specifications.

3.02 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 course 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. California 202.

SIEVE SIZES	3/4″ MAXIMUM PERCENTAGE PASSING SIEVE
2″	---
1 1/2″	---
1″	100
3/4″	90 – 100
No. 4	35 – 60
No. 30	10 – 30
No. 200	2 – 9

(C) Tests. The aggregate base shall conform to the following tests:

	Test Method No. Calif.	Requirements
Resistance (R-Value)	301	78 Minimum
Sand Equivalent	217	25 Minimum
Durability Index	229	35 Minimum

3.03 SPREADING

Aggregate base shall be delivered as a uniform mixture and each layer shall be spread in one operation without segregation.

Where the required thickness is 0.50 foot or less, the base material may be spread and compacted in one layer. Where the required thickness is more than 0.50 foot, the base material shall be spread and compacted in two or more layers of approximately equal thickness, the maximum compacted thickness of any one layer not to exceed 0.50 foot. Each layer shall be spread and compacted in a similar manner. The aggregate base may be spread by any equipment that will produce a uniform layer with segregation.

3.04 COMPACTING

The relative compaction of each layer of compacted base material shall not be less than 95 percent of that determined by Test Method No. Calif. 216 (maximum density determination - 6″ cone) and in place densities as determined using the Sand Cone Method ASTM D-1556 or Nuclear Method ASTM D-2922. 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 tolerance shall be compensating so that the average grade and cross section specified are met.

3.05 MEASUREMENT

Quantities of aggregate base will be measured by the ton. The weight of material to be paid for will be determined by deducting from the weight of material delivered to the work, the weight of water in the material at the time of weighing, as determined by Test Method No. Calif. 226, in excess of one percentage point more than the optimum moisture content as determined by Test Method No. Calif. 216 (maximum density determination - 6" cone).

3.06 PAYMENT

Quantities of aggregate base will be paid for at the contract price per ton, which price shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and applying water; hauling and constructing aggregate base, complete in place, as specified.

SECTION V - SURFACING AND PAVEMENTS

1. ASPHALT CONCRETE

1.01 GENERAL

This work shall consist of furnishing and placing asphalt concrete as specified in these Specifications. Asphalt concrete shall conform to the provisions in Section 29 ″Asphalt Concrete″ of the State Specifications except as modified in this Section V.

Paving asphalt, liquid asphalt, and asphaltic emulsion shall conform to the provisions in Section 92 ″Asphalt″, Section 93 ″Liquid Asphalt″ and Section 94 ″Asphaltic Emulsions″ of the State Specifications.

Unless otherwise specified in the Plans or in the Special Provisions, asphalt concrete shall be Type B, 1/2 inch maximum, medium grading and asphalt binder shall be paving asphalt, grade AR4000.

Prime coat shall be RS-1 spread at 0.2 gallon per square yard unless otherwise directed by the Engineer and shall be applied 24 hours prior to paving.

1.02 SUBGRADE

Sub-section 39-4 of the State Specifications shall not apply; the preparation of subgrade to receive asphalt concrete shall conform to the provisions in Section III(5) of these Specifications.

1.03 WATER

The cost of applying water in connection with cooling the asphalt concrete will be considered as included in the contract price paid for asphalt concrete and no additional compensation will be allowed therefor.

1.04 SEAL COAT (FOG SEAL)

Seal coat shall be required on all newly paved streets and shall be applied in accordance with the provisions in Section V(2) ″Bituminous Seals″ of these Specifications. Sub-Section 39-7 of the State Specifications shall not apply.

1.05 ASPHALT CONCRETE MIX

Whenever possible an approved mix already designed by CalTrans at an existing plant shall be used.

The following shall be the specification for asphalt concrete placed in the structural section as shown on the plans, in the special provisions approved by the Engineer.

In the tables below, the symbol ″X″ is the gradation which the Contractor proposes to furnish for the specified sieve. The proposed gradation shall meet the gradation shown in the table under

″Limits of Proposed Gradation.″ Changes from one mix design to another shall not be made during the progress of the work unless permitted by the engineer. However, changes in proportions to conform to the approved mix design shall not be considered changes in mix design. Tolerances for ″X″ values are indicated in the tables. The aggregate gradation shall conform to the range given and be within the tolerance shown for ″X.″

AGGREGATE GRADING REQUIREMENTS Types A, and B Asphalt Concrete Percentage Passing 1/2″ Maximum, Medium			
Sieve Sizes	Limits of Proposed Gradation	Operating Range	Contract Compliance
3/4″	---	100	100
1/2″	---	95 – 100	89 – 100
3/8″	---	80 – 95	75 – 100
No. 4	59 – 66	X±5	X±8
No. 8	43 – 49	X±5	X±8
No. 30	22 – 27	X±5	X±8
No. 200	---	3 – 8	0 – 11

The combined aggregate shall conform to the following quality requirements prior to the addition of the asphalt:

Tests	Calif Test	Asphalt Concrete Type		Open Grade Asphalt Concrete	Asphalt Concrete Base Type	
		A	B		A	B
Percentage of Crushed Particles Coarse Aggregate (Min)	205	90%	25%	90%	90%	25%
Fine Aggregate (Passing No. 4, Retained on No. 8) (Min)	---	70%	20%	90%	70%	20%
Los Angeles Rattler	211					
Loss at 100 Rev. (Max)		10%	---	10%	10%	---
Loss at 500 Rev. (Max)		45%	50%	40%	45%	50%
Sand Equivalent	217					
Contract Compliance (Min)		47	42	---	47	42
Operating Range (Min)		50	45		50	45
Film Stripping (Max)*	302	---	---	25%	---	---
Kc Factor (Max)	303	1.7	1.7	---	1.7	1.7
Kf Factor (Max)	303	1.7	1.7	---	1.7	1.7

* After mixing with asphalt binder.

The asphalt concrete mixture, composed of the aggregate proposed for use and the optimum amount of asphalt as determined by California Test 367, shall conform to the following quality requirements.

Tests	Calif Test	Asphalt Concrete Type		Open Grade Asphalt Concrete	Asphalt Concrete Base Type	
		A	B		A	B
Swell (Max)	305	0.030″	0.030″	---	0.030″	0.030″
Moisture Vapor Susceptibility (Min)	307	30	25	---	30	25
Stabilometer Value (Min)	366	37	35	---	37	35
Stabilometer Value (Min) (3/8″ or No. 4 Max A.C.)	366	30	30	---	---	---

1.06 MEASUREMENT

Subsection 39-8 of the State Specifications shall not apply. Asphalt concrete will be measured by weight. The quantity to be paid for shall be either the combined weight of the mixture or the weight of the separate items for the various types of aggregate and the type of asphalt binder, whichever is designated in the Proposal Form. The quantity of aggregate to be paid for as a contract item shall be determined by weighing the completed mixture and deducting the weight of the asphalt binder added thereto.

Quantities for placing asphalt concrete dikes will be measured by the linear foot along the completed dike. Quantities for placing asphalt concrete ditches, spillways and aprons at the ends of drainage structures will be measured by the square yard of the asphalt concrete in place. In addition to the quantities for placing asphalt concrete measured on a linear foot or square yard basis, the aggregate and asphalt binder entering into the mixture will also be measured on a weight basis.

Quantities of sand cover will be measured by the ton or cubic yard.

1.07 PAYMENT

Sub-Section 39-8 of the State Specifications shall not apply. Quantities of asphalt concrete shall be paid for at the contract price per ton for aggregate (asphalt concrete), or open graded aggregate (asphalt concrete), or base aggregate (asphalt concrete), and at the contract price per ton for paving asphalt; or aggregate and asphalt binder shall be paid for at a single contract price per ton for asphalt concrete.

Quantities of asphalt concrete dikes shall be paid for at the contract price per linear foot for placing asphalt concrete dikes and, in addition, shall be paid for at the contract price per ton for aggregate (asphalt concrete) and paving asphalt entering into the mixture. Full compensation for any necessary excavation and backfill involved in undercutting cut slopes for constructing dikes shall be considered as included in the contract price paid per linear foot for placing asphalt concrete dikes.

Quantities of asphalt concrete placed in ditches, spillways, and aprons at the ends of drainage structures shall be paid for at the contract price per square yard for placing asphalt concrete (miscellaneous areas) and in addition, shall be paid for at the contract price per ton for aggregate (asphalt concrete) and paving asphalt entering into the mixture. Full compensation for preparing the area to receive the asphalt concrete shall be considered as included in the contract price per square yard for placing the asphalt concrete.

When there are no contract items for placing asphalt concrete dikes or for placing asphalt concrete (miscellaneous areas), the work shall be paid for as follows:

(1) If the work is shown on the Plans, full compensation shall be considered as included in the price paid per ton for the aggregate (asphalt concrete) and paving asphalt entering into the mixture.

(2) If the work is not shown on the Plans, the cost thereof shall be paid for as extra work as provided in Section I(8.03) ″Force Account Payment.″

Quantities of prime coat, paint binder, fog seal and tack coat shall be paid for at the contract price per ton for liquid asphalt (prime coat), and at the contract price per ton for asphaltic emulsion (paint binder). When there are no contract items for this work, the cost thereof shall be considered as included in the contract price paid for asphalt concrete. The provisions in Section I(3.02)(B) ″Increased or Decreased Quantities″, shall not apply to the items of prime coat and paint binder.

In Section 39 of the State Specifications, whenever reference is made to payment for extra work, such extra work (if there be any) shall be paid for as provided in Section I(8.03) ″Force Account Payment″ of these Specifications.

Sand cover shall be paid for the contract price per ton or cubic yard, which price shall include removing excess sand.

The above contract prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in constructing asphalt concrete, complete in place as specified.

2. BITUMINOUS SEALS

2.01 GENERAL

This work shall consist of furnishing and placing bituminous seals as specified in these Specifications; bituminous seals shall conform to the provisions in Section 37 ″Bituminous Seals″ of the State Specifications except as modified in this Section 2.

Paving asphalt, liquid asphalt, and asphaltic emulsion shall conform to the provisions in Section 92 ″Asphalt″, Section 93 ″Liquid Asphalt″, and Section 94 ″Asphaltic Emulsions″ of the State Specifications.

2.02 MAINTAINING TRAFFIC

The Contractor shall provide for the passage of traffic through the work in accordance with the provisions in Section I(6.14) ″Public Convenience″ and Section I(6.15) ″Public Safety″ of these Specifications.

2.02 MAINTAINING TRAFFIC

The Contractor shall provide for the passage of traffic through the work in accordance with the provisions in Section I(6.14) ″Public Convenience″ and Section I(6.15) ″Public Safety″ of these Specifications.

2.03 EXCESS SCREENINGS

Removed screenings to be disposed of outside the right-of-way shall be disposed of as provided in Section I(6.20) ″Disposal of Material Outside the Right-of-Way″ of these Specifications.

2.04 MEASUREMENT

Sub-Section 37-1.08 ″Measurement″ and Sub-Section 37-2.07 ″Measurement″ of the State Specifications shall not apply.

Quantities of screenings will be measured by the ton or cubic yard. Quantities of paving asphalt, liquid asphalt, and asphaltic emulsion for use in seal coats will be measured by the ton. When water is added to asphaltic emulsion for use in seal coats, the quantities of asphaltic emulsion will be measured prior to the addition of water; no separate measurement or payment will be made for the added water and full compensation or payment shall be considered as included in the contract price paid for the asphaltic emulsion.

Quantities of slurry seal will be measured by the square foot of material placed.

2.05 PAYMENT

Sub-Section 37-1.09 ″Payment″ and Sub-Section 37-2.08 ″Payment″ of the State Specifications shall not apply.

Quantities of seal coat shall be paid for at the contract price per ton or cubic yard for screenings; and, at the contract price per ton for paving asphalt, liquid asphalt (seal coat), and asphaltic emulsion (seal coat); and at the contract price per square yard for liquid asphalt (prime coat). When there are no contract items for paving asphalt, liquid asphalt (seal coat), and asphaltic emulsion (seal coat), the cost thereof shall be considered as included in the contract price paid for screenings. Salvaging and stockpiling excess screenings shall be paid for as extra work as provided in Section I(8.03) ″Force Account Payment.″

Quantities of slurry seal shall be paid at the contract price per square foot.

The provisions in Section I(3.02)(B) ″Increased or Decreased Quantities″ shall not apply to seal coat or slurry seal.

The above contract prices and payments shall include compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in placing seal coats and slurry seals, complete in place, as specified.

SECTION VI - CONCRETE

1. PORTLAND CEMENT CONCRETE

1.01 GENERAL

This section includes Specifications for Portland Cement, fine aggregate, and water with or without admixtures used in the manufacturing of Portland Cement Concrete. Concrete shall be proportioned and mixed as specified in these Specifications.

1.02 CLASS

Concrete shall be designated by class to indicate the minimum compressive strength. The class of concrete to be used shall be as specified in other sections of these Specifications, as shown on the Plans or designated in the Special Provisions, and shall be designated by a numeral indicating the minimum 28-day compressive strength of concrete in pounds per square inch determined in accordance with Test Method No. Calif. 521.

1.03 PORTLAND CEMENT

(A) Materials. Portland Cement shall be Type II, low-alkali cement, conforming to the requirements of ASTM Designation C150, with the following exceptions:

(1) The cement shall contain not more than 0.60 percent by weight of alkalies calculated as Na_20 when determined by flame photometry, using the direct intensity method in the Specifications of ASTM Designation C114.

(2) The percentage of tricalcium silicate shall not be limited.

(3) The tensile strength requirements shall not apply.

(4) When tested in mortar in accordance with Test Method No. Calif. 527, the expansion of water shall not exceed 0.010 percent and the contraction in air shall not exceed 0.048 percent.

All cement used in the manufacture of concrete for a project shall be of the same brand.

(B) Tests. When required by the Engineer, the Contractor shall obtain from the cement company from which the cement is purchased, a certificate stating that the cement delivered to the work complies with these Specifications.

All sampling and testing of cement shall be performed in accordance with the standard methods of American Society for Testing and Materials.

(C) Storage. The cement shall be suitably protected from exposure to moisture until used. Sacked cement shall be so piled as to permit access for tally, inspection, and identification of each shipment.

All cement not conforming to the Specifications and all cement damaged by exposure to moisture shall be removed immediately and permanently from the work.

1.04 FINE AGGREGATE

(A) Composition. Fine aggregate shall be natural sand, or a combination of natural and manufactured sand. Fine aggregate shall be composed of not less than 50 percent natural sand. The aggregate shall be of such character as to make possible the production of a workable concrete within the limits of water content provided in Section VI, Sub-Section 1.13, "Limitations of Unit Water Content." It shall be free from deleterious coatings and other extraneous material.

(B) Organic Impurities. The fine aggregate shall be free from injurious amounts of roots, bark, sticks and other organic impurities. Fine aggregate shall be tested for organic impurities in accordance with the test method of ASTM Designation C40. The fine aggregate shall indicate a color not darker than the reference standard.

(C) Washing. Regardless of source, all fine aggregate shall be thoroughly and uniformly washed before delivery on the work.

(D) Sand Equivalent Value. The average value of sand equivalent determined on three successive samples shall not be less than 75 when sampled at the batching bins. Individual samples shall have a sand equivalent value of not less than 70. In borderline cases, the value reported as the sand equivalent of a sample shall be the average result of three tests made on portions of the same sample. Sand equivalent shall be determined in accordance with Test Method No. Calif. 217.

(E) Grading. Fine aggregate shall be graded within the following limits:

Sieve Size	Percentage Passing Sieves
3/8 inch	100
No. 4	95 – 100
No. 16	45 – 80
No. 30	25 – 55
No. 50	10 – 35
No. 100	2 – 10

The percentage of the aggregate passing the No. 8 and smaller sieves shall be computed as the percentage of the fine aggregate which passes the No. 4 sieve. In addition to the above required grading analysis, the distribution of the fine aggregate sizes shall be such that the difference between the total percentage passing the No. 16 sieve and the total percentage passing the No. 30 sieve shall be between 10 and 35 percent; and the difference between the percent passing the No. 30 and No. 50 sieves shall be between 10 and 30 percent. During the progress of the work, variations in grading shall not be greater than the following.

Sieve Size	Maximum Variation Passing
No. 16	Percent + 8
No. 30	Percent +7
No. 50	Percent + 4

1.05 COARSE AGGREGATE

(A) Composition. Coarse aggregate shall consist of gravel, crushed gravel, crushed rock, or combination thereof. It shall be free from deleterious coatings, roots, bark, sticks, rags, and other organic or extraneous material. The aggregate shall be of such character as to make possible the production of a workable concrete within the limits of water content specified in Section VI, Sub-Section 1.13, "Limitation on Unit Water Content." Adequate supplies of coarse aggregate shall be produced and stockpiled sufficiently in advance of constructed operations or permit sampling and testing before use. Regardless of source, all coarse aggregate shall be thoroughly and uniformly washed before delivery to the work. Coarse aggregate when tested in accordance with Test Method No. Calif. 211, shall have a loss in the Los Angeles rattler machine not in excess of 45 percent. Coarse aggregate, when tested in accordance with ASTM Designation C88, shall have a loss not in excess of 10 percent after five cycles in sodium-sulfate solution. Coarse aggregate when sampled at the batching bin shall have a cleanness value of not less than 75 when subject to the cleanness test performed in accordance with Test Method No. Calif. 227.

(B) Grading. Coarse aggregate shall be furnished in primary sizes, each of which conforms to the following grading requirements.

Percentage Passing Sieves Primary Aggregate Sizes		
Sieve Size	1½ Inches by ¾ Inch	1 Inch by No. 4
2 Inch	100	100
1-1/2 Inch	90 – 100	90 – 100
1 Inch	5 – 55	40 – 100
3/4 Inch	0 – 15	0 – 50
3/8 Inch	0 – 5	0 – 15
No. 4		0 – 5
No. 8		

The 1 inch by No. 4 primary shall be so graded that not less than 50 percent of the material which passes 3/4 inch is retained on a 3/8 inch sieve. During the progress of the work, the graduation of the primary aggregate nominal sizes as furnished for the work shall be of such uniformity that the material passing the 2", 1", 3/4" and 3/8" sieves will not vary from the graduation for the primary aggregate nominal sizes by more than the following:

1 1/2" X 3/4" Primary Aggregate Nominal Size: Maximum variation of percentage of material passing 1" sieve, ±15
1" X No. 4 Primary Aggregate Nominal Size: Maximum variation of percentage of material passing 3/4" sieve, ±15
Maximum variation of percentage of material passing 3/8" sieve, ±8

The variations shown are the maximum allowable and will be reduced by the amount necessary to meet the grading requirements above.

1.06 STORAGE OF AGGREGATES

Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size will be avoided and also that the various sizes will not become intermixed before proportioning.

1.07 PROTECTION

Stored or stockpiles aggregates shall be protected from dust and other foreign matter. Aggregates coated to such extent that they will not pass the sand equivalent or cleanness test requirements at the time of batching shall be rewashed as necessary or be rejected.

1.08 WATER

(A) Used in Concrete. Water for washing aggregates and for mixing concrete shall be free from oil and shall conform to the following requirements:

(1) Chlorides and Sulfates. Water for concrete shall contain no chlorides, calculated as CL, in excess of 1,000 parts per million; nor sulfates calculated as S04, in excess of 1,000 parts per million.

(2) Impurities. The water shall contain no impurities in quantities, which 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 of more than five percent compared to results obtained with distilled water.

(B) Curing. Water for curing concrete shall contain no chlorides, calculated as CL, in excess of 2,000 parts per million; nor sulfates, calculated as S04, in excess of 1,500 parts per million; nor impurities, in sufficient amount to cause discoloration of the concrete or produce etching of the surface.

1.09 ADMIXTURES

When specified in the Special Provisions, an admixture of the type called for shall be furnished by the Contractor and shall be incorporated in the concrete mixture in the amount specified. When admixtures are not specified in the Special Provisions, the Contractor may propose the use of admixtures for his own benefit. The Contractor shall submit a request in writing to the Engineer, stating type and quantity proposed and shall obtain the Engineer′s acceptance before incorporating any admixture in the mix. Once accepted, the type and quantity used shall not be varied without acceptance by the Engineer. All use of admixtures requested by the Contractor shall be at the Contractor′s expense. Air entraining admixture shall conform to the requirements of ASTM Designation C260. The admixture shall be incorporated into the concrete with the mixing water.

1.10 PROPORTIONING

(A) Design Mix. All mineral aggregate and cement shall be proportioned by weight, except that small quantities may, on approval of the Engineer, be proportioned by volume. The Contractor shall determine the design mix for the class of concrete required for the work and the design mix shall be delivered to the Engineer upon request.

(B) Cement. Batches requiring fractional sacks of cements will not be permitted, unless the Contractor elects to weigh the cement in each batch. When bulk cement is used and the volume of the batch is one cubic yard or more, the scale and weigh hopper for Portland cement shall be separate and distinct from the aggregate hopper or hoppers.

(C) Aggregate. Fine aggregate and the primary sizes of coarse aggregate shall be combined in each batch of concrete in proportions which will produce a mixture within the grading limits specified below. Within these limits, the relative proportions used shall be as elected by the Contractor, and as accepted by the Engineer.

Grading Limits of Combined Aggregates		
	Percentage Passing Sieves	
Sieve Size	1 1/2 Inch Max	1 Inch Max
2 Inch	100	---
1 1/2 Inch	90 – 100	100
1 Inch	50 – 86	90 – 100
3/4 Inch	45 – 75	55 – 100
3/8 Inch	38 – 55	45 – 75
No. 4	30 – 45	35 – 60
No. 8	23 – 38	27 – 45
No. 16	17 – 33	20 – 35
No. 30	10 – 22	12 – 25
No. 50	4 – 10	5 – 15
No. 100	1 – 6	1 – 8
No. 200	0 – 3	0 – 4

The maximum aggregate size used in the work shall be as shown on the Plans or indicated in the Special Provisions. If the maximum aggregate size is not so designated, the 1-inch maximum size shall be used.

(D) Water. Water shall be measured by volume or weight. The device for measurement of water shall be readily adjustable and, under all operating conditions, shall have an accuracy within one percent of the quantity required per batch. The device shall be so arranged that free air has been expelled from the water at the time of volume measurement. It shall be so arranged that measurement will not be affected by variable pressures in the water supply line. Measuring devices shall be so constructed that their accuracy can be readily verified.

1.11 LIMITATIONS ON CEMENT CONTENT

The cement content shall be as selected by the Contractor, within the following limitations:

(A) Minimum Cement Content. The minimum content shall be not less than six sacks (564 lbs) per cubic yard for concrete used in walls, minor structures and all other structures, and not less than 5 sack *(*470 lbs) per cubic yard for all other concrete.

(B) Compressive Strength. The cement content shall be ample to result in concrete having the minimum compressive strength specified.

1.12 LIMITATIONS OF SLUMP

The average slump of three successive batches of acceptable concrete measured at point of placement shall not exceed the following:

Non-reinforced concrete	3 inches
Reinforced concrete slabs, beams, girders, and other vertically unsupported structural members.....	3 inches
Reinforced concrete, all other.....	4 inches
Concrete placed under water, not less than 6 inches nor more than.....	8 inches

If the slump of any individual batch is two inches or more greater than the average maximum given above, that batch shall not be used in the work and no payment will be made for it. Slump will be measured by the Kelly Ball procedure.

1.13 LIMITATION ON UNIT WATER CONTENT

The unit water content in pounds of free water (exclusive of that absorbed by the aggregate) per cubic yard of concrete shall not exceed the values given in the following tabulation:

Maximum Pounds of Free Water Per Cubic Yard		
Specified Max Slump of Concrete, Inches	1½ Inch Max Aggregate	1 Inch Max Aggregate
3	300	315
4	312	325
8	340	375

(A) For air-entrained concrete, the values in the above table shall be decreased by 30 pounds per cubic yard.

(B) For concrete containing a chemical admixture, the value in the above table shall be decreased by 15 pounds per cubic yard.

(C) For concrete containing both air-entraining and chemical admixtures, the values in the above shall be decreased 45 pounds per cubic yard.

1.14 MIXING AND BATCHING EQUIPMENT

(A) On Site Mixing The contractor shall provide dependable mechanical batch type mixers with a capacity adequate to mix batches of whole sack units, and to fit the requirements of construction. The concrete shall be mixed in the mixer for the time and rate recommended by the mixer manufacturer. All mixed concrete shall be placed in the forms within sixty (60) minutes from the time of introduction of cement and water to the mixer.

(B) Ready-Mix Concrete. Transit mix concrete may be used in lieu of concrete mixed at the job.

All mixing requirements herein specified for concrete mixed at the site shall be in force, except that the minimum mixing period of transit mixers shall be in force, except that the minimum period of transit mixers shall be twelve (12) minutes after being fully charged.

Each batch of concrete shall be mixed at the rate of rotation designated by the manufacturer of the equipment and the total volume of the materials mixed per batch shall not exceed the total volume as recommended by the manufacturer of the equipment.

All mixed concrete shall be placed in the forms within ninety (90) minutes from the time of introduction of cement and water into the mix.

The organization supplying the ready mixed concrete shall have a plant of sufficient capacity and transportation facilities to ensure continuous delivery at the rate of schedule as approved by the Engineer.

If it is necessary to add water to the concrete after arrival in a truck mixer or truck agitator at the job site, the drum shall be rotated 30 revolutions after the water is added before the concrete is discharged.

The manufacturer of ready-mix concrete shall deliver with each load a statement, signed by an authorized employee, showing the class of concrete, the volume of the delivery in cubic yards, the time of day at which water was first introduced into the mixer.

The retampering of concrete or mortar which has partially hardened, that is, mixing with or without additional cement, aggregate, or water, will not be permitted.

(C) Hand Mixed Concrete. All concrete shall be mixed in mechanically operated batch mixers, except that when specifically permitted by the Engineer, batches of not more than one-third cubic yard may be mixed on a watertight, level platform. The proper amount of coarse aggregate shall be measured in measuring boxes and shall be spread on the platform, and the fine aggregate shall be spread on this layer, the two layers being not more than one foot in total depth. On this mixture shall be spread the dry cement, and clean water shall be added, evenly distributed and the whole mass again shall be turned not less than three times, not including placing in the carriers or forms.

1.15 TEST SPECIMENS

All specimens shall be taken from the concrete in accordance with the Standard Method of Sampling Cement, ASTM Designation: C172, or later revision, and cured in accordance with the Standard Method of Curing Concrete Test Specimens, ASTM Designation C192, or later revision and tested in accordance with Test Method No. Calif. 521. The Engineer will furnish molds and will mold the test cylinders.

Should the Contractor request that additional test cylinders be made for determining the strength of concrete in place at an age earlier than 28 days, the Engineer will mold and test such cylinders at the Contractor′s expense.

1.16 MEASUREMENT AND PAYMENT

Portland cement concrete will be measured and paid for in accordance with the provisions specified in the various sections of these Specifications covering construction requiring concrete. Should the Contractor request and obtain permission to use admixtures for his own benefit, he shall furnish such admixtures and incorporate them in the concrete mixture at his expense and no additional compensation will be allowed therefor.

2. CONCRETE CONSTRUCTION

2.01 GENERAL

This work shall include constructing structures, walls, minor structures and all other types of concrete structures, to the lines and grades designated in accordance with the designs and details shown on the Plans. Six sack concrete mix (3250 PSI Min. @ 28 days) shall be used unless another class is indicated in the Special Provisions or on the Plans.

2.02 MINOR STRUCTURES

The following structures are classified as minor structures:

1. culvert headwalls
2. drop inlets
3. catch basins
4. manholes
5. junction boxes
6. junction structures
7. valley gutters
8. commercial driveways
9. alley approaches

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 specified herein.

2.03 DEWATERING

Dewatering from the interior of any foundation of 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 slump separated from the concrete work by a tight wall.

2.04 PLACING CONCRETE

(A) General. All concrete shall be placed while fresh and before it has taken an initial set. Tampering partially hardened concrete with additional water will not be permitted.

Concrete shall not be placed on frozen ground nor in contact with ice within the forms. All concrete shall be effectively protected from freezing for a period of five days after placing. Placing concrete shall be stopped when the quantity of rain falling on the concrete is sufficient to wash the finished or unfinished surface.

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 run directly over reinforcement.

Suitable means shall be provided for maintaining the concrete at a temperature of at least fifty degrees (50^{o}F). for a period of seven (7) days after placing unless otherwise directed by the Engineer. The methods of heating the materials and protecting the concrete shall be approved. Salt, chemicals, or other foreign materials shall not be mixed with the concrete for the purpose of preventing freezing.

The bottom of all excavation 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 and/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 absorption of water from the concrete. Too much water shall not be used and no pools shall form on the area to be concreted.

(B) Depositing. The concrete shall be deposited as nearly as possible 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 six feet without the use of adjustable length pipes or ″elephant trunks.″

Layers of concrete shall not be tapered off in wedge shape slopes but shall be built 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 plans of weakness within the section. If a section cannot be placed continuously, 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 columns and walls is no longer plastic or, where so indicated, until initial shrinkage has occurred in such supporting concrete members.

(C) Consolidating. 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 or, 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 vibrators shall be such as to secure maximum consolidation of the concrete 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.

(D) 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. 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.

2.05 INSPECTION PRIOR TO PLACING CONCRETE

All excavations, forms, reinforcement, 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 and Specifications.

2.06 FORMS

(A) 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 shrinkage 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 by the Engineer.

(B) 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 designated 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.

(C) Surfaces. Forms, for all surfaces which will not be completely enclosed or hidden below the finished 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 in Section VI, Sub-Section 2.06(E). Lumber and material which becomes warped or checked prior to the placing of the concrete shall be removed and replaced.

(D) Edges. Unless otherwise noted, all sharp edges intended to be permanently exposed shall be chamfered with triangular fillets not less than one inch by one inch, to prevent mortar runs and to preserve smooth, straight lines. The triangular fillets or chamfer strips shall be milled from clean straight-grain lumber and shall be surfaced on all sides. At the option of the Contractor, extruded vinyl chamfer stripes of one inch radius may be used in lieu of the wood strips. However, only one type shall be used throughout any one structure. Curved surfaces shall be formed of plywood, metal or other approved material.

(E) 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 may be used with a continuous backing of surface material 3/4 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 staggered and vertical joints shall be continuous and perpendicular thereto or as indicated.

(F) Steel Forms. Surfaces of steel forms shall be free from irregularities, dents, sags, rust, and other material which would discolor the concrete.

(G) 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 not less than 1 inch from any surface. Spreader cones on ties shall not exceed one inch in diameter. Ties shall be of the type which do not have to be completely withdrawn; holes through the wall will not be permitted.

(H) Coating. Before concrete is placed, the contact surfaces of forms shall be coated with an approved non-staining form-coating compound. Forms previously used shall be thoroughly cleaned of all dirt, mortar, and foreign matter before being reused. When steel 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.

(I) 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 *but at no time less than 24 hours*. 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 for beams, soffits, and slabs, and other parts that support the weight of concrete, shall remain in place until the 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 the shores and 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.

(J) 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 earth.

2.07 FALSEWORK

All falsework and centering shall be designed and constructed to provide the necessary rigidity to withstand vibration resulting from adjacent construction and to support the dead and live loads imposed thereon. Unless otherwise designed and constructed to support the loads which would be imposed, the entire superstructure can be poured at one time.

Falsework supporting any span subject to bending stress shall not be released until after the last concrete placed in that span has attained the compressive strength indicated.

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 stream bed. 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 excavated areas.

2.08 CONCRETE FINISHING

(A) 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 off the surface of the concrete with a template, strike board, or approved compacting type screen, operated on and between supports or headers, until a uniform surface is obtained.

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

(C) Honeycombs and Rock Pockets. In the judgment of the Engineer, if rock pockets are of such an extent or character as to affect the strength of the structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the entire removal and replacement of that portion of the structure affected.

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

(1) Scratched Finish. A scratched finish shall consist of the surface of the preliminary finished concrete roughened by stiff brushes or rakes before it has reached its final set.

(2) Floated Finish. For surfaces where no other final finish is indicated, the surface of the concrete shall be given a floated finish with wood or cork base floats.

(3) 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 free of all trowel marks and shall be uniform in texture and appearance.

(4) Broom or Bolt 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.

(E) 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, repaired or patched, shall be removed. Tie holes and all repairable defective areas shall be patched immediately after form removal. Honeycombed and other defective concrete shall be removed to sound concrete, but in no case to a depth less than one inch. The patched areas shall be kept damp for seven days. Metal tools shall not be used in finishing the patch in a formed wall which will be exposed. After being cleaned and thoroughly dampened, tie holes shall be 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.

(1) 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 finishes 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.

(2) Smoothed Rubbed Finish. Smoothed rubbed finish shall be produced on green concrete and shall be completed no 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.

2.09 CURING

(A) Protection. Freshly deposited concrete shall be protected from excessively hot or cold temperatures, and shall be maintained without drying for the period of time necessary for the hydration of cement and proper hardening of the concrete.

(B) General 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.

(1) Moist Curing. Concrete shall be cured by one of the methods specified below as the Contractor may elect 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 not 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 an absorptive mat or fabric laid directly upon the concrete and kept continuously wet.

(d) By covering the entire surface of the concrete with a blanket of earth, sand, sawdust or other non-staining material not less than two inches in thickness and keeping it 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.

(2) Curing Compound Method. The entire surface of newly placed concrete shall be sprayed uniformly with a curing compound while the surface is still wet or moist.

If the finishing processes have not been completed prior to the loss of a visible film of 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 shall conform to the specifications of the State Specifications and shall be approved by the Engineer and applied at the rate recommended by the manufacturer.

2.10 JOINTS

(A) 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.

Pre-molded (Preformed) Expansion Joint Filler shall conform to ASTM Designation D1751.

(B) Construction Joints. Construction joints not shown on the Plans shall be so made and located as least to impair the strength of the structure and their location shall be subject to approval.

2.11 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 manhole 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 accordance with the City Standard Drawings for new manholes and as directed by the Engineer.

2.12 MEASUREMENT

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 the concrete.

(A) Minor Structures. Minor structures will be measured as a unit from actual count.

(B) Manholes. Manholes will either be measured as a unit complete in place; or manholes will be measured as units for the first six feet of depth, and per linear foot for each foot of depth greater than six feet. Depth of manholes will be measured from the lowest invert to the top of the frame.

(C) Adjusted Structures. Structures which are adjusted will be measured as units from actual count.

2.13 PAYMENT

Quantities of concrete in structures will be paid for at the current price per cubic yard, which price shall include full compensation for furnishing all labor, materials, tools, equipment, samples, formwork, and incidentals, and for doing all work involved in constructing, curing and finishing the concrete work, complete in place as indicated. The price paid for minor structures shall include full compensation for all structure excavation and structure backfill and for furnishing and placing all bar reinforcing steel, metal frames, grates, covers, miscellaneous metal and steps necessary to construct the minor structures, complete in place, as indicated, and no separate payment will be made for these included items.

Quantities of 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.

Structures which must be reconstructed in accordance with Section VI, Sub-Section 2.11 during the adjustment process shall be paid for in accordance with Section I, Sub-Section 8.03 ″Force Account Payment.″

When indicated in the Proposal Form manholes greater than six feet in depth will be paid for at the contract unit price for the first six feet, and at the contract price for each foot of depth in excess of six feet.

Full compensation for furnishing and placing expansion joint filler and preformed compression joint seals, shall be considered as included in the prices paid for the various items of concrete work and no additional compensation will be allowed therefor.

3. REINFORCEMENT

3.01 GENERAL

This work shall include the furnishing and placing of reinforcement of the shape and dimensions shown on the Plans, and as specified in these Specifications. Details not shown shall be in accordance with the ″ACI Building Code for Reinforced Concrete″ (ACI318).

3.02 MATERIALS

Bar reinforcement, except No. 2 bars, shall be deformed bars, and shall conform to ASTM Designation A15 or A408, intermediate grade (40,000 psi yield point).

Welded wire fabric shall conform to ASTM Designation A185. The gauge of the wire and dimensions of the mesh shall be as specified.

3.03 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.

3.04 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.

(A) Hooks. Hooks shall conform to the ″ACI Manual of Standard Practice for Detailing Reinforced Concrete Structures″ (ACI315).

3.05 PLACING

(A) Spacing. 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 under full load. Metal supports which extend to the surface of the concrete shall not be used without the approval of the Engineer.

(C) Clearances. 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.

3.06 SPLICING

Splicing of bar reinforcing steel shall be either by lapping or by butt welding at the option of the Contractor. 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.

(A) 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 tensile stress shall be avoided whenever possible.

(B) Lap Splices. The length of lap for deformed bars shall be in accordance with ACI318 or shall be not less than 24 bar diameters, nor less than 23 inches. Spiral reinforcement shall be spliced, either by lapping at least 80 diameters for deformed bars, or 120 diameters for plain bars, or by butt welding at the option of the Contractor. Splices shall be staggered at least 30 bar diameters, and not more than one-third of the bars may be spliced at one location.

(C) Butt Splices. When splices are made by butt welding, 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 pre-qualified and procedures shall be in accordance with Test Method No. Calif. 601.

(D) Wire Mesh. Where splicing is required, wire mesh shall be lapped at least the dimension of one mesh.

3.07 INSPECTION

No concrete shall be deposited until the Engineer has inspected the placement of the reinforcing steel and given permission to place concrete.

3.08 MEASUREMENT

(A) Reinforcing Steel. 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 these Specifications.

The estimated quantities 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 reinforcing steel, the final quantities for payment will be revised in the amount represented by the change in dimensions.

The weights calculated shall be based upon the following tabulations:

BAR REINFORCING STEEL		
Deformed Bar Designation Number	Unit Weight Pounds Per Linear Foot	Nominal Diameter Inches
3	0.376	0.375
4	0.668	0.500
5	1.043	0.625
6	1.502	0.750
7	2.044	0.875
8	2.670	1.000
9	3.400	1.128
10	4.303	1.270
11	5.313	1.410
14	7.650	1.692
18	13.600	2.256

(B) Welded Wire Fabric. Quantities of welded wire fabric placed as specified will not be measured separately.

3.09 PAYMENT

(A) Reinforcing Steel. Quantities of bar reinforcing steel will be paid for at the contract price per pound, which price shall include full compensation for furnishing all labor, materials, tools equipment, and incidentals, and for doing all the work involved in furnishing and placing the bar reinforcing steel, complete in place, as specified.

(B) Welded Wire Fabric. Quantities of welded wire fabric will not be paid for separately, and full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and placing welded wire fabric shall be considered as included in the price paid for the item of work in which the welded wire fabric occurs, and no additional compensation will be allowed therefor.

(C) Minor Structure Reinforcement. The quantities of bar reinforcement steel required for minor structures will not be paid for as a separate item and the cost thereof will be considered as included in the contract price paid for the minor structure.

4. CONCRETE CURB, SIDEWALK, DRIVEWAYS AND VALLEY GUTTERS

4.01 GENERAL

This work shall consist of constructing curbs, valley gutters, sidewalk, driveway sections in sidewalk, and driveway aprons as shown on the Plans or specified in these Specifications. Concrete shall be as specified in Section VI, Sub-Section 1, of these Specifications and shall be five sack mix (2500 PSI Min. @ 28 Days), except commercial driveways and valley gutters which shall be six sack mix (3250 PSI mix @ 28 days).

4.02 SUBGRADE PREPARATION

The subgrade shall be constructed true to grade and cross-section, as shown on the Plans or as directed by the Engineer.

The subgrade, including any base material, shall be thoroughly compacted by an approved mechanical device to not less than ninety-five (95) percent relative compaction as determined by Test Method No. Calif. 216 Relative Compaction shall be determined in accordance with Test Method No. California 216 and/or Test Method No. California 231. A sand cone verification test will be required for each set of nuclear method tests performed at intervals as determined by the Engineer, before the placing of the concrete.

Material under the curbs and valley gutters shall not be displaced when the roadway section is excavated.

4.03 EXISTING CURBS AND SIDEWALKS

Where the Plans provide for the reconstruction of a portion of an existing curb and sidewalk, the existing section shall be cut to a minimum depth of one and one half (1-1/2″) inches with an abrasive type saw at the first scoring line at or beyond the planned joint and the entire section to be reconstructed shall be removed. The new curb and sidewalk shall join the old work at this line.

4.04 FORMS

Timber forms shall be surfaced on the side placed next to the concrete, and shall have a true surfaced upper edge and shall not be less than one and five-eighths (1-5/8″) inches thick after being surfaced.

The depths of forms for the toe and back of curbs shall be equal to the full depth of the curb. The depth of the face forms for concrete curbs shall be equal to the full face height of the curb.

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 ensure rigidity in the forms.

Benders or thin plank forms may be used on curves, grade changes, or for curb returns. Back forms for curb returns may be made of one-half (1/2″) inch thick benders cleated together for the full depth of the curb. Forms and base shall be wet immediately in advance of placing concrete.

The form on the face of curbs shall not be removed while the concrete is sufficiently plastic to slump. Side forms for curbs, sidewalks, island paving, and driveways shall not be removed in less than twenty-four (24) hours after the finishing has been completed.

4.05 CURING

The entire exposed area of the concrete shall be cured with white pigmented curing compound. The spraying shall commence as soon as the finishing process has been completed. White pigmented curing compound shall conform to the specifications of the State Specifications.

4.06 CONSTRUCTION

Prior to placing concrete, the base material onto which the concrete is to be placed shall be thoroughly watered.

Concrete shall be placed and compacted in forms without segregation.

(A) Curb and Gutter. The top and face of the finished curb shall be true and straight, and the top surface of curbs shall be of uniform width, free from humps, sags, or other irregularities. When a straight edge ten (10′) feet long is laid on top or face of the curb or on the surface or lip of gutters, the surface shall not vary more than 0.01 foot from the edge of the straight edge, except at grade changes or curves.

The Contractor shall stamp a figure S in the top of curb at all locations where sanitary sewers cross under curbs, and a figure W in the top of curb at all locations where water lines cross under curbs.

The Engineer may require the Contractor to run water down the new curbs in order to assure that there are no low spots in the flow line of the gutter where water could pond. Any low spots shall be immediately corrected to provide smooth flow with no ponding.

4.07 EXTRUDED CURBS

Any curb, except on structures, may be placed by using an extrusion machine approved by the Engineer.

The combined mineral aggregate for the concrete placed by the extrusion method will be of such size that the percentage composition by weight, as determined by Test Method No. Calif. 202, will conform to the following grading:

Sieve Sizes	Percentage Passing Sieves
1/2″	100
3/8″	85 – 100
No. 4	60 – 80
No. 8	40 – 60
No. 16	25 – 40
No. 30	15 – 25
No. 50	6 – 16
No. 100	1 – 5
No. 200	0 – 2

Curbs to be constructed over an existing pavement shall be anchored to the pavement by means of steel dowels firmly grouted with 1.1 Portland cement and sand grout in holes drilled in pavement. Dowels shall conform to the provisions for bar reinforcing steel in Section VI, Sub-Section 3 ″Reinforcement.″

In lieu of placing dowels and bar reinforcing steel and in advance of placing curbs on an existing pavement, the surface shall be thoroughly cleaned and an adhesive, the composition and mixing of which is specified in CalTrans Standard Specifications, Sub-Section 73-1.05B ″Extruded or Slip Formed Curb Construction″ of the State Specifications, shall be applied. Cleaning of the pavement shall be accomplished by wire brushing or blast cleaning. The cleaned surface shall be free from dust, loose material or oil.

The adhesive shall be prepared at the site of the work in quantities no larger than can be applied and covered with extruded concrete within 30 minutes from the start of mixing.

The mixing adhesive shall be applied promptly to the pavement in a strip approximately 4 inches wide located in the central portion of the contact width of the curb. The adhesive shall be applied at a uniform rate not in excess of 100 linear feet of 4-inch strip per gallon.

The top and the face of the finished curb shall be true and straight and the top surface of curbs shall be of uniform width, free from humps, sags or other irregularities. When a straight edge 10 feet long is laid on the top or face of the curb or on the surface of gutters, the surface shall not vary more than 0.01 foot from the edge of the straight edge, except at grade changes or curves.

Concrete shall be uniformly fed to the machine and be of such consistency that after extrusion the concrete will maintain the shape of the curb section without support. If additional work is necessary to produce the required finish prior to brushing, the work shall be performed immediately after extrusion.

4.08 SIDEWALK, DRIVEWAYS AND VALLEY GUTTERS

The finished surface of the sidewalk, driveways and valley gutters shall not vary more than 0.01 foot from a ten (10′) foot straight edge, except at grade changes, and the finished surface shall be free from blemishes.

4.09 BACKFILL BEHIND CURBS

The planter area in medians and between the back of curb and the front of sidewalk in parkway areas shall be compacted to a relative compaction of not less than 85% as determined by Test Method No. Calif. 216 Relative Compaction shall be determined in accordance with Test Method No. California 216 and/or Test Method No. California 231. A sand cone verification test will be required for each set of nuclear method tests performed at intervals as determined by the Engineer. The material may be selected from the excavation and shall be free of lumps and debris greater than one inch and shall be cohesive.

4.10 IMPERFECT OR DAMAGED WORK

The Contractor shall repair and clean all concrete damaged or discolored during construction. Concrete may be cleaned by an abrasive blast cleaner. Where curb, gutter or sidewalk required repairs before acceptance, the repairs shall be made by removing and replacing the entire portion between weakened plane joints or score marks and not by refinishing the damaged portion.

4.11 MEASUREMENT

Quantities of curbs will be measured by the linear foot along the back of the curb. Quantities of sidewalks, driveways and valley gutters will be measured by the square foot.

4.12 PAYMENT

Quantities of curbs shall be paid for at the contract price per linear foot. Quantities of sidewalks, driveways and valley gutters 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, and for doing all the work involved in constructing curbs, sidewalks, driveways, and valley gutters complete in place, as specified.

1. STORM DRAINS

1.01 GENERAL

This work shall consist of furnishing and installing storm drains as specified in these Specifications. Unless otherwise specified in the Special Provisions or noted on plans, the Contractor may have the option of using any of the materials specified in these specifications.

1.02 GUARANTY (Required for all pipe)

The pipe manufacturers shall give a written guaranty to the City, that they shall agree to replace any pipe material that shows signs of stress or failure within five years after project has been completed. They shall also agree to bear all cost involved in making repair.

1.03 CAST IN PLACE CONCRETE PIPE

(A) General. Cast-in-place concrete pipe shall be constructed of Portland cement concrete placed in a prepared trench to prescribed dimension, line, and grades, with a traveling form or other moveable form capable of producing a pipe of required dimension and workmanship in accordance with these Specifications.

(B) Excavations. The trench shall be excavated to established grade and alignment. The bottom of the trench shall be shaped to form the outside form for the pipe, and shall be graded and prepared to provide full, firm, and uniform support by undisturbed earth or compacted fill over the bottom 180^{o} of the pipe section.

(C) Concrete. Concrete shall be Class 3000.

(1) Aggregates. The maximum size of aggregate shall be as follows:

48″ (or less) diameter pipe - 1″ aggregate.
Over 48″ diameter pipe - 1-1/2″ aggregate.

(2) Slump. The slump, as determined by the Kelly Ball method (Test Method No. Calif. 520.8), shall not exceed 3 inches.

(D) Dimensions.

(1) Wall thickness. The minimum wall thickness for the various sizes of pipe shall not be less than that shown here:

Internal Diameter	Minimum Wall Thickness
24″	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″

(2) Radius of Curvature. The minimum radius of curvature measured at centerline of the pipe shall not be less than that shown here:

Internal Diameter	Minimum Radius
24″	50′
30″	50′
36″	50′
42″	65′
48″	80′
54″	100′
60″	120′
72″	130′

(E) Tolerances.

(1) Diameter. Variations from the nominal internal diameter shall not exceed 2 percent. The actual internal cross-sectional area shall not be less than the theoretical circular area of the pipe.

(2) Horizontal Alignment. The alignment of the installed pipe shall not deviate from the planned centerline more than 0.3 foot at any point nor vary more than 0.2 foot in any 10 linear foot interval.

(3) Invert. The flow line of the finished pipe shall not deviate more than 0.08 foot from the planned grade line at any point nor shall the finished flow line vary more than 0.05 foot in 10 linear feet.

(4) Adjacent forms. Offsets at form laps shall not exceed the limits specified below:

Pipe Diameter	Maximum Offset
24″, 30″	3/8″
36″, 42″	1/2″
48″, 54″	5/8″
60″	3/4″
72″	7/8″

(F) Equipment. The pipe shall be constructed with equipment especially designed for constructing cast-in-place concrete pipe. All equipment shall be in good working condition, and faulty operation shall be cause for requiring the removal of such equipment and termination of the concreting operation until equipment is procured that will construct acceptable pipe in a continuous operation without frequent breakdown or joints.

When metal forms are used they shall be of adequate strength to hold their position and withstand the pressure caused during the vibrating of the concrete, and shall sustain the loading occurring during construction of the pipe without displacement of the form or deviation from the alignment, gradient, or wall thickness, or damage to the concrete previously placed. Forms shall be smooth, free of concrete and shall be oiled before use.

The forms shall be lapped so that the lap ridges in the interior of the pipe shall face downstream without obstruction to the flow of water.

Vibrating equipment shall be a portable high frequency vibrator capable of consolidating the concrete expeditiously without segregation of materials.

(G) Construction.

(1) Placement of Concrete. All earth surfaces against which concrete is to be placed shall be free of standing water, mud, or debris, and shall be firm enough to prevent sloughing of earth into the concrete during placement and vibration.

Absorptive surfaces shall be moistened thoroughly immediately prior to placing concrete against the surfaces.

The cast-in-place pipe shall be constructed in one placement around the complete periphery of the pipe.

(2) Construction Joints. Sloping construction joints, intermediate between terminal structures, shall be constructed if the pour is interrupted more than 15 minutes. The joint shall be formed approximately 45^{o} with the vertical, with the sidewalls of equal length. Steel reinforcing bar dowels, No. 4 bars 24 inches long, shall be inserted in the center of the concrete section at 12 inch spacing around the periphery of the pipe. The dowels shall be placed horizontally, with 12 inch embedment.

The surface of the concrete joint and the dowels shall be cleaned of all latent and loose concrete immediately after initial set has occurred in the concrete. The concrete surface in the joint shall be left rough to develop bond with concrete to be added in future work.

Upon continuation of the pipe construction, the surface of the joint shall be coated with 1/2 inch layer of bonding mortar, and a concrete collar shall be constructed around the joint monolithic with the new work.

The bonding mortar, which shall be applied immediately before placing additional cement over the joint, shall consist of not less than 2 parts of cement to 3 parts of sand (by volume).

The concrete collar, formed by excavating the earth along the periphery of the joint shall lap the joint by at least 2 times the wall thickness and shall have a thickness of not less than 1 1/2 times the wall thickness.

(3) Finish. After removal of the interior forms, all cracks and rock pockets shall be repaired immediately. All porous and fractured concrete shall be removed and the holes patched. Holes cut in the pipe for inspection, testing, or removal of forms shall be repaired by filling with concrete or dry patching mortar. Excess concrete at form bulges and oversize form laps shall be removed.

The finished surface inside the concrete pipe shall be substantially free of fractures, cracks, and surface roughness, and the surface texture shall be equivalent to the interior finish of a precast concrete pipe.

All dirt, or extraneous concrete shall be immediately removed from the pipe.

The exterior surface of the concrete shall be finished with the equivalent of a wood float finish to a uniform shape and not less than the minimum thickness required for the specified size of pipe. All cracks, rock pockets, or other defects shall be repaired before curing.

(4) Curing. Upon completion of the finishing, and subsequent to the inspection of the Engineer, the ends of the pipe shall be covered with a heavy cover which shall be kept wet, and the exterior surface shall be cured using one of the methods outlined in Section VI, Sub-Section 2.09 ″Curing″ except that the sprinkling for 16 hours as stated in Section VI, Sub-Section 2.09(B)(1)(a), will not be required.

(5) Backfill. No backfill other than the 6 inch layer applied for curing of the concrete shall be placed over the pipe until satisfactory test results have been obtained and permission of the Engineer for placement of additional backfill has been given in writing.

(H) Structures. At locations where inlets or junction structures are to be constructed, the cast-in-place pipe shall be constructed through the wall of the structure (or through the structure location) as a continuous operation. While the concrete in the pipe is still fresh, it shall be trimmed to the neat line of the inside faces of the structure walls as shown on the Plans before construction of the structure itself. Alternate methods may be used subject to the approval of the Engineer.

(I) Cover Requirements in Public Roads, Parking Areas, and Driveways.

(1) The depth from subgrade to top of cast-in-place concrete pipe shall not be less than ten (10″) inches.

(2) If the subgrade is more than ten (10″) inches but less than twenty-four (24″) inches above the top of the cast-in-place pipe, a reinforced concrete slab shall be constructed over the pipe. The cover slab shall be ″Class 3000″ concrete, six inches thick, reinforced with a single mat of No. 4 bar reinforcing steel (spaced 12″ on centers both ways). The slab shall extend each side of center of the pipe a distance not less than the external diameter of the pipe.

(3) If the top of pipe is twenty-four (24″) inches or more below the subgrade of the pavement, a cover slab is not required.

(4) Trench backfill below cover slabs shall not be less than four inches thick over the top of pipe and shall otherwise conform to provisions of Section III, Sub-Section 4.04, ″Trench Backfill.″

1.04. REINFORCED CONCRETE PIPE

(A) Materials. Reinforced Concrete Pipe shall conform to the requirements of ASTM Designation C-76 for standard strength reinforced concrete pipe.

(B) Joints. Rubber gasketed joints shall conform to the requirements of ASTM Designation C-443 and shall be flexible and able to withstand expansion, contraction and settlement. Jointing materials shall be sufficiently protected from the air and sun to prevent drying or deterioration. Backfill shall not commence until the joints are inspected and approved by Engineer. All joints shall be cleaned and then sealed with the type of materials necessary to make a tight joint. Voids occurring in the outer and inner annular sealing material shall be filled with the same type of material and the inside of the joint finished smooth.

(C) Installation. Reinforced Concrete Pipe shall be laid and jointed in accordance with generally accepted practice and the following provisions in order to be suitable for the purpose intended.

Necessary facilities shall be provided for lowering and properly placing the sections of pipe in trench. Circular pipe with elliptical reinforcement shall be placed with the minor axis of the reinforcement in a vertical position.

All pipes shall be laid to conform to the prescribed line and grade as shown on plans within an allowable tolerance as calculated by the following formula: Allowable at any given point (in feet) = 5 x slope of pipe (feet per foot). Variations within the above specified tolerance shall be compensating so that the average line and grade specified are met. All pipe shall be laid up grade, unless otherwise permitted by the Engineer.

1.05 CORRUGUATED HIGH-DENSITY POLYETHYLENE (HDPE) PIPE

(A) Materials. HDPE storm drain pipe and fittings materials shall meet and/or exceed all of the requirements of AASHTO Specification M-294. Pipe shall be manufactured with integral bell/spigot joints with rubber gaskets. For pipe sizes larger than 24 inch diameter the Contractor shall submit to the Engineer the specification for the pipe for review and approval.

(B) Installation. Special care shall be taken so that no more than 5.0% deflection occurs in the pipe. Pipe shall be installed per pipe manufacture′s recommendations and the City of Hanford Standard Drawing ″Flexible Pipe Trench Detail″, ST-8 with the following exceptions:

a) Minimum cover to top of pavement for H-20 loading is 12 inches.
b) Select Backfill Material around the pipe and to 12 inches above shall be trench backfill per Section III (4.04) or Aggregate Base per Section IV(3) of these Specifications.

(C) Joints. Joints shall be rubber ring gasket (elastomeric seals). Gaskets shall be factory installed and conform to ASTM F-477.

Water stops (rubber joint gaskets) shall be installed on each pipe that is in the manhole structure. The deflection requirement shall be based on average pipe i.d. as delivered and measured in the field.

(D) Testing. Documentary evidence of test results will be considered sufficient when pipe manufacturer furnishes a certificate and/or test reports indicating that the pipe has been subjected to and passed hydrostatic, load, and chemical resistance tests conducted in accordance with approved methods.

Upon completion of backfill and compacting trenches, Contractor, at his expense, shall pull a properly sized mandrel through the installed main line to demonstrate the maximum pipe deflection is within specified limits. If excessive deflection obstructs passage of the mandrel, the Contractor shall perform all work necessary to repair the storm drain and retest to ensure that pipe deflection is within the allowable limit. Use of a rerounder device will not be allowed.

1.06 POLYVINYL CHLORIDE (PVC)

(A) Materials. Plastic sewer pipe and fitting materials shall meet and/or exceed all of the requirements of ASTM specification D3034 for diameters 12″-15″, and ASTM F679 for 18″-24″, with integral bell gasket joints. Pipe shall be made of PVC plastic having a cell classification of 12454B or 12364B as defined in ASTM D1784 and shall have an SDR rating of 35.

Minimum pipe stiffness (F/y) at 5% deflection shall be 46 PSI for all sizes when tested in accordance with ASTM method D2412, external loading properties of plastic pipe by parallel-plate loading, and shall conform to the following dimensions and tolerances, as in accordance with ASTM designations D3034 and F679.

Inside Diameter	Minimum Wall Thickness	
Inches	Inches (SDR 35)	Average O.D.
12	0.360	12.500
15	0.437	15.300
18	0.536	18.701
21	0.632	22.047
24	0.711	24.803

For pipe larger than 24 inches in diameter the Contractor shall submit to the City Engineer the specification for the pipe for review and approval.

(B) Installation. Special care shall be taken in the installation of PVC pipe so that no more than 5% deflection occurs in the pipe. Pipe shall be installed in compliance with ASTM D2321. The bottom of trench shall be formed such that the pipe can be placed with uniform support along its length.

All trench backfill shall be done in accordance with the pipe manufacturer's recommendation and as specified in Section III(4.04) "Trench Backfill."

(C) Joints. Joints shall be rubber ring gaskets (elastomeric seals). Rubber gaskets shall be factory installed and conform to ASTM F477.

Water stops (Manhole Adapter Rings) shall be installed on each pipe that is in the manhole structure. The 5% deflection requirement shall be based on the average pipe I.D. delivered and measured in the field.

(D) Testing. Documentary evidence of test results will be considered sufficient when pipe manufacturer furnishes a certificate indicating that the pipe has been subjected to and passed hydrostatic, load, and chemical resistance tests conducted in accordance with approved methods.

Upon completion of backfill and compacting trenches, Contractor, at his expense, shall pull a properly sized mandrel through the installed main line to demonstrate the maximum pipe deflection does not exceed 5%. If excessive pipe deflection obstructs passage of the mandrel, the Contractor shall perform all work necessary to repair section of storm drain main and retest to ensure that pipe deflection is within the allowable limit. Use of a rerounder device will not be allowed.

1.07 POLYVINYL CHLORIDE (PVC) Large Diameter Ribbed Pipe

(A) Materials. Large diameter ribbed pipe and fittings materials shall meet and/or exceed all of the requirements of ASTM F794.

Minimum pipe stiffness (F/y) at 5% deflection shall be 46 PSI for all sizes when tested in accordance with ASTM method D2412.

(B) Installation. Special care shall be taken in the installation of PVC pipe so that no more than 5% deflection occurs in the pipe. The bottom of trench shall be formed such that the pipe can be placed with uniform support along its length.

All trench backfill shall be done in accordance with the pipe manufacturer's recommendation and as specified in Section III, Sub-Section 4.04, "Trench Backfill."

(C) Testing. Documentary evidence of test results will be considered sufficient when pipe manufacturer furnishes a certificate indicating that the pipe has been subjected to and passed hydrostatic, load, and chemical resistance tests conducted in accordance with approved methods.

Upon completion of backfill and compacting trenches, Contractor, at his expense, shall pull a properly sized mandrel through the installed main line to demonstrate the maximum pipe deflection does not exceed 5%. If excessive pipe deflection obstructs passage of the mandrel, the Contractor shall perform all work necessary to repair section of storm drain main and retest to ensure that pipe deflection is within the allowable limit. Use of a rerounder device will not be allowed.

1.08 JACKING PIPE

(A) At locations shown on the Plans, or specified, reinforced concrete pipe shall be jacked into place between the limits shown in accordance with these specifications. The strength of pipe designated will be determined for vertical load only. Additional reinforcement of strength of pipe required to withstand jacking pressure shall be determined and furnished by the Contractor at his expense. Variations from theoretical alignment and grade at the time of placing shall not be more than 0.1 greater than the outside limits of the pipe. Sluicing or jetting will not be permitted.

(B) If a cave-in occurs from outside these limits, a metal shield shall be used ahead of the first section of pipe or the face of excavation shall not extend a distance greater than 1 1/2 feet beyond the end of the pipe, unless permitted by the Engineer.

Areas resulting from caving or excavation outside the above limits shall be backfilled with sand or grout by a method which will fill the voids.

The annular space of the inside joints shall be mortar filled and finished smooth after the pipe has been installed.

(C) No separate measurement or payment will be made for constructing or backfilling jacking pits. Backfill shall meet these specifications as called for in Section III, Sub-Section 4.04.

(D) Casings for vitrified clay pipe shall be augured and jacked simultaneously. Casings will meet the same alignment control as called for in Section VII, Sub-Section 1.08 (A) and (C) and shall have free space between pipe and casing filled with sand and/or ends of casing sealed with mortar.

1.09 SYSTEM ACCEPTANCE TESTS-GRAVITY STORM DRAIN LINES

(A) Tests

The Contractor, at his own expense, shall furnish all material, labor and equipment required for testing pipe lines under the direction of the Engineer. No tests will be recognized that are not conducted in the presence of the Engineer. Sufficient notice shall be given to the Engineer in advance of the time set for conducting tests.

Systems may be tested as a unit or in sections, but the entire system shall successfully conform to the requirements of these Specifications before it will be accepted. Pipe shall be clean before starting test.

First test shall be made with air, but retests of section failing air test shall be made by water only.

(B) Air Test

Length of line tested at one time shall be limited to the length between adjacent manholes. Air test procedure shall be as follows: Pressure the test section to 3.5 PSI and hold above 3.0 PSI for not less than 5 minutes. Add air if necessary to keep pressure above 3.0 PSI. At the end of this 5-minute saturation period, note the pressure (must be 3.0 PSI minimum) and begin the timed period. If the pressure drops 0.5 PSI in less than the time given in the following table, then the section of pipe shall not have passed the test.

Line Size	Min. Time in Seconds
4	122
6	184
8	245
10	306
12	367
15	460

For larger diameter pipe use the following formula:

Min. Time is seconds-370 X pipe diameter in feet.

If the test is not passed, the leak shall be found and repaired to the satisfaction of the Engineer and the length of repaired line retested.

The pressure gauge used shall be supplied by the Contractor, shall have minimum divisions of 0.10 PSI and shall have an accuracy 0.04 PSI. Accuracy and calibration of the gauge shall be certified by a reliable testing firm at six month intervals or when requested by the Engineer.

(C) Water Test

All pipes shall be tested between successive manholes by closing the lower end of the storm drain to be tested and the inlet into the upper manhole and filling the pipe and manhole with water to a point six (6) feet above the invert of the open storm drain in the upper manhole. If the depth is less than six (6) feet, fill to top of manhole. Contractor may fill the pipe for twenty-four (24) hours in advance of any tests.

The allowable leakage under the conditions above shall not exceed 200 gallons per 24 hour per inch of pipe diameter, per mile of gravity pipeline tested.

If the leakage exceeds the maximum allowed herein, the pipe shall be overhauled by the Contractor at his expense. Pipe shall be held true to line and grade so that a light will be visible from manhole to manhole. Lateral deflection of less than four (4) inches to allowable. Contractor will furnish all water for testing.

1.10 SYSTEM ACCEPTANCE TESTS - PRESSURE STORM DRAIN LINES

The system shall be subjected to a test pressure of 100 PSI and after two hours the leakage shall not exceed .130 gallons per inch diameter per 24 hours per joint. Any visible leaks shall be repaired.

Test shall not be made until the backfilled trench has been compacted and until 24 hours after the pipe has been held completely full of water under operating pressures.

Any leaks, failures, or imperfect construction developing under such test shall be promptly corrected by the Contractor at his sole cost and expense.

All testing shall be done in the presence of the City Inspector after 24 hours prior notice of testing given by the Contractor. All equipment for testing will be furnished by the Contractor.

1.11 VIDEO INSPECTION

Following failure of a low-pressure air test, the City′s Representative may direct that a video inspection of the subject line be performed. Such inspection will be arranged by the City′s Representative, and paid for by the Contractor prior to final acceptance of the improvements. The inspection shall be in color, and shall be recorded on VHS-format 1/2″ tape, which shall become the property of the City.

The City shall be the sole judge as to the acceptability of construction revealed by such inspection. If there are areas of pipeline not within the allowable grade tolerance, or if the inspection reveals holes or leaks in the pipeline, the Contractor will be so notified, and will be responsible to make needed repairs. The City will not advise the Contractor as to recommended procedures, but will limit its comments to the acceptability of the end product.

Other Criteria for Testing

The City′s Representative may also consider other criteria before requiring that a video inspection be made. These include, but are not limited to: poor soil conditions on site, groundwater above the spring line of the pipe, and the City′s Representative′s report of difficulty maintaining horizontal and vertical alignment during construction. If video inspection for other than a failed air test reveals faults such as broken pipe, misalignment, or improper grades, such faulty areas shall be promptly removed and replaced by the Contractor. Both the video inspection and subsequent repairs shall be at the Contractor′s expense. If the video inspection reveals no faults in the line, the cost of such inspection will be borne by the City.

1.12 MEASUREMENT

Quantities of storm drains will be measured by the linear foot along the centerline of the pipe form end of pipe to end of pipe, excluding any pipe laid between the inside walls of any structure.

1.13 PAYMENT

Quantities of storm drains shall be paid for at the contract price per linear foot for each size, type, or class, which prices shall include full compensation for furnishing all labor, materials, tools, equipment and doing all excavation, bedding, backfill, compaction, cleaning, testing and paving in place complete as specified.

2. SANITARY SEWERS

2.01 GENERAL

This work shall consist of furnishing and installing sanitary sewers as specified in these Specifications. Unless otherwise specified in the Special Provisions or noted on plans, the Contractor may have the option of using any of the materials specified in these Specifications.

2.02 GUARANTY (Required for all Pipe)

The pipe manufacturers shall give a written guaranty to the City, that they shall agree to replace any pipe material that shows signs of stress or failure within five years after project has been completed. They shall also agree to bear all cost involved in making repair.

2.03 PIPE MATERIALS

(A) Vitrified Clay Pipe. Vitrified Clay Pipe (VCP) shall be mechanical compression joint pipe, band seal, wedge lock, speed seal or approved equal. VCP and fittings shall be extra strength, first quality, sound and well burned throughout their entire thickness and shall comply with the current revisions of ASTM designation C-700.

(B) Cast Iron Pipe. All cast iron pipe and fittings shall comply with ASTM designation: A74 for extra heavy pipe.

Rubber gaskets used for jointing cast iron pipe shall conform to ASTM designation: C564.

(C) ABS Truss Pipe. Pipe and fittings materials shall conform to ASTM D2680. The inside diameter of an installed section shall not deflect more than 4%. Fittings not described by this standard shall be shop fabricated or molded from materials listed in paragraphs 4 and 5 of D2680 and shall be of equivalent quality to those described.

ABS Solid Wall sewer pipe and fittings shall be manufactured from resins described in paragraph 5.1 of D2680 and tested in accordance with paragraph 9.3 of D2680.

All joints shall be chemically welded. Primer then cement shall be applied liberally to the outside of the spigot and inside the coupling immediately prior to stabbing the pipe together. Pipe spigot end shall be supplied with home marks to assure proper jointing.

Special care shall be taken in the installation of ABS Truss Pipe so that no more than 4% deflection occurs in the pipe. The bottom of trench shall be formed such that the pipe can be placed with uniform support along its length.

Documentary evidence of test results will be considered sufficient when pipe manufacturer furnishes a certificate indicating that the pipe has been subjected to and passed hydrostatic, load, and chemical resistance tests conducted in accordance with approved methods.

(D) Polyvinyl Chloride (PVC) Non-Pressure Pipe. Plastic sewer pipe and fittings materials shall meet and/or exceed all of the requirements of ASTM specification D3034 for diameters 4″-15″, and ASTM F679 for 18″-24″, with integral bell gasket joints. Pipe shall be made of PVC plastic having a cell classification of 12454B or 12364B as defined in ASTM D1784 and shall have an SDR rating of 35.

Minimum pipe stiffness (F/y) at 5% deflection shall be 46 PSI for all sizes when tested in accordance with ASTM method D2412, external loading properties of plastic pipe by parallel-plate loading, and shall conform to the following dimensions and tolerances, as in accordance with ASTM designations D3034 and F679.

Inside Diameter Inches	Minimum Wall Thickness Inches (SDR 35)	Average O.D.
4	0.120	4.215
6	0.180	6.175
8	0.240	8.400
10	0.300	10.500
12	0.360	12.500
15	0.437	15.300
18	0.536	18.701
21	0.632	22.047
24	0.711	24.803

For pipe larger than 24 inches in diameter the Contractor shall submit to the Engineer the specification for the pipe for review and approval.

Special care shall be taken in the installation of PVC pipe so that no more than 5%

deflection occurs in the pipe. Pipe shall be installed in compliance with ASTM D2321. The bottom of trench shall be formed such that the pipe can be placed with uniform support along its length.

Documentary evidence of test results will be considered sufficient when pipe manufacturer furnishes a certificate indicating that the pipe has been subjected to and passed hydrostatic, load, and chemical resistance tests conducted in accordance with approved methods.

Pipe shall not deviate from straight by more than 1/16 in./ft. (5 mm/m) of length when the maximum offset is measured from the concave side of the pipe.

Joints shall be rubber ring gaskets (elastomeric seals). Rubber gaskets shall be factory installed and conform to ASTM F477.

Water stops (Manhole Adapter Rings) shall be installed on each pipe that is in the manhole structure. The 5% deflection requirement shall be based on the average pipe I.D. delivered and measured in the field.

(E) Polyvinyl Chloride (PVC) Pressure Rated Pipe. Unplasticized polyvinyl chloride (PVC) pressure sewer pipe with integral thickened wall bells shall conform to the requirements of A.W.W.A. C-900. Pipe shall be class 200 DR 14 with a 4 to 1 safety factor.

Pipe shall be suitable for use at a maximum hydrostatic work pressure of 200 PSI at 73^{o}F. Provisions must be made for contraction and expansion at each joint with a rubber ring and integral thickened bell as part of each joint. Pipe and fitting must be assembled with a non-toxic lubricant.

Pipe shall be made from clean, virgin, approved Class 12453-B PVC compound conforming to ASTM Resin specification D1784. Clean reworked material generated from the manufacturer's own pipe production may be used.

(F) Polyvinyl Chloride (PVC) Large Diameter Ribbed Pipe. Large diameter ribbed pipe and fitting materials shall meet and/or exceed all of the requirements of ASTM F794.

Minimum pipe stiffness (F/y) at 5% deflection shall be 46 PSI for all sizes when tested in accordance with ASTM method D2412.

Special care shall be taken in the installation of PVC pipe so that no more than 5% deflection occurs in the pipe. The bottom of trench shall be formed such that the pipe can be placed with uniform support along its length.

(G) High Density Polyethylene Pipe (HDPE). All HDPE for sanitary sewers shall be minimum Class 100 and conform to ASTM F-894. Pipe material shall meet the requirements of Type III, minimum Class C, Category 5, Grade P34 as defined in ASTM D1248 standard specification for polyethylene plastics molding and extrusion materials.

Gaskets shall meet the requirements of ASTM F477 and be molded into a circular form or extruded to the proper section and then spliced into circular form and shall be made of a properly cured high grade elastomeric compound. The basic polymer shall be natural rubber, synthetic elastomer or a blend of both. The lubricant used for assembly of gasket joints shall have no detrimental effect on the gasket or on the pipe. Contractor shall have the manufacturer furnish a certificate of conformance to these specifications.

2.04 LAYING OF PIPE

When the designed slope of the pipe is 2% or less, the Contractor shall accurately establish a grade line from grade stakes set at 25 foot intervals over the center of the pipe, above the surface of the ground, parallel to the invert of the pipe before any pipe is laid in the trench and use this grade line to check the elevation of each length of pipe. The Contractor shall maintain the grade line for a minimum distance of three consecutive grade stakes. All pipe shall be laid to conform to the prescribed line and grade as shown on the Plan within an allowable tolerance as calculated by the following formula:

~~Allowable tolerance at any given point (in feet) = 5 X slope of pipe (feet per foot).~~
Allowable vertical tolerance at any given point (in feet) shall be as follows:

Pipes less than 8″- 1/2″
Pipes greater than 8″but less than 12″- 1″
Pipes greater than 12″but less than 18″- 1 1/2″
Pipes greater than 18″but less than 24″- 2″

At no time shall the vertical tolerance be greater than 2″.

Variations within the above specified tolerance shall be compensated so that the average line and grade specified are met.

An adequate bell hole shall be dug at the end of each pipe. Each length of pipe shall be laid on an approved trench bottom or bedding material and shall have full bearing surface for its entire length between bell holes. Adjustments of pipe to line and grade shall be made by scraping away or filling in and tampering approved material under the body of the pipe. No wedging or blocking to support the pipe will be permitted.

Pipe shall be laid upgrade with the bell and upgrade from the point of connection to an existing sewer. Open ends of new or existing pipe which are not to be immediately connected shall be plugged or capped to prevent the entry of dirt or trash.

All sewer line connections to manholes, main sewers or laterals shall be left uncovered until after the inspection has been made. After approval of the connection is obtained, the trench shall be backfilled as specified in Section III, Sub-Section 4.04, ″Trench Backfill.″

Upon completion of backfill and compacting trenches, Contractor, at his expense, shall pull a properly sized mandrel through the installed main line to demonstrate the maximum pipe deflection does not exceed 5% (4% for ABS Truss and HDPE pipes). If excessive pipe deflection obstructs passage of the mandrel, the Contractor shall perform all work necessary to repair the failing section of sewer main and retest to ensure that pipe deflection is within the allowable limit. Use of a rerounder device will not be allowed.

2.05 CONNECTION OF LATERALS TO EXISTING SEWERS

All tools, materials and appurtenances, shall be furnished by the Contractor.

Sections of sewer showing leakage in excess of that allowed shall be repaired or reconstructed as necessary to eliminate the excessive leakage.

2.06 SYSTEM ACCEPTANCE TESTS - GRAVITY LINES

(A) Tests

The Contractor, at his own expense, shall furnish all material, labor and equipment required for testing pipe lines under the direction of the Engineer. No tests will be recognized that are not conducted in the presence of the Engineer. Sufficient notice shall be given to the Engineer in advance of the time set for conducting tests.

Systems may be tested as a unit or in sections, but the entire system shall successfully conform to the requirements of these Specifications before it will be accepted. Pipe shall be clean before starting test.

First test shall be made with air, but retests of section failing air test shall be made by water only.

(B) Air Test

Length of line tested at one time shall be limited to the length between adjacent manholes. Air test procedure shall be as follows: Pressure the test section to 3.5 PSI and hold above 3.0 PSI for not less than 5 minutes. Add air if necessary to keep pressure above 3.0 PSI. At the end of this 5-minute saturation period, note the pressure (must be 3.0 PSI minimum) and begin the timed period. If the pressure drops 0.5 PSI in less than time given in the following table, then the section of pipe shall not have passed the test.

Line Size	Min. Time in Seconds
4	122
6	184
8	245
10	306
12	367
15	460

For larger diameter pipe use the following formula:

Min. time is seconds - 370 X pipe diameter in feet.

If the test is not passed, the leak shall be found and repaired to the satisfaction of the Engineer and the length of repaired line retested.

The pressure gauge used shall be supplied by the Contractor, shall have minimum divisions of 0.10 PSI and shall have an accuracy 0.04 PSI. Accuracy and calibration of the gauge shall be certified by a reliable testing firm at six month intervals or when requested by the Engineer.

(C) Water Test

All pipes shall be tested between successive manholes by closing the lower end of the sewer to be tested and the inlet into the upper manhole and filling the pipe and manhole with water to a point six (6) feet above the invert of the open sewer in the upper manhole. If the depth is less than six (6) feet, fill to top of manhole. Contractor may fill the pipe for twenty-four (24) hours in advance of any tests.

The allowable leakage under the conditions above shall not exceed 200 gallons per 24 hour per inch of pipe diameter, per mile of gravity pipeline tested.

If the leakage exceeds the maximum allowed herein, the pipe shall be overhauled by the Contractor at his expense. Pipe shall be held true to line and grade so that a light will be visible from manhole to manhole. Lateral deflection of less than four (4) inches to allowable. Contractor will furnish all water for testing.

2.07 SYSTEM ACCEPTANCE TESTS - PRESSURE LINES

The system shall be subjected to a test pressure of 100 PSI and after two hours the leakage shall not exceed .130 gallons per inch diameter per 24 hours per joint. Any visible leaks shall be repaired.

Test shall not be made until the backfilled trench has been compacted and until 24 hours after the pipe has been held completely full of water under operating pressures.

Any leaks, failures, or imperfect construction developing under such test shall be promptly corrected by the Contractor at his sole cost and expense.

All testing shall be done in the presence of the Engineer or authorized representative after 24-hour prior notice of testing given by the Contractor. All equipment for testing will be furnished by the Contractor.

2.08 VIDEO INSPECTION

Following failure of a low-pressure air test, the City′s Representative may direct that a video inspection of the subject line be performed. Such inspection will be arranged by the City′s Representative, and aid for by the Contractor prior to final acceptance of the improvements. The inspection shall be in color, and shall be recorded on VHS-format 1/2″ tape, which shall become the property of the City.

The City shall be the sole judge as to the acceptability of construction revealed by such inspection. If there are areas of pipeline not within the allowable grade tolerance, or if the inspection reveals holes or leaks in the pipeline, the Contractor will be so notified, and will be responsible to make needed repairs. The City will not advise the Contractor as to recommended procedures, but will limit its comments to the acceptability of the end product.

Other Criteria for Testing

The City′s Representative may also consider other criteria before requiring that a video inspection be made. These include, but are not limited to: poor soil conditions on site, groundwater above the spring line of the pipe, and the City′s Representative′s report of difficulty maintaining horizontal and vertical alignment during construction. If video inspection for other than a failed air test reveals faults such as broken pipe, misalignment, or improper grades, such faulty areas shall all be promptly removed and replaced by the Contractor. Both the video inspection and subsequent repairs shall be at the Contractor′s expense. If the video inspection reveals no faults in the line, the cost of such inspection will be borne by the City.

2.09 CLEANING OF SEWER LINES

The Contractor shall clean all sewer lines with a Wayne sewer cleaning tool (or other approved cleaning device) in a manner prescribed by the manufacturer resulting in removal of all foreign matter from the lines. Cleaning of lines shall be required prior to City acceptance of the improvement.

2.10 REPAIR OF DAMAGED SEWER LINES

The Contractor shall replace full lengths of damaged pipe and repair all damaged pipe joints such that the replaced sections of new or repaired pipe joints are leakproof. Replaced lengths of sewer pipe shall be ″bedding″ in a sand slurry mix of one sack cement per cubic yard poured from bottom of original cut to springline of sewer laterals crossing over water main but no slurry shall support water main. Pour shall be one foot minimum width. New joints assemblies shall be made with no hub vinyl type coupling fastened with stainless steel clamps.

2.11 PAYMENT

Quantities of sanitary sewer mains and laterals shall be paid for at the contract price per linear foot. Quantities of sanitary wyes, tees and taps shall be paid for at the contract price per each. The above prices shall include full compensation for furnishing all labor, materials, tools, equipment, and doing all the work involved in furnishing and installing the sewer pipe and appurtenances including excavation, bedding, backfill, compaction, cleaning, testing and paving, as specified.

SECTION VIII

MISCELLANEOUS IRON AND STEEL, AND METAL BEAM GUARD RAIL

1.01 GENERAL

This work shall consist of furnishing and installing miscellaneous iron and steel and metal beam guard rail as specified in these Specifications.

1.02 MATERIALS

(A) Miscellaneous Iron and Steel. Miscellaneous iron and steel items shall conform to the Specifications listed in the following table:

Material	ASTM Designation
Structural Steel	A 36
Bolts and Nuts	A 307
Cast Iron	A 48 , Class 40

At the option of the Contractor, bar portions of steel frames and grates may be fabricated from structural steel conforming to the requirements of AISI Designation: C1021.

All steel items shall be galvanized. Galvanizing of structural steel shall conform to the requirements of ASTM Designation: A 123. Galvanizing of steel hardware shall conform to the requirements of ASTM Designation: A 153. Galvanizing shall be performed after fabrication. Components of bolted assemblies shall be galvanized separately before assembly. All edges of contacting surfaces, where galvanizing is required, shall be completely sealed by welding before galvanizing. Galvanized surfaces that are abraded or damaged shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating, after which the cleaned areas shall be painted with two coats of zinc dust paint conforming to the requirements of Federal Specification MIL-P-21035.

Frames and grates, or frames and covers shall be matchmarked in pairs before delivery to the work and grates and covers shall fit into their frames without rocking.

(B) Metal Beam Guard Rail. Materials and construction of metal beam guard rail shall conform to the Provisions in CalTrans Standard Specifications, Sub-section 83-1.02B ″Metal Beam Guard Railing″ of the State Specifications and to the current State Standard Plans.

The rail elements and fittings shall be galvanized in accordance with the Provisions in Section VIII, Sub-Section 1.02(A), of these Specifications.

1.03 MEASUREMENT AND PAYMENT

(A) Miscellaneous Iron and Steel. No separate measurement or payment will be made for miscellaneous iron and steel items and full compensation for furnishing all labor, materials, tools, equipment and incidentals and doing all the work involved in installing the items as specified shall be included in the contract prices paid for the structures in which the items are placed.

(B) Metal Beam Guard Rail. Quantities of metal beam guard rail will be measured and paid for at the contract price per linear foot (measured from end to end, along the face of the rail), which price shall include full compensation for furnishing all labor, materials, tools, equipment, incidentals, and for doing all the work involved in installing metal beam guard rail, complete in place, as specified.

SECTION IX

TRAFFIC SIGNAL SYSTEMS AND LIGHTING SYSTEMS

1.01 DESCRIPTION

This work shall consist of the furnishing and installing of traffic signal systems (including highway safety lighting) conforming to the Provisions of Section 86-1 through 86-6 of the State Specifications as required by the Plans and the following Specifications.

Where there are conflicts between Section 86 of the State Specifications and the City of Hanford Specifications, the City Specifications, including Plans and Special Provisions, shall prevail. Payment shall be in accordance with Section IX, Sub-Section 1.25, herein.

1.02 EQUIPMENT LIST AND DRAWINGS

A complete list of equipment and materials proposed for use and installation shall be submitted for review as required by State Specifications. Five (5) sets of traffic signal controller cabinet schematic wiring diagrams shall be shipped with controller equipment or cabinet.

In lieu of providing three (3) sets of ″as-built″ or corrected plans, the Contractor shall provide one (1) marked copy of the Plans, showing in detail all construction changes and location and depth of conduit, and shall review these changes and locations with the Engineer at the job site upon completion of the work.

1.03 EXCAVATING AND BACKFILLING

Excavation shall not be permitted under existing pavement, including public and private streets, driveways, and sidewalk, except with prior approval of the Engineer. Conduit shall be placed by jacking or drilling methods in such cases. Where permitted, excavation and backfill shall be in accordance with the City Specifications.

1.04 FOUNDATIONS

All work and materials shall conform to the Provisions of Section 86-2.03 of the State Specifications, including all references therein.

Unless otherwise designated, a two-foot by three-foot raised pad of Portland Cement concrete shall be placed so as to extend the full width in front of each controller cabinet in unpaved areas.

1.05 STANDARDS, PEDESTALS, AND POSTS

All work and materials shall conform to Provisions of Section 86-2.04 of the State Specifications, including all references therein. Contractor shall contact utility companies and make arrangements for necessary precautions to avoid utility conflicts when raising and setting poles.

1.06 CONDUIT AND PULL BOXES

All work and materials shall conform to the Provisions of Sections 86-2.05 and 86-2.06 of the State Specifications and these Specifications.

Conduit shall be placed under existing pavement, including public and private streets, driveways, and sidewalks by jacking or drilling methods at a minimum depth of 30 inches.

Any existing conduit damaged by the Contractor shall be replaced in kind at no cost to the City. Where necessary, existing conduits shall be extended in kind to terminate in the new pull box locations.

Special attention is directed to the requirement for installation of pull boxes on long runs at spacings of not over 200 feet.

1.07 CONDUCTORS

All work and materials shall conform to the Provisions of Section 86-2.08 of the State Specifications and these Specifications.

All single wire conductors with thermoplastic insulation shall be marked in conformance with UL Publication UL 83, paragraphs 122 to 125, inclusive, except that the limitation on white or gray colors in paragraph 124A will not apply. The wire shall have clear, distinctive and permanent markings.

Separate service and common conductors shall be provided throughout the system for traffic signals and street lighting. Service conductors for traffic signals shall be No. 8 AWG, unless otherwise specified. Service commons and street lighting conductors shall be No. 10 AWG or larger.

Conductors for detectors and Detector lead-in shall conform to Section 86-5.01 of the State Specifications.

Inductive loop detector conductors from individual loops shall meet and run together to the nearest pull box and shall be tagged in the pull box as specified for detector circuit conductors in said Section 86-2.08 and as shown on the Plans, except that a neutral will not be required. Each 2-wire lead cable from the first pull box to the controller cabinet shall be tagged with the identity of all detectors connected to the circuit. Tags shall be permanently attached to the conductors.

1.08 WIRING

All work and materials shall conform to Provisions of Section 86-2.09 of the State Specifications and these Specifications. Splices shall be Type C insulated in conformance with ″Method B″ as shown in the State Standard Plans and in Section 86.2.09E.

Special attention is directed to the requirement that all signal light conductors be run continuously without splices, except branch neutrals and where otherwise specified. Railroad pre-empt conductors shall also be run without splices.

Conductors within cabinets shall be cabled together with self-clinching nylon cable ties, and attached to the cabinet with cable clamps.

Neutral and luminaire conductors shall not be spliced in the pull box nearest controller, but shall be continued to terminals in the cabinet.

1.09 BONDING AND GROUNDING

All work and materials shall conform to Provisions of Section 86-2.10 of the State Specifications and these Specifications.

1.10 SERVICE

All work and materials shall conform to Provisions of Section 86-2.11 of the State Specifications and these Specifications, and to the regulations and Specifications of the serving utility company.

Type B service grounding (with concrete box) shall be used, (see State Standard Plans), unless otherwise specified.

Service equipment shall be mounted on the side-center of the controller cabinet, unless otherwise specified, and shall be enclosed in a single-unit raintight can, approximately 12 inches wide by 21 inches high by 4-1/2 inches deep, with an internal channel to take the unmetered service conductors from entry at the bottom of the can to the meter. (Can shall be Murray #JC002C2, Square D #100 QRB, or approved equal, and shall include by-pass links to allow operation during meter testing.)

Underground service shall be connected through a separate 3/4 inch or 1 inch rigid metal conduit between the utility service point and entry to service can.

Energy for the traffic signals shall be metered.

Luminaires shall <u>not</u> be metered.

The Contractor shall order service and bear any costs thereof from Pacific Gas and Electric Company, or Southern California Edison Company.

1.11 FIELD TESTS

All work shall conform to Provisions of Section 86-2.14 of the State Specifications and these Specifications.

The functional test shall consist of not less than five days of continuous, satisfactory operation of the entire system. During the test period, the Contractor's forces will maintain the system exclusive of those portions beyond points of serving utility connection.

Adjustments in timing or operation shall be made as requested by the Engineer or City's maintenance agent.

Tests shall not start on a Friday, or on any day preceding a legal holiday.

1.12 GALVANIZING AND PAINTING

All work and materials shall conform to Provisions of Section 86-2.15 and 86-2.16 of the

State Specifications, including all references therein.

1.13 TRAFFIC SIGNAL HEADS, LOUVERS AND BACKPLATES

All work and materials shall conform to Section 86-4.01 of the State Specifications and these Specifications.

All mast-arm signal indications shall be 12-inch sections (with Type M-2 mounting) unless otherwise specified. Far side left turn signals shall be programmed visibility type heads mounted at a minimum height of 10 feet.

1.14 SIGNAL HEAD MOUNTING

All work and materials shall conform to Section 86-4 ″Traffic Signal Faces and Fittings″ of the State Specifications and these Specifications.

Terminal compartments shall be bronze.

Mounting brackets shall be Types A1, A4, A5, A6, B1, B2, B4, W1, W2, W0, W3, and M2, as shown on the Plans, unless otherwise noted.

All red arrow and red ball signal indications shall be equipped with light emitting diode (LED) kits, available from Electro Tech or approved equal.

1.15 DETECTORS AND PUSH-BUTTONS

All work and materials shall conform to Section 86-5 of the State Specifications and these Specifications.

Detectors shall be the inductive loop type unless otherwise specified.

Conductors and lead-in cable shall conform to Section IX, Sub-Section 1.07 of these Specifications.

Sensor units and power supply shall be interchangeable with Automatic Model LD-1, or Econolite Model ED-1, now in use by the City, and shall be housed in the controller cabinet. A separate sensor unit shall be provided for each direction of travel and for each left turn lane, regardless of phasing associated with approaches.

Sensor units shall be six-x sensitivity.

Slots cut in existing pavements or base course for the installation of inductive loop conductors shall be filled with an epoxy resin compound which shall be ″Stacrete″ or ″CONCRESSIVE #1026″ or approved equal. In areas of new construction, or where pavement overlay is to be provided, loop detectors are to be installed, as above specified, prior to placement of final surface course of pavement.

Loops shall be configurations of individual 6-foot square units, unless otherwise specified. Each 6-foot loop shall be separately wired with leads extending to the nearest pull box. Individual loops attached to the same sensor shall be connected in series at the nearest pull box, unless otherwise specified.

Loops shall be centered in each traffic lane, unless otherwise specified.

Pedestrian push buttons shall be Type B and shall be installed with stainless steel tamper proof screens.

1.16 PEDESTRIAN SIGNALS

All work and materials shall conform to Provisions of Section 86-4.05 of the State Specifications and these Specifications.

All pedestrian signal indications shall be international symbols of man and hand, and constructed of polycarbonate material.

Pedestrian signals shall be ″Type A″ with two incandescent lamps with sockets and a front screen. Colors shall be Portland Orange and Lunar White. All orange hand signal indicators shall be equipped with light emitting diode (LED) kits, available from Electro Tech or approved equal.

1.17 HIGH PRESSURE SODIUM LUMINAIRES AND BALLASTS

All work and materials shall conform to Provisions of Sections 86-6, ″Lighting″, of the State Specifications and these Specifications.

All high pressure sodium luminaires shall have built-in ballasts and photocells, unless otherwise specified.

1.18 FLASHING BEACONS AND SIGN LIGHTING FIXTURES (INCANDESCENT)

All work and materials shall conform to Provisions of Section 86-4.07 and 86-6.06 of the State Specifications and these Specifications.

1.19 PHOTOELECTRIC CONTROLS

All work and materials shall conform to Section 86-6.07 of the State Specifications and these Specifications.

The photoelectric control shall be Type IV with individual photocells for each luminaire or illuminated sign, unless otherwise specified.

1.20 SALVAGING, REINSTALLING AND STOCKPILING ELECTRICAL EQUIPMENT

Where shown on the Plans, existing electrical equipment shall be removed and salvaged. Care shall be executed so that it will remain in its original form and existing condition whenever possible. The Contractor will be required to replace, at his expense, equipment damaged or destroyed by reason of his operations.

The Contractor shall haul all salvaged equipment to the City of Hanford Corporation Yard located at 900 South 10th Avenue. The cost of salvaging, loading and hauling and stockpiling said equipment shall be considered as included in the contract lump sum paid for signals and lighting, and no additional compensation will be allowed therefor.

1.21 EXISTING SIGNS

Existing stop signs, street signs, speed limit signs, warning signs, guide signs, etc., shall be reset as necessary and maintained by the Contractor during construction.

1.22 MODIFICATIONS, REPAIRS, OR RELOCATION OF FACILITIES

Where modifications, repairs and relocations are required to an existing traffic signal system, new signals shall be installed and placed in operation prior to removal of existing signals at each location, so as to provide for continuous operation of traffic signals with at least one eight-hand signal indication visible to traffic at all times for public convenience. (Exception to the above is when moving an existing pole to a new location, or installing a new pole on an existing foundation, at which time temporary signals may be required and right-hand signals shall be re-energized as quickly as possible.) In all cases, right-hand signals shall be completely restored to operation at the end of each day′s work and at other times when construction operations are suspended for any reason. (Temporary signals, standards, wiring, etc., shall be provided by the Contractor, if necessary for public safety, to provide the above at no cost to the City.)

If it is necessary for signals to be out of operation to an extent greater than that indicated above, an approved means of traffic control shall be provided by the Contractor, at his expense.

1.23 DELIVERY OF CONTROLLERS

Controller, auxiliary equipment, and cabinet shall be delivered to the City or its maintenance agent, as described by the Engineer, for operational testing and adjustment. After testing and adjustment and when notified by the Engineer, the Contractor shall pick up the cabinet and haul the same to the site of work at his expense.

NOTE: Five (5) sets of cabinet schematic wiring diagrams, as specified in Section IX, Sub-Section 1.02 herein, shall be delivered at the same time and place as the above equipment.

1.24 CONTROLLERS

(A) All work and materials shall conform to Provisions of Section 86-3 (86-3.01 through 86-3.06D inclusive) of the State Specifications and these Specifications.

(B) Specified groups of controller equipment, described in the Special Provisions, will be acceptable and shall be bid as such by respective suppliers. Equipment shall be fully wired and installed in a specified cabinet to conform to these Specifications, Plans and Phasing Diagrams.

(C) Interchangeability of controller equipment is required where feasible, for the purpose of replacement during maintenance by other controllers now in use by the City, and shall be accomplished without any change in wiring (except adaptor cable), additional parts, loss of functions, or special equipment.

(D) All controller equipment and detector sensor units shall be equipped with cannon-type plugs, unless otherwise specified.

(E) External light relays shall be directly interchangeable with Type SR-4 relays now in use by the City, in place of those specified in Section 86-3.04 C. Solid state switching devices and other relays shall be as specified in Section 86.

(F) Where future signal phasings or equipment are shown on the Plans, the controller cabinet shall be wired to accept necessary additional equipment with no harness or internal wiring changes or additions, and only minor changes in cabinet terminal wiring. Actual controller equipment, relays, or detector equipment for future phasing shall not be provided unless necessary for present operation.

(G) All circuits appearing at the controller plugs shall be wired to a terminal block. All connecting cable leads shall terminate at terminal blocks, without splicing or taping.

(H) All cabinets shall be fitted with locks which are operable by a standard police key as supplied by Econolite Signal Company and Eagle Signal Company for pretimed controller cabinets and police panels, and by standard key as supplied by Automatic Signal Company for tumbler locks on actuated controller cabinets. Two keys shall be supplied with each cabinet.

(I) All cabinets shall be equipped with sufficient shelves in the back of the cabinet to hold all equipment, including detector sensor units, future controller units, and any special equipment or spare units called for in the Specifications, Plans, or Phasing Diagrams.

(J) Field connection terminals shall be located along the bottom back and bottom sides of the cabinet, with minimum clearance of 12 inches from the bottom of the cabinet and 6 inches from the nearest shelf.

(K) Terminals relays, and other equipment mounted on the cabinet wall shall be accessible without removal of any equipment housed on the shelves.

(L) All cabinets for actuated controllers shall have a thermostatically controlled electric fan with a capacity of 100 cubic feet per minute or greater, as specified in Section 86-3.04 B.

(M) Type R or Type P cabinets shall have a louver near the bottom of the front door, with available air flow area of approximately 37 square inches, and a glass fiber air filter mounted on the inside of the door. The filter shall be easily removable for cleaning or replacement.

(N) All cabinets for actuated controllers shall be equipped with a fluorescent lamp fixture and switch, installed along the top front interior of the cabinet to provide for general illumination of control equipment.

(O) All phases of actuated equipment shall be provided with individual recall switches either on the face of the controller itself or on the inside of the cabinet door, and an additional normally open spring loaded detector switch for each phase, mounted on the inside of the cabinet door.

(P) Controller wiring, bus bars, terminals, relays, switches, etc., shall have a current rating sufficient for the total maximum signal load at the intersection during any phase of operation.

(Q) Time switches shall be mounted for convenient access on a cabinet wall, and shall provide capability for skipping selected days of the week, switching on and off three times a day, 15-minute time increments, and 10-hour reserve operation in case of power failure.

(R) ″Solid State″ controller equipment shall be modular (Type 90) controller units (Types S, SP, D, or Dp phase sections as required or specified) and shall meet minimum requirements of Section 86-3.06 of the State Specifications and attached Special Provisions.

(S) All controllers shall be provided with a solid state monitoring device as specified in Section 86-3.08C of the July 1992 State Specifications.

1.25 PAYMENT

Full compensation for performing all work complete as shown on the Plans or specified in these Specifications or Special Provisions, shall be considered as included in the contract lump sum price paid for signals and lighting, which price shall include furnishing all labor, materials, tools, and equipment and making all alterations as necessary to perform the work, and no additional payment shall be allowed therefor.

2. TRAFFIC STRIPES, PAVEMENT MARKINGS AND PAVEMENT MARKERS

2.01 DESCRIPTION

This work shall consist of the furnishing and installing of traffic striping, pavement markings and pavement markers conforming to the Provisions of Section 84, ″Traffic Stripes and Pavement Markings″, and Section 85, ″Pavement Markers″, of the State Specifications and as required by the Plans and the following Specifications.

2.02 THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS

Thermoplastic material and installation shall conform to the provisions of Section 84-2 of the State Specifications and the following Specifications.

Both white and yellow thermoplastic material shall contain reflective glass spheres, uniformly mixed throughout the material at the rate of not less than 400 pounds of beads per ton of material. Immediate reflectance shall be accomplished by surface application of beads at the time material is applied.

Existing markings shall be completely removed by sandblasting prior to installation of new material. Existing traffic buttons shall be covered and protected during sandblasting and warning signs shall be placed to warn all approaching traffic of the sandblasting. The sand shall be prevented from blowing and spreading and shall be swept up and removed at the end of each working day or sooner if directed by the Engineer.

The price paid for applying the thermoplastic material shall include full compensation for furnishing all labor, materials, tools, and equipment, involved in cleaning surfaces of existing pavements (including removal of debris, and existing paint or tape markings), hauling, and all incidental work connected therewith in furnishing the material complete in place.

2.03 PAINTED TRAFFIC STRIPES AND PAVEMENT MARKINGS

Painting traffic stripes and pavement markings shall conform to the provisions in Sections 84-1, ″General″, of the Standard Specifications and these Specifications.

The street surface shall be clean of dust, dirt, and debris prior to application of paint. If, in the opinion of the Engineer, the street is not clean, it shall be swept by a dry broom method prior to application of paint, at the expense of the Contractor.

Rapid Dry Acetone-Based Traffic Paint shall be used and painting shall be done in a neat and workmanlike manner. On new surfacing, pavement markings and traffic stripes shall be painted with two coats of paint. Paint shall be applied at the rate of 100 square feet per gallon at 15 mils wet. A minimum of ten (10) days shall elapse between the application of a seal coat and the first coat of paint. After completion of the first coat of paint, a minimum of ten (10) additional days shall elapse prior to the application of a final coat.

On existing surfacing, pavement markings and traffic stripes shall be applied in one coat.

The Contractor shall protect the fresh paint from disfigurement, wheel tracking or damage. All damaged paint shall be repaired by the Contractor at his expense. Wheel tracking of the paint shall be removed by the Contractor at his expense.

The following are specifications for Rapid Dry Acetone - Based Traffic Paint:

Pigment, % by weight	58.62
Vehicle, % by weight	38/42
Non-volatile, % by weight of paint, min.	70
Weight per gallon, lbs.	12.0-12.6
Viscosity, K.U.	70-85
Fineness of Grind, min.	4
Dry time: 7°F without beads ASTM Dl-711, Minutes, Max.	3-6
Dry time: Field normal temperature and Humidity, Minutes, Max.	3-6
Flexibility, 8 mils Wet, 24 Hrs. Air Dry 1/2″ Mandrel	No cracking
Contrast Ratio: 5 Mils Wet, Min. 15 Mils Wet, Min.	.96
Bleeding ASTM D-969, Min.	.90
Reflectance, Min.	85 for White, 50 for Yellow
VOC gms/liter, Max.	150

Coverage: 100 square feet per gallon at 15 Mils Wet.

Rapid dry water borne traffic paint may be used with written approval by City Engineer.

The contract price paid for painting traffic stripes and pavement markings shall be considered as full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in painting traffic stripes and pavement markings as shown on the Plans and the Standard Plans and as specified by the Standard Specifications and these Specifications, and no additional allowance shall be made therefor.

Payment for removal of existing striping and pavement markings shall be included in the payment for the installation of new striping and pavement markings and no separate payment will be made therefor.

2.04 PAVEMENT MARKERS

All work and materials shall conform to Provisions of Section 85, ″Pavement Markers″ of the State Specifications and these Specifications.

Pavement markers shall have the shape, dimensions and tolerance shown on the Standard Plan A-20A.

Pavement markers will be of the type shown on the Plans, on Standard Plan A-20A, or specified herein.

Non-reflective (Type A and AY) pavement markers shall be Class II or Class III, unless otherwise specified.

Reflective (Types B, C, D, G, and H) pavement markers shall be Ray-O-Lite, Cycolac, or approved equal.

A hot melt adhesive shall be used to cement the markers to the pavement instead of the Rapid Set Type or Standard Set Type adhesive specified in said Section 85-1.055 of the Standard Specifications. The bitumen adhesive material shall conform to the following:

Specification	ASTM Test Method	Requirement
Flash Point COC, °F.	D 92	550 Minimum
Softening Point, °F.	D 36	200 Minimum
Brookfield Viscosity, 400°F.	D 2196	7,500 cP, Max.
Penetration 100g, 5 sec, 77°F.	D 5	10 – 20 dmm
Filler Content % by weight (Insoluble in 1,1,1 Trichloroethane)	D 2371	50 – 75

Filler material shall be calcium carbonate and shall conform to the following fineness:

Sieve Size	Percent Passing
No. 100	100
No. 200	95
No. 325	75

Bitumen adhesive shall be indirectly heated in an applicator with continuous agitation. The adhesive shall be applied at a temperature between 400°F. and 425°F. Pavement markers shall be placed immediately after application of the adhesive.

Placement of pavement markers using bitumen adhesive shall conform to the requirements for placing markers in said Section 85-1.06 of the Standard Specifications, except as follows:

1. Markers shall not be placed when pavement or air temperature is 50°F. or less.

2. Blast cleaning of clean, new asphalt concrete surfaces will not be required.

The contract price paid for Pavement Marker installation shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing Pavement Markers complete in place as shown on the plans, as specified in the Standard Specifications and these Specifications and as directed by the Engineer.

3. TRAFFIC SIGNS AND STREET SIGNS

3.01 DESCRIPTION

This work shall consist of furnishing and installing roadside traffic signs in accordance with the provisions of Section 56-2 of the State Specifications and the following Specifications.

3.02 MOUNTING

Traffic signs shall be mounted on galvanized metal posts as specified in the Standard Plans, unless otherwise directed by the Engineer. Signs, mounting posts, and hardware shall conform with Section 56-2.01 through 56-2.04 of the State Specifications. Signs shall be punched for center mounting for signs of four foot width or less. Larger signs shall be mounted on two posts at four-foot spacing.

Street signs shall be mounted on galvanized metal posts as shown on the Standard Plans.

3.03 MATERIALS

All signs shall be of Scotchlite Engineer Grade reflective sheeting on 0.080-inch tempered aluminum (6061T6 alloy) sheeting with aluminum channel bracing along top and bottom back of signs. Metal posts exceeding 3 feet in length shall be 2 inch galvanized pipe, OR 2-3/8″ galvanized tubing. All signs shall have a border and rounded corners.

3.04 LAYOUT AND DESIGN OF SIGN MESSAGE

All traffic signs shall conform to the current requirements of the California Traffic Control Devices Committee, Uniform Sign Chart, and the CalTrans Traffic Manual, letter size, spacing and dimension of signs shall be as specified in CalTrans Traffic Manual. Stop signs and warning signs shall be 30 inch size Minimum.

3.05 PAINTING OF POSTS AND BACKS OF SIGNS

Paint shall conform to Section 91, ″Paint″, of the State Specifications except as amended or added to by these Specifications.

Metal posts and the backs of metal traffic signs shall be painted in the following manner:

1. Pre-treatment: Vinyl Wash (State Specification 8010-31A-27)
2. Prime Coat: Zinc Chromate (State Specification 701-80-51)
3. Intermediate Coat: Enamel, Exterior White, Metal (State Specification 701-80-10)
4. Finish Coat: Enamel, Exterior White, with beige tint as specified below, Metal (State Specification 701-80-10)

Prior to painting any surface it shall be cleaned and prepared. Any of the following methods may be used: hand cleaning, solvent cleaning, power tool cleaning, blast clean. All mill scale, rust, dirt, loose or chalky paint, deleterious matter, foreign material, oil, grease, salts, and cracked or peeled paint shall be removed.

All enamel for painting backs of signs and posts shall be tinted a beige color to match color No. 30179 of Federal Standard No. 959. The intermediate and finish coats shall have a total film thickness of at least 2 mils.

Painting shall be done in a neat and workmanlike manner. If fresh paint is damaged by the elements, it shall be removed and replaced at the Contractor′s expense. Any of the following will be evidence that the paint is unsatisfactory and the Contractor shall remove and replace it at his expense: lack of uniformity, inordinate amount of residual brush marks, stippled texture, skips, runs, sags and thin areas.

The Contractor shall protect all parts of his sign and the complete work area against staining and disfigurement from his painting operations. He shall be responsible for any damage caused by his operation to vehicles, persons, or property and shall provide at his expense protective means to guard against such damage.

All defects shall be corrected prior to placing the next coat. The surface of any paint coat shall be free of deleterious material before additional paint is applied.

Full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all work involved in preparing, priming and painting the back of signs and sign posts shall be considered as included in the prices paid for installing permanent signs, relocating signs, or installing City furnished signs.

3.06 EXISTING AND RELOCATED SIGNS

Existing signs shall be relocated as necessary and maintained by the Contractor during construction. Any existing signs damaged by the Contractor shall be replaced at no expense to the City. Relocated signs shall be installed on new posts conforming to the Specifications for new sign mounting.

3.07 PUBLIC CONVENIENCE SIGNS

Public convenience signs may be provided by the City for installation by the Contractor. Such signs shall be installed on metal posts in accordance with the Specifications for new sign mounting, or as otherwise directed by the Engineer. The value of all City furnished signs not returned to the Engineer in good condition shall be charged to the Contractor.

3.08 MEASUREMENT AND PAYMENT

All signs shall be measured by actual count for each installation. Permanent signs will be paid for at the contract unit price, which price shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals for purchasing and installing the permanent signs complete in place as specified.

Relocated signs will be paid for at the contract unit price which price shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals for relocating existing signs complete in place as specified.

Public convenience and detour signs will be paid for at the contract unit price per each to install City furnished signs, which price shall include full compensation for furnishing all labor, materials, tools, equipment, posts, and incidentals for installing City furnished detour signs complete in place as specified. The value of all detour signs not returned to the Engineer in good condition will be deducted from payment to the Contractor.

No payment will be made for moving signs attached to public convenience barricades.

SECTION X

WATER SYSTEMS

1.01 GENERAL

This work shall consist of furnishing and installing water mains and appurtenances as specified in these Specifications. All work is to be completed in accordance with these Specifications and the American Water Works Association Standards, latest edition. The American Water Works Association Standards shall govern in case of discrepancies.

1.02 PIPE MATERIALS

(A) Ductile Iron Pipe And Fittings

Ductile iron pipe will only be allowed in pipe sizes with diameters greater or equal to 18 inches and only upon approval of the City Engineer.

Ductile iron pipe shall be designed in accordance with the latest revisions of ANSI/AWWA C150/A21.50 for a minimum of 200 PSI (or project requirements, whichever is greater) rated working pressure of 100 PSI minimum surge allowance; 2 to 1 factor of safety on the sum of working pressure plus surge pressure.

Ductile iron pipe shall be manufactured in the U.S.A. in accordance with the latest revision of ANSI/AWWA C151/A21.51. Each pipe shall be subjected to a hydrostatic pressure test of at least 500 PSI at the point of manufacture. Documentary evidence of test results will be considered sufficient when pipe manufacturer furnishes a certificate indicating that the pipe has been subjected to and passed hydrostatic, load and chemical resistance tests conducted in accordance with approved methods.

Pipe shall have standard asphaltic coating on the exterior. Pipe shall also have a cement mortar lining on the interior in accordance with ANSI/AWWA C104/A21.4, of latest revision.

The class or nominal thickness, new weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer's mark, country where cast, year in which the pipe was produced, and the letters ″DI″ or ″Ductile″ shall be cast or stamped on the pipe.

All pipe shall be furnished with Push-on Type Joints, such as ″Tyton″ or ″Fastite.″ Joints shall be in accordance with ANSI/AWWA C111/A21.11, of latest revision, and be furnished complete with all necessary accessories.

Fittings shall be manufactured in the U.S.A. and be either ductile iron or gray iron. Ductile iron fittings shall conform to the latest revisions of either ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. Gray iron fittings shall be in accordance with ANSI/AWWA C110/A21.10, of latest revision. Fittings shall have a standard asphaltic coating on the exterior. Fittings shall also have a cement mortar lining on the interior in accordance with ANSI/AWWA C104/A21.4, of latest revision.

Fittings and accessories shall be furnished with either Mechanical or Push-on Type Joints in accordance with ANSI/AWWA C111/A21.11, of latest revision.

All pipe, fittings, and accessories shall be installed and tested in accordance with the latest revision of AWWA Standard C600. Newly installed ductile iron water mains shall be disinfected in accordance with the latest revision of AWWA Standard C651 prior to placing in service.

All pipe, fittings, and accessories shall be encased with 8 mil-thick polyethylene wrap in accordance with ANSI/AWWA Standard C105/A21.5.

(B) Polyvinyl Chloride Pressure Pipe (PVC) Blue in Color

Polyvinyl Chloride (PVC) water pipes 12 inches or smaller shall conform to the requirements of AWWA C-900 ″Poly vinyl chloride (PVC) Pressure Pipe.″ All class 150 pipe shall meet the requirements of DR18 and class 200 pipe shall meet the requirements of DR14.

Polyvinyl Chloride (PVC) water pipes larger than 12 inches in diameter shall conform to the requirements of AWWA C-905 ″Poly Vinyl Chloride (PVC) Pressure Pipe.″ All water pipes larger than 12 inches in diameter shall be minimum Class 200 pipe and shall meet the requirements of DR-21.

All pipe shall be suitable for use as a pressure conduit. Provisions must be made for expansion and contraction at each joint with an elastomeric ring. Rubber gaskets shall be factory installed and conform to ASTM F477. The bell section shall be designed to be at least as strong as the pipe wall. Sizes and dimensions shall be as listed in the ASTM Standard.

Standard laying lengths shall be 20 ft. (± 1″) for all sizes. At least 85% of the total footage of pipe of any class and size shall be furnished in standard lengths. The remaining 15% in random lengths. Random lengths will not be less than 10 ft. long. Each standard and random length of pipe shall be tested to four times the class pressure of the pipe for a minimum of 5 seconds. The integral bell shall be tested with the pipe.

The pipe stiffness using F/AY for PVC class water pipe is as follows:

CLASS	DR	F/AY
150	18	935
200	14	914

Randomly selected samples shall withstand without failure the pressure test described in ASTM D1599 including the bell and spigot joints.

Pipe shall withstand the impact test described in ASTM D2444 with no visible evidence of shattering or splitting after impact.

(C) Couplings

Pipe couplings shall be Ring-Tite or Fluid-Tite; manufacturing shall conform to AWWA Standard C400-077, Latest Edition.

(D) Fittings

All fittings used are to be cast iron AWWA Class 150, Ring-Tite or Fluid-Tite, or flanged City approved equal. A plug fitting with coupling shall be used at the end of lines and on unused ends of all fittings to plug the line or fitting.

(E) Valves

All main line gate valves shall equal or exceed AWWA Standard C500-71 with a minimum of 175 PSI working pressure and 300 PSI test pressure.

These valves are approved for service within the City of Hanford:

6 in. thru 10 in.	12 in. and over
Waterous Series 500 Mueller A-2380-24 Mueller A-2370-26 M. & H. 67 RT, O-Ring Clow F-5082 Kennedy 573X or approved equal	Waterous Series 500 Mueller A-2370-26 or approved equal

(F) Valve Boxes

Valve box risers shall consist of *a full depth* 12″ I.D. PVC pipe and be installed during backfilling procedure. *No splicing will be allowed unless done with bell joint*. The riser shall be supported on 2″ X 4″s, and shall extend to a point above the top of curb until being set at final grade prior to paving.

Valve box covers shall have the word ″Water″ for domestic main valves, and ″Fire″ for fire hydrant and fire main valves, cast into the lid.

A Christy ″G8″ traffic valve box or approved equal shall be installed over the 12″ riser and set to finish grade with a 6″ wide X 8″ deep circular, lamp black, concrete collar.

(G) Fire Hydrants

All new hydrants shall equal or exceed AWWA Standard C503-75. New fire hydrant assemblies shall consist of furnishing and installing new pipe, fittings, valve, hydrant bury, riser, breakoff spool mounted with breakaway bolts, hydrant, gaskets and thrust block as per City Standards.

These fire hydrants are approved for service within the City of Hanford:

RESIDENTIAL USE:	COMMERCIAL USE:
With 1 – 2 1/2″ Hose Outlet And 1 – 4 1/2″ Steamer Outlet James Jones J3740 ~~Clow Series 2000, Style 75 ½~~ American AVK High Pressure Wet Barrel, Series 2470	With 2 – 2 ½″Hose Outlet And 1 – 4 ½″ Steamer Outlet James Jones 3760 ~~Clow Series 2000, Style 76~~ American AVK High Pressure Wet Barrel, Series 2470

Hydrants shall be set so that the bottom flange on the hydrant will be 2″ above the finished sidewalk grade.

Relocation of existing fire hydrants shall include furnishing and installing new pipe, fittings, valve, hydrant bury and breakoff spool mounted, with breakaway bolts as shown on the standards for new hydrants except that the existing hydrant will be re-attached to the new bury and breakoff spool. See Standards sheet for details.

(H) Jointing of Fittings

On Valves and fittings, the joints shall be Ring-Tite or Fluid-Tite, or approved mechanical joint. After the pipe is placed in the trench, the bell and spigot shall be thoroughly cleaned of all dirt, mud, or grease before being placed in final position. Each pipe must be set fully home. Jointing new pipe to old fittings will be accomplished by use of bell joint clamps. All fittings shall be blocked with concrete as directed by the Engineer. Thrust blocks are to be of sufficient size and design to prevent damaging movement of the main under testing pressure as outlined in these Specifications. Concrete for thrust blocks shall be Class B (5 sack mix).

1.03 PIPE HANDLING

The pipe shall be handled with care and shall be rolled or lifted whether by hand, rope or mechanical equipment.

1.04 SERVICE CONNECTIONS AND REPLACEMENTS

The Contractor shall reconnect all existing water services to the new mains with like material and all existing iron pipe services shall be replaced to the property line with Type K Soft Tubing, and underground fittings used for services shall conform to AWWA Standard C800-66. Direct tapping of AC Main ~~shall be done with an approved machine, approved by pipe manufacturer~~. *will not be allowed without prior permission from the City Engineer*.

Service fittings shall be Mueller, James Jones, Hayes, Kennedy, Nibco, McDonald or City approved equal, and of the typical style and design listed below:

Curb Stops: Ford 1″ - KVT-3w, Ford 2″ - FV-43-777, James Jones 1″ - J4201, James Jones 2″ - J4205, or approved equal.

Corporation Stops: Ford 1″ - F-1000, Ford 1 1/2″ X 2″ (Used on 2″ services) FB-800 with C14-77, James Jones 1″ - J3401, James Jones 1 1/2″ X 2″ (Used on 2″ services) J-1937, or approved equal.

3″ Bronze Gate Valve: *C-500 Resilient wedge w/2″ operation nut.* ~~Kennedy Fig. 427 with steel handwheel, also Stockham, Red & White, or approved equal.~~

Plastic Pipe Materials (1″ through 2″ diameter)

Description: Pipe shall be manufactured from high molecular weight polyethylene base resin with a minimum density of .941 MG/M^3 as defined by ASTM D2737 as PE-3408. Pipe shall be made of plastic having a cell classification of 334434-C and shall conform to AWWA Specification C901-88.

Marking: Pipe shall be printed with manufacturer's brand name, pipe size, commercial standard, identification of the National Sanitation Foundation approval, recommended working pressure and production code. Letters shall be at least 1/2 inch in height and repeated on the pipe at intervals no less than 24 inches.

Dimensions: Pipe Dimensions and tolerance shall correspond with the values listed in ASTM D2737 for polyethylene (PE) plastic tubing with a standard dimension ratio (SDR) of 9.0 I.D. (CTS).

Working Pressure: Pipe shall have working pressure of 160 PSI @ 73.4°F.

Testing: Pipe must be capable of maintaining pressures of 300 PSI @ 73.4°F.

Workmanship: Pipe surfaces shall be smooth, and shall be free from bumps and irregularities.

All service replacements and reconnections shall be one (1) inch or larger in size unless otherwise directed by the Engineer. Connect to house lines at the meter or curb stop with galvanized bushing, nipple and compression coupling. Connect to the main using above listed corporation stop and compression coupling. Ford C44-34 for 3/4″ to 1″ connections, or C44-44 for 1″ to 1″ connections, James Jones J-2609 series or other City approved equal. Boring for services under curb, gutter and sidewalk will be required. All saddles shall be bronze, double strap. Existing mains will not be tapped with an industry approved machine for all replacement and added services and mains unless noted otherwise.

All service replacements that cross the street shall be bored under the street section as directed by the Engineer.

1.05 INTERRUPTION OF SERVICE

No existing service at any location (including domestic water or fire main system) shall be removed from service until such time as the new relocated replacement facility is in place and in operating condition unless authorized by the Engineer in writing. Contractor will be responsible to provide continuous service to all professional offices, laboratories, hospitals, beauty shops, and businesses requiring a constant water supply as the project proceeds to remove existing services and mains from active service to the customer.

1.06 EXCAVATION

The trenches for water main in construction shall be excavated to line and given grade, always having uniform gradient between grade stakes. After excavating in paved areas the Contractor shall saw cut along the excavation limit lines deeply enough to prevent pavement tearing or cracking. Allowances shall be made in excavation for the coupling such that the pipe has continuous uniform support, and the coupling does not rest on the original trench bottom. Should the Contractor excavate to a depth in excess of 4″ below the established gradient line he shall be required to fill to grade with good material, mechanically tamped to the satisfaction of the Inspector. Trenches shall always be excavated equal to, or in excess of, the minimum according to the General Standards Sheet. The trench width at the ground surface may vary and depends upon its depth and the nature of the ground encountered. The minimum clear width of unsheeted or sheared trench measured at the horizontal diameter of the pipe shall be one (1) foot greater than the outside diameter of the barrel of the pipe. The maximum of the pipe shall be permitted only on written approval of the Engineer. If non-compacted fill is encountered, either the material so encountered shall be compacted to the satisfaction of the Engineer, or loose granular material may be imported and compacted in the trench to form a stable base. All extremely soft or spongy earth below subgrade, not to exceed a depth of two (2) feet, shall be removed by the Contractor and replaced with screened gravel which shall be tamped until solid.

The excavations shall include the removal of all earth and material of any nature which may be encountered in digging trenches or excavations for any structure. Road surface material must be separated from earth or soil and must be removed from the site. The Contractor shall notify the Engineer at least forty-eight hours before he is to start any excavation. Contractor shall saw cut concrete alley approaches and driveways.

(A) Repair of Damaged Sewer Lines

The Contractor shall replace full lengths of damaged pipe and repair all damaged pipe joints such that the replaced sections and new or repaired pipe joints are leakproof. Replaced lengths of sewer pipe shall be ″bedded″ in a sand slurry mix of one sack cement per cubic yard poured from bottom or original cut to springline of sewer laterals crossing over water main but no slurry shall support water main. Pour shall be one foot minimum width. New joint assemblies shall be made with no hub vinyl type coupling fastened with stainless steel clamps.

1.07 INSTALLATION OF WATER PIPE

Pipe less than 12″ in diameter shall be laid in trenches at depths to allow a minimum of 36″ cover above the pipe. Twelve inch diameter pipe shall have a minimum cover of 42″. The location of the subsurface obstructions found in the field may necessitate a variance in the depth of the pipe,

which depth shall be determined in the field by the Engineer. Whenever it is necessary to deflect the pipe from a straight line either in the vertical or horizontal plane to avoid obstructions or to connect to existing mains, the degree of deflection at joints shall be approved by the Engineer.

On completion of the field assembly of the coupling, the pipe ends within the coupling shall be separated by at least 1/4″ - 1/2″ of free travel to allow for expansion. Other requirements than this shall follow installation handbook published by manufacturer of pipe.

All mains shall be installed as per the requirements of the State of California Department of Health, ″Required Separation Between Water Mains and Sanitary Sewers″, (Current Edition).

(A) Connecting To Existing Mains

Method of connecting new mains to existing facilities shall be determined by the Contractor, subject to approval of the Engineer. Standard accepted methods include the use of Ring-Tite or Fluid-Tite fittings, mechanical joint fittings, or heavy duty flexible couplings. The use of steel flexible couplings shall be confined to connections involving existing steel pipe. Flexible couplings used to connect all except steel pipe shall be cast iron with ductible iron bolts. Connections to existing asbestos cement pipe shall be performed with the use of like materials, if possible. Abandoned main to be plugged with concrete where cut. No galvanized fittings will be used on cast iron main connections. All fittings used for main line interconnection and tie-ins must be swabbed with a chlorine solution of 50 ppm in conformance with Section X(3.09) of these Specifications.

(B) Installation of Corporation Stops

See manufacturer′s installation guide and City Standard Drawings WA-11 and WA-14.

1.08 BACKFILLING

Backfilling is not to be started until after the laid and jointed pipe has been inspected by the Inspector. The backfill to a depth of one foot over the pipe shall consist of only loose granular material and shall be deposited manually. All backfill material up to the springline of the pipe shall be hydraulically tamped.

Particles of backfill material for any portion of the trench shall not exceed three inches in diameter or three inches in length. All layers within 2 ft. of the surface shall be compacted to a relative compactness of 95% of maximum density as determined by Test Method No. 216 Relative Compaction shall be determined in accordance with Test Method No. California 216 and/or Test Method No. California 231. A sand cone verification test will be required for each set of nuclear method tests performed at intervals as determined by the Engineer. All successive lower layers of backfill down to within one foot of the top of the pipe shall be compacted to a relative compactness of at least 90% according to the said No. 216 test and be free of soft or spongy areas. The initial compaction tests will be paid for by the City of Hanford, but in the event the tests do not meet the minimum standards as set out above, the Contractor shall be responsible for payment of any further testing required. The use of a hydra-hammer shall be restricted to areas at least 2 ft. in horizontal distance away from any sewer lines which are less than 10 ft. in depth. The use of a motor patrol or

other heavy vehicles shall not be permitted in compacting over shallow sewer lines (those with less than 3 ft. of cover).

1.09 CHLORINATION, STERILIZATION, AND FLUSHING OF PIPES

All pipes shall be disinfected according to the AWWA Standard Specification C601-81 before being placed in service. All new water mains, main extensions, and other portions of water transmission and distribution system for domestic water only shall be cleaned and sterilized, and water passing through shall be proven safe by bacteriological test and acceptable to the Department of Public Health, County of Kings or other approved testing laboratories. Water samples will be taken by City agents and the costs of such initial tests will be paid for by the City. In case of failure, two negative tests at 48-hour intervals will be required. In the event the initial tests do not meet the acceptable standards as set forth by the Kings County Health Department, the Contractor shall be responsible for payment of any further testing required. The City of Hanford will arrange for all tests.

Water for flushing and sterilization will be supplied by the City. The Contractor shall furnish all required materials and apparatus at his sole expense and shall perform the work of sterilization under supervision and as directed by the Engineer, and no additional compensation shall be allowed therefor.

The pipe shall be sterilized by the introduction of liquid chlorine or calcium hypochlorite (commercial ″HTH″, ″Perchloron″, ″Maxochlor″, or ″Pittchlor″) of known chlorine content (65% available chlorine by weight) in tablet form. The dosage of chlorinating agent shall be such as to produce a chlorine residual of fifty (50) parts of chlorine per million (ppm).

There shall be a minimum of 50 ppm residual chlorine after 24 hours. Tablets shall be glued inside and at the top of each joint of pipe by means of a non-toxic material. Permatex #1 is an approved material. Generally, tablets are used on the basis of two (2) tablets per joint for 4″, three (3) tablets per joint for 6″ pipe, four (4) tablets per joint for 8″ and five (5) tablets per joint for 12″ lines. Lines shall be flushed and be bacteriologically safe before service connections are made. Granulated chlorine or a 50 ppm solution shall be used to treat couplings and rings in addition to the tablets used in the pipe.

All valves shall be operated from fully open to fully closed during the 24-hour period of sterilization.

1.10 TESTING MAINS

The system shall be subjected to a test pressure of 125 PSI and after two hours the leakage shall not exceed ~~.130 gallons per inch diameter per 24 hours per joint~~. *± 5 PSI (34.5 Kpa)*. Any visible leaks shall be repaired.

Test shall not be made until the backfilled trench has been compacted and until 24 hours after pipe has been held completely full of water under operating pressures. Ends of laterals must be temporarily blocked during the test.

Any leaks, failures, or imperfect construction developing under such test shall be promptly corrected by the Contractor at his sole cost and expense.

All testing shall be done in the presence of the Engineer after 24 hours prior notice of testing given by the Contractor. All equipment for testing will be furnished by the Contractor.

1.11 TESTING BACKFLOW PREVENTOR

Prior to acceptance and placing in service backflow prevention systems, Contractor shall be required to test apparatus to ensure proper operation of system. Test work shall be performed by a certified backflow tester in accordance with American Water Works Association (AWWA) Standards.

Prior to testing of backflow preventor systems Contractor shall contact the Engineer to coordinate inspection of system.

Test reports shall be submitted in writing to the Engineer prior to placing system in service. Contractor shall be responsible for coordinating testing of system and payment of all costs associated therewith.

1.12 RESTORATION OF SURFACING

Existing paving shall be saw cut to neat lines and edges cleaned and primed before repaving commences. After compaction of the asphalt the final surface shall be one-quarter (1/4) inch higher than the undisturbed adjoining surface. The entire cost of pavement replacement and repair regardless of the trench width incurred during pipe installation will be borne by the Contractor. The Contractor shall guarantee and maintain the resurfacing and the backfilled trenches for a period of one (1) year from the date of final acceptance.

Asphalt concrete shall conform to the provisions in Section 39 ″Asphalt Concrete″ of the State Specifications except as modified in Section V, Sub-Section 1 of these Specifications.

Unless otherwise specified in the Plans or in the Special Provisions, asphalt concrete shall be Type ″B.″

1.13 RETURN OF MATERIALS

Contractor shall return all salvageable water system materials (owned by City) to City of Hanford Corporation Yard. Said materials shall include water valves, tees, blowoffs and other materials that are deemed reusable by the Engineer.

1.14 MEASUREMENT AND PAYMENT

Quantities of water pipe will be measured by the linear foot along the centerline of the pipe from end of pipe to end of pipe. Water pipe shall be paid for at the contract price per linear foot for each size, type, class, which prices shall include full compensation for furnishing all labor, materials, tools, equipment and doing all excavation, bedding, backfill, compaction, cleaning, testing, flushing and sanitation, and paving in place complete as specified.

The unit price for installing new services and reconnecting existing services shall include materials and labor, including excavation, backfill, and re-surfacing and no additional compensation will be allowed.

On new hydrant installations, relocation and reconnections the cost of the materials and installation shall be bid lump sum with the exception that the pipe run between the bury and main shall be included in the Estimated Quantities for 6″ water pipe and will be paid at the unit price therefor.