

Oasis On The Sun

STANDARD SPECIFICATIONS & DRAWAINGS

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GENERAL PROVISIONS

SECTION 1 - PROPOSAL REQUIREMENTS

1.01 GENERAL INFORMATION

The City Clerk of the City of Avenal, California, will receive at the City Hall, in said City, until the hour and day specified in the "Notice Inviting Bids", sealed proposals for furnishing material, supplies, equipment and labor for performing the work as specified in the Plans and Specifications.

1.02 FORM OF PROPOSAL

All proposals must give the unit price where indicated, or lump sum where unit prices are not called for, for each of the items and must be signed by the bidder with his address. If the proposal is made by an individual, his name and post office address must be shown. If made by a partnership, the name and post office address of each member of the firm or partnership must be shown. If made by a corporation, the proposal must show the name of the state under the laws of which the corporation was chartered and the names, titles, and business addresses of the president, secretary, and treasurer.

All proposals must be submitted under sealed cover.

1.03 WITHDRAWAL OF PROPOSALS

Any bid may be withdrawn at any time prior to the time fixed in the public notice for the opening of bids, but only upon filing with the City Clerk a written request of the withdrawal. The request shall be executed by the bidder or his duly authorized representative. The withdrawal of a bid does not prejudice the right of the bidder to file a new bid. A bid will not be received, and no bid may be withdrawn after the time fixed in the public notice for the opening of bids.

1.04 PROPOSAL GUARANTEE

All proposals must be accompanied by either a cashier's check, certified check or bidder's bond of a corporate surety authorized to do business in the State of California and acceptable to the City in a sum equal to at least 10 percent of the total amount of the bid. Checks or bonds must be payable to the City of Avenal; such securities will be retained by the City as a guarantee that the bidder, if his bid is accepted, will enter into a satisfactory Contract within ten (10) calendar days, not including

Sundays, from the date notice of award is mailed to the bidder, and will furnish a good and sufficient bond for the faithful performance thereof and for the payment of labor and material costs in accordance with the requirements of Subsection 1.06 herein.

1.05 RETURN OF GUARANTEES

All proposal guarantees will be held until the Contract has been awarded, after which the guarantees accompanying proposals no longer considered in making the award will be returned to the bidder whose proposal they accompanied. Retained proposal guarantees will be held until the Contract has been executed, after which all guarantees will be returned, except those forfeited as required in Subsection 1.09 herein.

1.06 REQUIRED CONTRACT SECURITIES

The bidder to whom the Contract has been awarded will be required to furnish a labor and material bond in an amount equal to 50 percent of the Contract price, and a faithful performance bond in an amount equal to 100 percent of the Contract price; said bonds shall be secured from a surety company satisfactory to the City, and are to be submitted to the Engineer with the executed Contract.

1.07 REJECTION OF PROPOSAL

The City reserves the right to reject any or all proposals.

Proposals may be rejected if they show any alteration of form, additions not called for, conditional or alternative bids, incomplete bids, erasures, or irregularities of any kind. Proposals in which the prices are obviously unbalanced may be rejected.

More than one proposal from an individual, a firm or partnership, a corporation or an association under the same or different names, will not be considered. Reasonable grounds for believing that any bidder is interested in more than one proposal for the work contemplated may cause the rejection of all proposals in which such bidder is interested.

1.08 AWARD OF CONTRACT

The award of the Contract, if it is awarded, will be to the lowest responsible bidder whose proposal complies with all the requirements described. Unless set forth otherwise in the Special Provisions, such award, if made, will be made within thirty (30) calendar days after the opening of the proposals. If the lowest responsible bidder refuses or fails to execute the Contract, the City may award the Contract to the second lowest responsible bidder. Such award, if made, will be made within forty-five (45) calendar days after the opening of the proposals. If the second lowest responsible bidder refuses or fails to execute the Contract,

the City may award the Contract to the third lowest responsible bidder. Such award, if made, will be made within sixty (60) calendar days after the opening of the proposals. The periods of time specified above, within which the award of Contract may be made, shall be subject to extension for such further periods as may be agreed upon in writing between the City and Bidder concerned.

All bids will be compared on the basis of the Engineer's estimate of quantities of work to be done.

1.09 EXECUTION OF CONTRACT

The Contract shall be signed by the successful bidder and returned together with the Contract bonds required in these Standard Specifications within ten (10) calendar days, not including Sundays, after the bidder has received notice that the Contract has been awarded. No proposal shall be considered binding upon the City until execution of the Contract by all parties, including the City.

Failure to execute a Contract and file acceptable bonds as provided herein within ten (10) calendar days after the bidder has received notice that the Contract has been awarded, shall be just cause for the annulment of the award and the forfeiture of the proposal guarantee as liquidated damages. The Contractor shall submit to the Engineer along with the executed Contract, the sureties required in Subsection 1.06 and the insurance certificates required in Subsection 7.03 of these Specifications.

1.10 EXAMINATION OF SITE OF WORK, PLANS, SPECIFICATIONS AND CONTRACT FORMS

The bidder is required to examine carefully the site of the proposed work, the proposal, Plans, Specifications and Contract forms for the work contemplated, 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 the work to be performed and materials to be furnished, and as to the requirements of the Plans, Specifications, and the Contract. The submission of a proposal shall be considered prima facie evidence that the bidder has made such examination.

Prospective bidders must satisfy themselves, by such means as they prefer, as to local conditions and all other matters which influence their bid for the work. The City or Engineer shall not be liable on account of any obstructions of any nature, unforeseen difficulties in construction, or unreliable information from any source.

1.11 MATERIAL STATEMENT, SAMPLES AND GUARANTEES

Before any Contract is awarded, the bidder may be required to furnish a complete statement of the origin, composition, and manufacturer of any or all materials to be used in the construction of the work together with samples which may be subjected to the tests provided for in these Specifications to determine their quality and fitness for the work.

Reference is made to Subsections 5.08 and 7.24 of these Specifications, wherein the Contractor is required to guarantee all materials, equipment and workmanship for a period of one year from the date of the filing of the Notice of Completion. The bidder may also be required to furnish a written guarantee covering certain items of work for varying periods of time from the date of the filing of said Notice. When such guarantee is required, the form and the time limit of the guarantee shall be as specified in the Specifications. Said guarantee shall be signed and delivered to the Engineer before acceptance of the Contract. The labor and materials bond shall not be reduced until the expiration of the time required by Section 4205 of the Government Code.

1.12 QUANTITIES

The estimates of the quantities of work to be done and materials to be furnished given in the Notice Inviting Bids, Bid Proposal and in the Specifications are approximate only, being given as a basis for the comparison of bids, and the City does not expressly or by implication agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or portion of the work or to omit portions of the work that may be deemed necessary or expedient by the Engineer.

No upward adjustment in unit price will be allowed, nor any additional compensation of any kind will be paid, in the event of any increase or decrease of any Contract item, regardless of the amount of such increase or decrease, including complete deletion of any item.

1.13 UNIT PRICES

Excepting the items for which lump sum prices are required, the unit prices inserted in the bid form by the bidder will be considered to be the bid prices for the various work performed. In case of a discrepancy between the unit price bid and the calculated total, the unit price shall govern.

1.14 DEFINITIONS

Whenever the word "City" is used herein, it shall be held to mean the City of Avenal, California, acting as a municipal corporation and/or a trustee for improvement districts within the City.

Whenever the word "Contractor" is used herein, it shall be held to mean the party or parties of the second part in the agreement for the construction of the work herein specified.

Whenever the word "Engineer" or "Inspector" is used herein, it shall be held to refer to person or persons duly appointed by authority of the City for the duties imposed in connection with the work herein specified to be done.

Whenever the word "Laboratory" is used herein, it shall be held to mean any recognized commercial testing laboratory designated by the City of Avenal to test materials and work involved in the Contract.

Whenever the word "Permittee" is used herein, it shall be held to mean the person or persons, copartnership or corporation, private or public, who has obtained a permit from the City of Avenal and agreed to do work encompassed by said permit in conformance with the requirements thereof.

Whenever the words "Special Provisions" are used herein, they shall be held to mean the specific clauses setting forth conditions or requirements peculiar to the work and supplemental to these Standard Specifications.

Whenever the word "Specifications" is used herein, it shall be held to mean the directions, provisions and requirements contained in these Standard Specifications and as supplemented by the Special Provisions.

Whenever the words "Standard Drawings" are used herein, they shall be held to mean the Standard Drawings of the City of Avenal.

Reference is made to Subsection 3.08 of these Specifications for additional definitions and terms as set forth in Section 1 of the "State of California, Department of Transportation, Standard Specifications", latest revision. Said Section 1 of the State Standard Specifications, as modified by Subsection 3.08 of these Specifications, is hereby incorporated into these Specifications.

1.15 DESIGNATION OF SUBCONTRACTORS

In compliance with Sections 4100-4113 of the Government Code, the Contractor shall file with his bid the name and address of each subcontractor who will perform more than one-half of one percent (1/2%) of the work. Only one subcontractor shall be listed for

each portion of the work, which portion shall be defined as to its nature and extent. The failure of the Contractor to specify a subcontractor shall constitute a statement that the Contractor is qualified and intends to perform said work himself.

The Contractor must have the consent of the City and approval of the Engineer, in writing, to substitute a subcontractor other than that designated in the original bid, to permit any subcontract to be assigned or transferred, to allow a subcontract to be performed by other than the original subcontractor, or to subcontract work for which no subcontractor was designated in the original bid and which is more than one-half of one percent (1/2%) of the work.

Violation of any of the above provisions will be considered a violation of the Contract, and cause for ordering any unapproved subcontractor from the work site. Reference is made to Subsection 8.08 for additional regulations regarding subcontractors.

SECTION 2 - GENERAL SCOPE OF WORK

2.01 WORK TO BE DONE

The work to be performed under the Contract consists of furnishing all materials, equipment, supplies, labor and transportation, and performing all work as required by the Contract in strict accordance with the Specifications, schedules and drawings, all of which are made a part hereof. The work shall be complete, including all work, material and services not expressly called for in the Specifications, or not shown on the drawings, which may be necessary for completion and proper construction to carry out the Contract in good faith. The site of work shall be left in a neat condition. The cost of all work performed, furnished and installed is to be included in the amount bid for the various items of work with no separate compensation allowed therefor.

2.02 ALTERATIONS

Reference is made to Subsection 1.12 of these Specifications.

The City of Avenal reserves the right to increase or decrease the quantity of any item or portion of the work, or to omit portions of the work as may be deemed necessary or advisable by the Engineer; also, to make such alterations or deviations, additions to, or omissions from, the Plans and Specifications, as may be determined during the progress of the work to be necessary and advisable for the completion thereof.

Upon written order of the Engineer, the Contractor shall proceed with the work as increased, decreased or altered.

2.03 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.

Unless otherwise specifically indicated in the Plans or Specifications, any work or responsibility of the Contractor set forth in the Specifications or on the Plans and not set forth as a separate bid item shall be considered incidental or appurtenant to the work and full compensation for the cost thereof included in the various bid items of work. Such work or responsibility will in no case be considered as extra work.

When work is classified as extra work by the Engineer, 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.

Extra work, when ordered and accepted as indicated herein, shall be paid for in accordance with the terms therein provided. Reference is made to Subsection 9.10 of these Specifications.

2.04 CLAIMS

If the Contractor deems that additional compensation will be due him for work or material not clearly covered in the Contract, or not ordered as extra work as defined herein, he shall notify the Engineer in writing of his intention to make claim for such additional compensation before he begins the work on which he bases the claim. If such notification is not given, the Engineer is not afforded the opportunity or proper facilities for keeping strict account of the actual cost as required; therefore, the Contractor shall make no claim for such compensation, and if made, any such claim will be denied by the Engineer.

Reference is made to Subsection 4.01 relating to the authority of the Engineer in resolving claims.

2.05 REMOVAL OF OBSTRUCTIONS

The Contractor shall remove and dispose of all structures, debris, or other obstructions of any character designated in the Plans and Specifications, or as directed by the Engineer, in the construction of the proposed improvements. The Contractor shall also remove and dispose of all trees or other vegetable growth designated by the Plans and Specifications or the Engineer as obstructions to the proper completion of the work.

Unless specifically set forth as a separate bid item, full compensation for all costs involved in the removal and disposal of obstructions shall be included in the amounts bid for the various items of work and no separate payment shall be made therefor.

2.06 CLEANUP

During the construction of the project, the Contractor shall provide periodic cleanup as the work progresses, such cleanup to be accomplished as soon as practicable and as public necessity and convenience require, as determined by the Engineer. In general, daily interim cleanup will be required.

When construction is completed, and prior to application for acceptance of the work, the Contractor shall clean all work areas and all grounds occupied by him in connection with the work of all debris, excess materials, temporary structures and equipment. All portions of the work shall be left in a neat, presentable condition. The roadways in which construction operations have been accomplished, as well as all haul roads upon which spillage has occurred, shall be swept clean, as directed by the Engineer. Roads adjacent to construction activity which have received dirt or debris tracked from the construction area shall also be swept and cleaned.

Full compensation for cleanup during construction and for final cleanup shall be included in the prices bid for the various items of work, and no separate payment will be made therefor.

SECTION 3 - PLANS AND SPECIFICATIONS

3.01 GENERAL

The Plans, Specifications and other Contract documents will govern the work. Anything in the Specifications and not on the Plans, or on the Plans and not in the Specifications, shall be as though shown or mentioned in both.

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

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

No test, investigation, statement or estimate of a factual situation not incorporated in the Contract shall be relied on by the Contractor. Any test, investigation statement or estimate of fact incorporated in the Contract shall be considered by the Contractor to be a suggestion only and he shall request equal access to the underlying or background informative material or source and shall arrive at his own opinion thereon, including his determination of how reliable might be any conclusion appearing in (or inferred from) the Contract.

In general, the drawings will indicate dimensions, position and kind of construction, and the written Specifications will indicate qualities and methods. Any work indicated on the drawings and not mentioned in the written Specifications, or vice versa, shall be furnished as though fully set forth in both. Work not particularly detailed, marked or specified, shall be as similar parts that are detailed, marked or specified.

All alterations authorized by the Engineer which affect the requirements and information given on the approved plans shall be in writing. No changes shall be made in any plan or drawing after the same has been approved by the Engineer, except by direction of the Engineer.

If the Contractor, during the course of the work, discovers any discrepancies between the Plans and the conditions in the field, or any errors or omissions on the Plans which will significantly affect the work, it shall be his duty to inform the Engineer immediately in writing, and the Engineer shall

promptly verify the same. Any work done after such discovery, until authorized, will be done at the Contractor's risk.

3.02 COORDINATION AND PRECEDENCE OF PLANS AND SPECIFICATIONS

These 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.

The order of precedence of documents which make up the Contract shall be as follows:

1. The Agreement
2. Permits from other agencies as may be required by law
3. Special Provisions
4. Construction Plans
5. Technical Provisions of these Standard Specifications
6. Standard Drawings
7. General Provisions of these Standard Specifications
8. State (Caltrans) Standard Specifications

Change orders, supplemental agreements and approved revisions to the Plans and Specifications will take precedence over documents listed above. Detailed plans shall have precedence over general plans.

Dimensions called out on the Plans shall control and supersede scaled dimensions. No scaled dimension shall be used in the execution of the work.

Whenever any conflict appears in any portions of the Contract, it shall be resolved by application of the order of precedence, unless the Engineer shall otherwise order.

3.03 INTERPRETATIONS

Should it appear that the work to be done, or any matter relative thereto, is not sufficiently detailed or explained in these Specifications, on the Plans and in 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 City Engineer, whose decision thereon shall be final.

3.04 WORKING DRAWINGS

When working drawings or shop drawings are required by the Specifications or requested by the Engineer, they shall be prepared in accordance with modern engineering practice at the Contractor's expense. Unless otherwise specified, shop or working drawings shall be submitted in quadruplicate to the Engineer for approval or correction at least fifteen (15) calendar days before approved drawings will be required for the work. One set will be returned to the Contractor marked "approved" or "approved as corrected". If changes are required, 4 copies of corrected shop or working drawings shall be delivered to the Engineer.

Shop or working drawings shall be of a size and scale to clearly show all necessary details.

For items requiring shop drawings, no materials shall be furnished or work done before approval of the drawings.

Approval of shop or working drawings by the Engineer is interpreted to mean that there is substantial and acceptable conformance with the Contract Plans, but details of design may not necessarily be checked for adequacy or accuracy. Such approval shall not relieve the Contractor from the responsibility for errors or omissions in the drawings or from deviations from the Contract documents unless such errors, omissions, or deviations were specifically called to the attention of the Engineer. The Contractor shall be responsible for the correctness of the shop or working drawings, for shop fits and field connections, and for the results obtained by use of such plans.

In the event of discrepancy between the scaled dimension on any drawing and the figures written thereon, the figures shall be taken as correct, except as otherwise determined by the Engineer.

3.05 CONFORMITY WITH PLANS AND ALLOWABLE DEVIATIONS

Finished surfaces (the completed final surface of earth, concrete, pavement or other material, or the completed top of a layer of subgrade, base or surfacing) in all cases shall conform with the lines, grades, cross sections, and dimensions shown on the approved plans. Where tolerances are indicated in the Specifications, the work shall be constructed within said tolerances. Deviations from the approved plans, as may be required by the exigencies of construction, will be determined in all cases by the Engineer and only authorized in writing.

3.06 EXISTING STRUCTURES SHOWN ON PLANS

Where underground and surface structures are shown on the Plans, the locations, depth and dimensions of such structures are believed to be reasonably correct, but are not guaranteed. Such structures are shown for the information of the Contractor, but information so given is not to be construed as a representation that such structures will, in all cases, be found or encountered just where shown, or that they represent all the structures which may be encountered.

3.07 OMISSIONS IN PLANS AND SPECIFICATIONS

Omissions from the Plans or the Specifications of the materials or details of work which are manifestly or obviously necessary to carry out the intent of the Plans and Specifications, or which are customarily furnished or performed, shall not relieve the Contractor of his responsibility for furnishing such omitted materials or performing such omitted work, but shall be furnished or performed as if fully shown or described in the Plans or Specifications.

Any materials or work mentioned in the Specifications and not shown on the Plans or shown on the Plans and not mentioned in the Specifications shall be of the same effect as if shown or mentioned in both.

3.08 INCORPORATION OF REFERENCED PROVISIONS OF STATE STANDARD SPECIFICATIONS

The work embraced herein, where referenced thereto, shall be done in accordance with the provisions of the specified portions of Sections 1 through 95 of the Specifications entitled "State of California, Department of Transportation, Standard Specifications," latest revision, which Specifications are hereinafter referred to as the State Standard Specifications, and in accordance with the following provisions:

Whenever in the State Standard Specifications, the following terms are used, they shall be understood to mean and refer to the following:

Department of Transportation, or Department - Public Works Department of the City of Avenal.

Director - Director of Public Works, City of Avenal.

Engineer - The City Engineer, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

Laboratory - The recognized commercial testing laboratory designated by the City of Avenal to test materials and work involved in the Contract.

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

State - The City of Avenal.

Other terms appearing in the State Standard Specifications, and these Specifications, shall have the intent and meaning specified in Section 1, Definition and Terms of the State Standard Specifications, and as set forth in Subsection 1.14 of these Avenal Standard Specifications.

In case of conflict between the State Standard Specifications and these Specifications, these Specifications (Avenal Standard Specifications) shall take precedence over and be used in lieu of such conflicting portions in the State Standard Specifications.

SECTION 4 - CONTROL OF WORK

4.01 AUTHORITY OF THE ENGINEER

The Engineer shall decide all questions which may arise as to the quality or acceptability of materials furnished and work performed and as to the manner of performance and rate or progress of the work, all questions which may arise as to the interpretation of the Plans and Specifications, all questions as to the acceptable fulfillment of the Contract on the part of the Contractor, and all questions as to compensation, including any claims as provided in Subsection 2.04 of these Specifications. His decision shall be final and binding upon the Contractor. He shall also have the authority to enforce, and make effective, such decisions and orders which the Contractor fails to carry out promptly.

4.02 PERMITS AND LICENSES

The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notice necessary and incidental to the due and lawful prosecution of the work.

Satisfactory evidence of obtaining the required permits shall be submitted to the Engineer prior to, and as a condition of, issuance of the "Notice to Proceed". The Contractor shall abide by the conditions of said permits and perform all work governed by said permits in conformance therewith and as directed by the Engineer.

Should the Contractor desire to make preliminary soil investigations in public street rights-of-way, he shall secure the required permits from the appropriate agencies and abide by the provisions of said permits.

Full compensation for all costs involved in procuring all permits and licenses as indicated herein, including all fees and charges, shall be included in the amount bid for the various items of work and no separate payment shall be made therefor.

4.03 CONSTRUCTION STAKING

Surveying, adequate for construction, shall be performed by qualified personnel prior to the start of construction. On City contracts, original construction staking will be provided at no cost to the Contractor by City personnel or authorized representatives of the City.

The Contractor shall be responsible for preserving construction survey stakes and marks for the duration of their usefulness. If any construction survey stakes are lost or disturbed and need to be replaced, such replacement shall be at the expense of the Contractor.

All distances and measurements will be made and given in a horizontal plane. Stakes will be set and stationed for proposed improvements, and cuts or fills marked to planned grades.

If the Contractor, during the course of the work, discovers any discrepancies between the Plans and the layout given by stakes, points, or instructions, it shall be his duty to inform the Engineer immediately in writing, and the Engineer shall promptly verify the same. Any work done after such discovery, until authorized, will be done at the Contractor's risk.

Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected. Any such variation shall be reported to the Engineer. Any deviation of constructed facilities from the grades shown on the Plans and staked in the field shall be the responsibility of the Contractor.

Grades for underground conduits will be set at the surface of the ground and the Contractor shall be responsible for transferring such grades to the bottom of the trench.

The Contractor shall preserve property line and corner survey markers, except where their destruction is unavoidable when the Contractor is proceeding in accordance with accepted practice. Markers that otherwise are lost or disturbed by his operations shall be replaced at the Contractor's expense by a Registered Civil Engineer appropriately licensed for land surveying, or a Licensed Land Surveyor.

The Contractor shall notify the Engineer at least 2 working days before he will require survey services in connection with laying out of any portion of the work. The Contractor shall not commence any construction without survey stakes in place.

Surveying by private engineers on work under the control of the City shall conform to the quality and practice required by the Engineer. The Engineer shall be notified before the stakes are set. Private engineers are required to furnish cut-sheets to the Engineer immediately upon the setting of the grades.

Full compensation for any costs incurred by the Contractor in complying with the above shall be included in the amount bid for the various items of work and no separate payment shall be made therefor.

4.04 INSPECTION DURING CONSTRUCTION

The Engineer and Inspector shall at all times have access to the work during construction and shall be furnished with every reasonable facility for ascertaining full knowledge relative to 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 or Inspector so that proper inspection may be provided. Any work done in the absence of the Engineer or Inspector may be subject to rejection.

The inspection of the work shall not relieve the Contractor of any of his obligations to fulfill the Contract 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 Inspector and accepted, or estimated for payment.

Projects financed in whole or in part with funds from sources other than the City shall be subject to inspection at all times by the agency providing said funds or its authorized agent.

4.05 REMOVAL OF DEFECTIVE OR UNAUTHORIZED WORK

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

Any work done beyond the lines and grades shown on the Plans or established by the Engineer or any extra work done without written authority will be considered as unauthorized and will not be paid for.

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 cause defective work to be remedied or removed and replaced and unauthorized work to be removed, and to deduct the costs thereof from any monies due or to become due the Contractor.

4.06 FINAL INSPECTION

Whenever the work provided and contemplated by the Contract has been satisfactorily completed and the final cleanup performed, the Engineer will make the final inspection.

4.07 SUPERINTENDENCE AND PERSONNEL

The Contractor, in his absence, shall be represented on the work by a competent superintendent, who, as well as the Contractor, shall be in charge of the work and shall be required to receive suggestions and instructions from the Engineer or the Inspector and see them faithfully executed. It shall be the duty of the Contractor to insure 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 such superintendent or foreman who is in charge of the work in the Contractor's absence.

If any subcontractor, workman, or person employed by the Contractor shall fail or refuse to carry out the directions of the Engineer, or shall appear to the Engineer to be incompetent or to act in a disorderly or improper 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.

All work shall be under general supervision and inspection of the Engineer or the Inspector and any work done without the sanction or presence of the Engineer or Inspector will be subject to rejection.

4.08 EMERGENCY AVAILABILITY

The Contractor shall furnish to the City, prior to the issuance of the "Notice to Proceed", a list of persons, together with their addresses and home telephone numbers, who are authorized to act on behalf of the Contractor in an emergency arising out of conditions at the work site after normal working hours.

4.09 STANDARDS

The Engineer shall establish such standards as he may deem 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.

4.10 SUITABLE METHODS

The Contractor shall use such methods for the performance of the work embraced under these Specifications as will secure a satisfactory quality of work and rate of progress. Such methods 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 in order that a high quality of work and satisfactory rate of progress may be obtained.

When ordered by the Engineer, the Contractor shall discontinue unsuitable methods of work. Reference is made to Subsection 7.10, "Contractor's Equipment."

4.11 PROTECTION OF WORK

The Contractor shall provide and maintain proper barricades, fences, signal lights or watchmen to properly protect the work, persons, animals, and property against injury. The cost of such protection shall be included in the amount bid for the various items of work.

The City reserves the right to remedy any neglect on the part of the Contractor as regards the protection of the work, after 24 hours notice in writing, except in case of emergency when he shall have the right to remedy any neglect without notice, and in either case to deduct the cost of such remedy from money due the Contractor. Reference is made to Subsection 7.15, "Traffic Control, Public Convenience and Safety."

SECTION 5 - CONTROL OF MATERIALS

5.01 MATERIALS AND WORKMANSHIP

All materials, parts and equipment furnished by the Contractor in the work shall be first quality, free from defects and, unless specifically indicated otherwise in the Special Provisions, shall be new. Workmanship shall be in accordance with accepted standards. Both materials and workmanship shall be subject to the approval of the Engineer. Unless specifically indicated otherwise in the Special Provisions, all materials shall be furnished by the Contractor.

5.02 PROTECTION OF MATERIALS AND WORK

The Contractor shall provide and maintain storage facilities and employ such measures as will preserve the specified quality and fitness of materials to be used in the work. Stored materials shall be reasonably accessible for inspection. The Contractor shall also adequately protect new and existing work and all items of equipment for the duration of the Contract.

5.03 SAMPLES AND TESTS

At the option of the Engineer, the source of supply of each of the materials shall be approved by the Engineer before delivery is started and before such material is used in the work. Representative preliminary samples of the character and quality prescribed shall be submitted by the Contractor or producer of all materials to be used in the work, for testing or examination as desired by the Engineer.

All tests of materials furnished by the Contractor shall be made in accordance with the commonly recognized standards of national organizations, and such special methods and tests as prescribed in these Specifications.

Unless provided otherwise in these Specifications or in the Special Provisions, the cost of original testing shall be borne by the City for work performed under contract for the City. Any retesting required because of failure of materials to pass the initial test shall be done at the expense of the Contractor. All other tests required for work not under contract with the City, and located in City streets and alleys, or on private property, shall be borne by the Contractor or permittee.

The Contractor shall furnish and deliver such samples of materials as are requested by the Engineer, without charge. No material shall be used until it has been approved by the Engineer. Samples will be secured and tested whenever necessary to determine the quality of materials.

5.04 CERTIFICATES OF COMPLIANCE

A Certificate of Compliance stating that the materials to be used in the work comply in all respects with the requirements of the Plans and Specifications shall be supplied to the Engineer upon request. The certificate shall be signed by the manufacturer of the material or the manufacturer of assembled material delivered to the work, and the lot so certified must be clearly identified in the certificate.

All materials used on the basis of a Certificate of Compliance may be tested and sampled at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the work which conforms to the requirements of the Plans and Specifications, and any such material not conforming to such requirements will be subject to rejection whether in place or not.

The form of the Certificate of Compliance and its disposition shall be as directed by the Engineer.

5.05 TRADE NAMES OR EQUAL

Whenever the material or article to be furnished is described in the Specifications by trade name, brand name, or other reference is made to specific manufacturers or supplies, "or approved equal," or "City approved equal," the person to whom the Contract is awarded shall have thirty (30) calendar days after the award of the Contract to submit to the Engineer data substantiating a request for the substitution of an "approved equal" item. The Engineer will make a decision as to whether the product proposed to be furnished is of equal quality and performance and equally suited for the City's purposes.

No substitutions shall be used in the work until the Engineer has determined the acceptability of the requested substitution, which may include such samples and tests as may be required by Subsection 5.03 of these Specifications. In such cases of proving equal status, the Contractor shall pay the costs of required testing. No time extension to the Contract will be allowed due to any such proposed substitution, or the time required to determine the acceptability of such substitutions.

5.06 DEFECTIVE MATERIAL

All materials not conforming to the requirements of the 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 material, the defects of which have subsequently been corrected, shall be used until approved by the City 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 to the Contractor.

5.07 COMPACTION TESTS

Relative compaction of soil in trenches, embankment or structural backfill shall be determined by the laboratory standard of test procedure California Method 216, except that dry random sampling methods (dry weight basis testing) may be used. Drive-tube sampling of compacted soil may be utilized, unless otherwise directed by the Engineer. Reference is made to Subsection 5.03 of these Specifications as to the responsibility for costs associated with testing.

5.08 GUARANTEE OF MATERIALS AND WORKMANSHIP

The Contractor shall guarantee all materials, equipment and workmanship of the installation for a period of one year from the date of the filing of the Notice of Completion, or for such other period set forth in the Special Provisions. Should any material or appliance or any work develop any defect or weakness due, in the opinion of the Engineer, to the use of imperfect materials, equipment or workmanship, or failure to follow the Plans and Specifications, the Contractor shall be notified at once, and he shall immediately, at his own expense, make the necessary repairs or replacements to make the defective item or items suitable and satisfactory. Should the exigencies of the situation be such as to necessitate the repairs before the Contractor could be notified, or should the Contractor refuse to make the repairs or replacements within a reasonable period of time, the City shall have the right to make the necessary repairs or replacements at the expense of the Contractor, preserving as far as possible all available evidence of the cause of failure. Reference is made to Subsections 1.11 and 7.24 of these Specifications.

5.09 SALVAGE OF MATERIALS

Where indicated on the Plans, material to be salvaged shall remain the property of the City and shall be delivered and deposited by the Contractor at the location specified by the Engineer. No separate payment will be made for such salvaging and delivering of material, and the cost thereof shall be included in the various bid items of work.

SECTION 6 - UTILITIES

6.01 LOCATION

On City contracts involving subsurface work, a diligent effort will have been made to locate and indicate on the Plans, as accurately as possible, the location of all known main or trunk line utility facilities within the work area. Utility service connections will also be shown where information is available.

At least 2 working days before entering on the work, the Contractor shall request all utility owners having a possible interest in the work area to mark or otherwise indicate the location of their substructure. It shall be the Contractor's responsibility to determine the true location and depth of all utilities and service connections. He shall also familiarize himself with the type, material, age and condition of any utility which may be affected by the work.

Utility, as herein used, shall mean any domestic water supply system, sanitary sewer system, storm drain system, or any facilities owned and operated by the Pacific Gas and Electric Company, Continental Telephone, Consolidated Cablevision, or Consolidated Irrigation District, or any other company, corporation, or agency which may reasonably be considered a utility.

It is anticipated that proposed facilities will not positionally intersect such utility facilities and utility service lines, except as indicated on the Plans. The Contractor shall be responsible for precisely locating and preserving said utility lines and shall, prior to placing or constructing proposed facilities, expose and verify the locations of said utilities. Hand digging will be required to locate utilities without damage, and extreme care shall be exercised, inasmuch as the exact locations will only be determined by the excavation. If the Contractor discovers utilities not identified on the Plans, he shall immediately notify the Engineer and the utility owner in writing.

The Contractor's cost of verifying the locations of said utility facilities indicated on the Plans, including exposing them prior to construction, shall be included in the amount bid for the various bid items of work and no separate payment will be made therefor.

6.02 RELOCATION

Wherever it is shown on the Plans or Special Provisions that water, sewer, gas or other facilities or structures are to be relocated, such work shall be done by the Contractor in

cooperation with the owners of such utilities; provided that the owner of the utility may direct that the relocation be done by the owner's forces. In such a case the Contractor shall coordinate his work and cooperate fully in completing the relocation. Unless otherwise specified in the Special Provisions, the cost for relocation of utilities, or for coordinating the Contractor's work with the utility owner's work, shall be included in the various bid items of work, and no additional payment shall be made therefor.

Reference is made to Subsection 6.05 of these Specifications relative to delays caused by relocation of utilities either by the Contractor or by the utility owner.

Should the Contractor desire to have any relocation made of any utility facility, or other improvement, for his convenience in order to facilitate his construction operations, which relocation is in addition to or different from the relocations indicated on the Plans or in the Special Provisions, he shall make whatever arrangements are necessary with the owners of such utility for such relocation and bear all expenses in connection therewith.

6.03 PROTECTION

The Contractor is responsible for protection of all utility mains, services and other facilities within the limits of work. Responsible diligence will have been exercised on all City contracts in locating utilities, but the Contractor is responsible for checking in the field the locations as shown and is further responsible for any and all utilities whose presence or location is unknown.

All utility services and facilities damaged or broken by the Contractor shall be repaired or replaced in accordance with the requirements of the owner of said utility.

The Contractor shall not interrupt the service function or disturb the supporting base of any utility, without authority from the owner or order from the City.

When placing concrete around or contiguous to any utility, the Contractor shall, at his expense, furnish and install a cushion of expansion joint material, clear opening, or sleeve, or by other suitable means shall prevent embedment in or bonding with the concrete.

Care shall be taken not to move, without the consent of the Engineer and the owners, any sewers, drains, culverts, water, gas or other conduits, poles, or other structures; and in crossing or running parallel with such facilities, they shall be

securely hung, braced and supported in place (in a manner approved by the Engineer and the owner) until the work is completed.

The full cost of protection, repair, or replacement of utilities shall be included in the various bid items of work and no additional compensation will be paid therefor.

6.04 MAIN AND TRUNK LINE FACILITIES NOT SHOWN ON PLANS

Where main or trunk line utility facilities are encountered which were not indicated on the Plans and/or Specifications, the Contractor will be compensated for the cost of locating, repairing damage not due to his failure to exercise reasonable care, and for removing or relocating said main or trunk line utility facilities.

6.05 DELAYS

The Contractor is responsible for notifying utility owners in time to prevent delays attributable to utility relocations or alterations. The Contractor shall not be entitled to damages or additional payment if such delay does occur. The Engineer will determine the extent of the delay attributable to such interference, the effect of the delay on the project as a whole, and any commensurate extension of time due, if timely notice was given.

6.06 COOPERATION

When necessary, the Contractor shall so conduct his operations as to permit access to the worksite and provide time for utility work to be accomplished during the progress of the Contract work. Any costs associated with such cooperation shall be included in the amount bid for the various items of work and no separate payment shall be made therefor.

6.07 LIMITATIONS OF LIABILITY

Except for the assumption of liability as may be required by statute and such liabilities assumed in accordance with Subsection 6.04 of these Specifications, the City or the Engineer assumes no responsibility or liability with respect to the sufficiency or accuracy of the information or investigation of the location of utility facilities made by it, or with respect to the actual or apparent location of all known utility facilities as indicated on the Plans, or with respect to unforeseen developments which may occur as to the location of such utility facilities, or with respect to utility facilities which may be encountered at places different from that indicated.

SECTION 7 - LEGAL RELATIONS, AND RESPONSIBILITIES OF THE CONTRACTOR IN THECONDUCT OF HIS WORK

7.01 LAWS TO BE OBSERVED

The Contractor shall keep himself fully informed of all State and Federal laws and City ordinances and regulations, and revisions thereto, that in any way affect those engaged or employed in or on the work or in any way affect the conduct of the work, and of all orders or decrees of governmental or other bodies or officials having jurisdiction or authority over the same.

The Contractor, and all persons, firms or corporations employed by or under him, shall at all times observe and comply with all such laws, ordinances and regulations, orders and decrees. He shall protect and indemnify the City and its officers, employees and agents, 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, Specifications or Contract for the work in relation to any such law, ordinance, regulation, order or decree, the Contractor shall forthwith report the same to the Engineer in writing.

7.02 CONTRACTOR'S LICENSE

All bidders and Contractors shall be licensed in accordance with the laws of this State, specifically the provisions of Chapter 9 of Division 3 of the Business and Professions Code concerning the licensing of Contractors. Any bidder or Contractor not so licensed is subject to the penalties imposed by such laws.

7.03 CONTRACTOR'S LIABILITY INSURANCE AND WORKMENS' COMPENSATION INSURANCE

With respect to any work required to be done under this contract, the Contractor will indemnify and hold harmless the City of Avenal,the City Engineer, and all other public agencies, whether or not said agencies are named herein, who have jurisdiction within the areas in which the work is to be performed, and all officers and employees ofthe City of Avenal, the City Engineer and said other participating agencies, against any and all claims, demands, causes of action, damages (including damages to City property or the property of anyany participating agencies), costs or liabilities (including costs or liabilities of the City, the City Engineer or the participating agencies with respect to its employees), in law or in equity of every kind and nature whatsoever, directly or

in equity of every kind and nature whatsoever, directly or proximately resulting from or caused by the performance of the contract, whether such performance by the Contractor, his sub-contractor or anyone directlyor indirectly employed by him; and the Contractor shall, at his solerisk and expense, defend any and all suits, actions or other legal proceedings which may be brought or instituted by third persons against the City, the City Engineer, the participating agencies, their officers and employees on any such claim, demand, or cause of action, and the Contractor shall pay and satisfy any judgement or decree which may be rendered against the City, the City Engineer, the participating agencies, their officers and employees in any such suit, action, or other legal proceedings.

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

Coverage shall be at least as broad as:

1. Insurance Services Office Commercial General Liability coverage (occurrence form CG 0001).

2. Insurance Services Office form number CA 0001 (Ed. 1/87) covering Automobile Liability, code 1 (any auto).

3. Workers' Compensation insurance as required by the State of California and Employer's Liability Insurance.

4. Course of Construction insurance form providing coverage for "all risks" of loss.

Contractor shall maintain limits no less than:

1. General Liability: $1,000,000 per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.

2. Automobile Liability: $1,000,000 per accident for bodily injury and property damage.

3. Employer's Liability: $1,000,000 per accident for bodily injury or disease.

4. Course of Construction: Completed value of the project.

Any deductibles or self-insured retentions must be declared to and approved by the City. At the option of the City, either the insurer shall reduce eliminate such deductibles or self-insured retentions as respects the City, its officers, officials, employees and volunteers or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses.

The general liability and automobile liability policies are to contain, or be endorsed to contain, the following provisions:

1. The City, its officers, officials, employees, agents and volunteers are to be covered as insureds as respects: liability arising out of activities performed by or on behalf of the Contractor, products and completed operations of the Contractor; premises owner, occupied or used by the Contractor; or automobiles owned, leased, hired or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the City, its officers, officials, employees, agents or volunteers.

2. For any claims related to this project, the Contractor's insurance coverage shall be primary insurance as respects the City, its officers, officials, employees, agents and volunteers. Any insurance or self-insurance maintained by the City, its officers, officials, employees, agents or volunteers shall be excess of the Contractor's insurance and shall not contribute with it.

3. Any failure to comply with reporting or other provisions of the policies including breaches of warranties shall not affect coverage provided to the City, its officers, officials, employees, agents or volunteers.

4. The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

5. Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days' prior written notice by certified mail, return receipt requested, has been given to the City.

Course of construction policies shall contain the following provisions:

1. City shall be named as loss payee.

2. The insurer shall waive all rights of subrogation against entity.

Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A VII.

Contractor shall furnish the City with original endorsements effecting coverage required by this clause. The endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. The Endorsements are to be on forms provided by the City. All endorsements are to be received and approved by the City before work commences. As an alternative to the City's forms, the Contractor's insurer may provide complete, certified copies of all required insurance policies, including endorsements effecting the coverage required by these specifications.

Contractor shall include all subcontractors as insureds under its policies or shall furnish separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to all of the requirements stated herein.

If the Contractor does not keep such insurance in full force and effect, the City may take out the necessary insurance, and the Contractor agrees to pay the cost of said insurance.

7.04 RESPONSIBILITY FOR DAMAGE, LOSS OR INJURY

Neither the City, the City Council, the Engineer, nor any City officer or employee shall be answerable or accountable in any manner for any loss or damage that may happen to the work or any part thereof, or any material or equipment used in performing the work, or for injury or damage to any person or persons, either workmen or public, or damage to adjoining property from any cause whatsoever during the progress of the work or at any time before final acceptance of the work.

The Contractor shall indemnify and save harmless the City, the City Council and the Engineer from any suits, claims or actions brought by any person or persons for or on account of any injuries or damage sustained in or arising out of the construction of the work or in consequence thereof. The City Council may retain as much of the money due the Contractor as shall be considered necessary until disposition has been made of such suits or claims for damages as aforesaid.

Neither the City Council, the Engineer, nor any other officer or authorized agent shall be personally responsible for any liability arising under the Contract.

7.05 CONTRACTOR'S RESPONSIBILITY FOR WORK

Except as specifically provided in the Specifications, until the formal acceptance of the work by the City Council, the Contractor shall have the charge and care thereof and shall bear the risk of injury or damage to any part thereof by the action

of the elements or from any other cause, whether arising from execution or from the nonexecution of the work. The Contractor shall rebuild, repair, restore and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof, except such injuries or damages occasioned by acts of the Federal Government or the public enemy.

The City 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 the Specifications.

7.06 PRESERVATION OF PROPERTY

The Contractor shall be liable for any and all damage done to any property, structure, facility or improvement due to his operations. Due care shall be exercised to avoid injury to existing highway improvements or facilities, roadside trees and landscaping that are not to be removed, pole lines, fences, signs, survey markers and monuments, buildings and structures, conduits, pipelines under or above ground, all street facilities, and any other improvements or facilities within or adjacent to the work area, or on private property adjacent to the work area, and all such facilities shall be protected from injury or damage. The Contractor shall provide and install suitable, approved safeguards to protect such property or improvements from injury or damage. If such property or improvements 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 being performed under this 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.

7.07 RIGHTS-OF-WAY

The right-of-way for the work to be constructed as shown on the Plans will be provided by the City. The Contractor shall procure at no cost to the City all temporary construction easements not shown in the Plans, which he may deem necessary to carry out the work to be done under the Contract. Said additional right-of-way shall be brought, to the satisfaction of the Engineer, to a condition at least equal to that existing prior to its use by the Contractor. The Contractor shall not occupy property outside the right-of-way as shown on the Plans unless he enters into an agreement with the owner of said property.

Nothing in these Specifications shall be construed as allowing the Contractor to make any arrangements with any person to permit occupancy or use of any land, structure, or building within the limits of the Contract for any purpose whatsoever,

either with or without compensation, in conflict with any agreement between the owner, former owner, or tenant of such land, structure or building.

7.08 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 material is to be disposed of outside the right-of-way, the Contractor shall first obtain a written permit from the property owner on whose property the disposal is to be made and he shall file with the Engineer said permit or a certified copy thereof.

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, including any permits or bonds so required.

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 items 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 with the requirements of this subsection.

7.09 ELECTRIC AND WATER SERVICE

The Contractor shall provide and pay for electric service for all purposes of power and lighting required for the construction of the work of the Contract and shall maintain such service until the completion of the Contract.

The Contractor shall make his own arrangements for and shall provide himself with a satisfactory water supply for the work done under the Contract. All water so used shall be paid for by the Contractor, except that water to be used in the work may be taken from the City's water system at no cost, but only after obtaining a water meter from the City Utilities Division and payment of any deposits required therefor. A backflow prevention device, if not equipped with the meter, shall be furnished by the Contractor. All costs for furnishing water shall be included in the various bid items of work.

7.10 CONTRACTOR'S EQUIPMENT

The Contractor shall provide adequate and suitable equipment and means of construction to meet all the requirements of the work. When ordered to do so by the Engineer, the Contractor shall remove unsuitable equipment from the work and discontinue the operation of unsatisfactory equipment. The use of any

equipment which is obsolete as to type, in bad condition, or worn out will not be permitted on the work.

7.11 SAFETY PROVISIONS

The Contractor shall comply with the provisions of the Construction Safety Orders, Tunnel Safety Orders and General Safety Orders issued by the State Division of Industrial Safety, as well as all other applicable laws, ordinances and regulations.

Full compensation for all costs involved in providing job safety and special worker protection, except those pertaining to the hazards of caving ground in excavation, shall be included in the amounts bid for the various items of work, and no separate payment will be made therefor.

7.12 SPECIAL WORKER PROTECTION FROM TOXIC OR EXPLOSIVE GASES

In conformance with the Safety Orders set forth in Subsection 7.11, the Contractor shall protect workers from toxic or explosive gases by providing whatever testing equipment and other special equipment that may be needed to detect the presence of and to remove such toxic or explosive gases found to exist in any underground facilities involved in the work, whether these facilities are newly constructed or existing.

The above requirements of the State Division of Industrial Safety are minimum requirements. In addition, the Contractor shall provide, for the life of the Contract, similar protection for any person, including the Engineer or any of his authorized representatives, subcontractors, or any other person authorized or required to enter such underground facilities for inspection, repairs, or any other reason.

7.13 WORKER PROTECTION FROM CAVING GROUND IN EXCAVATIONS

As required by Subsection 7.11 of these Specifications, the Contractor shall comply with the provisions of the Construction Safety Orders, Tunnel Safety Orders, and General Safety Orders issued by the State Division of Industrial Safety, as well as all other applicable laws, ordinances and regulations, as they pertain to the protection of workers from the hazard of caving ground.

In compliance with the provisions of Section 6705 of the Labor Code of the State of California, the Contractor shall obtain the approval and acceptance of the Engineer in advance of the excavation of any trench or trenches, jacking or receiving pits, or pump sump pits, 5 feet or more in depth, of the detailed plans showing the design of shoring, bracing, sloping, or other provisions to be made by the Contractor for worker protection from the hazard of caving ground during the excavation of such trenches or pits, and during any other period that workers may be exposed to such hazard. If such plan varies

from the shoring system standards established by the Division of Industrial Safety, the plan shall be prepared by a Registered Civil or Structural Engineer.

The requirements as above set forth by the State Division of Industrial Safety for the provision of worker protection from the hazard of caving ground are minimum requirements. In addition, the Contractor shall provide, for the life of the Contract, the same protection for any person, including the Engineer or any of his authorized representatives, subcontractors, or any other person required to be exposed to such hazard in the performance of the work, inspection of the work, or any other reason.

Payment for worker protection from caving ground in excavations during construction shall be made at the lump sum bid price, and no additional compensation will be made therefor. Payment shall include all materials, labor and equipment necessary to adequately brace, shore, shield or slope all excavations and trenches as required by California Labor Code Section 6705. Also included are any costs incurred by the Contractor in preparing a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of the trenches, pits, etc.

7.14 MAINTAINING DRAINAGE

The Contractor shall provide and maintain drainage to the existing street section or other area of work with no separate compensation therefor. Temporary provisions for drainage of any area during construction where existing drainage facilities have been damaged or altered by the Contractor during his operations shall be made by the Contractor and as directed by the Engineer.

The Contractor shall be responsible for all damages to public or private property incurred due to failure to provide adequate drainage within and through the construction area or due to blockage of existing drainage facilities at or upstream from the area of work.

No separate payment shall be made for maintaining drainage and full compensation therefor shall be included in the prices bid for the various items of work.

7.15 TRAFFIC CONTROL, PUBLIC CONVENIENCE AND SAFETY

It shall be the Contractor's responsibility to provide for the convenience and safety of the public and public traffic in connection with his operations. Traffic control shall be furnished, provided and maintained by the Contractor at all times throughout the life of the Contract.

The Contractor shall so conduct his operations as to cause the least possible obstruction and inconvenience to public

traffic and abutting property owners (or tenants), and he shall have under construction no greater length or amount of work than he can prosecute properly with due regard to the rights and safety of the public. Unless other existing streets are stipulated in the Special Provisions to be used as detours, all traffic shall be permitted to pass through the work. Residents along the work area shall be provided passage as far as practicable, as determined by the Engineer. Convenient access to driveways, houses and businesses along the road, street, alley or other work area shall be maintained; temporary trench crossings shall be provided and maintained in good condition as required to provide said access. No more than one cross or intersecting street or road shall be closed at any one time without the approval of the Engineer.

The Contractor shall keep the City Fire Department, Police Department and ambulance companies informed at all times as to the exact location and progress of the work and shall notify them immediately of any streets closed to traffic or impassable for fire fighting or other safety equipment. At least 48 hours in advance of beginning work in any street, alley, or other public thoroughfare, the Contractor shall notify the Engineering department and any other jurisdictional agencies involved and comply with their requirements regarding traffic control and public convenience and safety.

The Contractor shall provide such flagmen, and furnish, erect, and maintain such fences, barriers, lights, and signs as are necessary to give adequate warning to the public at all times that the road, street, or other work area is under construction and of any dangerous condition to be encountered as a result thereof, and he shall also erect and maintain such warning and directional signs as may be furnished by the City. All such devices shall be promptly removed upon completion of the work.

The type and location of signs, lights, flags, flagmen and other traffic control and safety devices shall be in accordance with the latest addition of the "Manual of Warning Signs, Lights, and Other Devices for use in Performance of Work Upon Highways" issued by the State of California, Department of Transportation. Compliance with the requirements of said manual shall be considered as a minimum requirement and it shall be the responsibility of the Contractor to provide additional safety devices when necessary to maintain a safe condition.

Safe, adequate, continuous and unobstructed pedestrian and vehicular access shall be maintained to fire hydrants, residences, commercial and industrial establishments, etc., unless other arrangements satisfactory to the owners have been made. Safe and adequate pedestrian zones and public transportation stops, as well as pedestrian crossings of the work at intervals not exceeding 300 feet, also shall be maintained unless otherwise approved by the Engineer.

It shall be totally the responsibility of the Contractor to provide and maintain adequate traffic safety devices and warning signs. If the Engineer or the Inspector notes some deficiency in said devices, the situation shall be corrected immediately by the Contractor. Should the Contractor fail to comply with said requirements, safety regulations, instructions or directions, or such additional requirements as may be deemed by the Engineer to be necessary for safety of the workers or the public property, the Engineer may cause such precautions to be taken by other means at the Contractor's expense, but 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 and measures.

Full compensation for all costs involved in public convenience, safety and traffic control in accordance with the requirements specified shall be included in the lump sum price bid for traffic control. Where no bid item is provided for traffic control, the costs involved in public convenience, safety and traffic control shall be included in the amount bid for the various items of work and no separate payment shall be made therefor.

7.16 DUST CONTROL

The Contractor shall maintain dust control about the site of the work, including any haul roads to or from the site, by whatever means are necessary, such as watering, sweeping or oiling, so as to cause the least possible dust nuisance to the public. Any dust control measure ordered by the Engineer shall be promptly and immediately carried out.

The Contractor shall make his own arrangements for and shall provide himself with a satisfactory water supply, except as otherwise set forth in these Specifications.

The Contractor shall furnish his own equipment for transporting and applying water. Such equipment shall meet the approval of the Engineer. Water for the work may be taken from the City water system at no cost, but only after obtaining a meter from the City Utilities Division and payment of any deposit required therefor. Where the Contractor is allowed to utilize the public water supply, if the City furnished meter is not so equipped, the Contractor shall provide an approved backflow prevention device between the public water supply and his equipment for applying or transporting water when the Engineer determines that a backflow condition could be caused by the method or equipment used to draw water from the public supply.

If the Contractor fails to provide dust control measures so ordered within a reasonable time period as determined by the Engineer, the Contractor (or Developer in the case of private contracts) shall pay to the City a liquidated damage of thirty dollars ($30.00) for each half hour, or portion thereof, that

elapses from the time the penalty is ordered into effect by the Engineer, until dust control measures ordered by the Engineer are completely carried out and the dust nuisance eliminated or prevented. Such penalty shall be deducted from any monies owed the Contractor or levied as a fine against the Developer. In addition to the liquidated damage as specified above, if conditions warrant, the Engineer may order City forces to eliminate or prevent the dust nuisance. The full cost thereof, in addition to the liquidated damage as herein provided, shall be deducted from any monies owed the Contractor or shall be levied as a fine against the Developer.

Full compensation for dust control shall be included in the lump sum amount bid therefor. Where no bid item is provided for dust control, the cost therefor shall be included in the various bid items of work and no separate payment will be made therefor.

7.17 RESTORATION OF SURFACES

The Contractor shall replace all graded surface material adjacent and/or appurtenant to the work, and shall restore paving, curbing, sidewalks, gutters, landscaping, fences, lawn and other surfaces disturbed, to a condition equal to that before the work began, and shall furnish all labor and material incidental thereto. Where bid items are not provided for each type of restoration, full compensation therefor shall be included in the amount bid for the various items of Contract work. Reference is made to Subsection 18.05 of these Specifications for technical provisions relative to restoration of surfaces.

7.18 SANITARY REGULATIONS

Necessary housing accommodations shall be provided for the workmen for changing clothes and for protection during inclement weather. Toilet accommodations shall also be maintained for the use of employees on the work. The accommodations shall be in approved locations properly screened from public observation and shall be maintained in a strictly sanitary manner. The Contractor shall obey and enforce all sanitary regulations and orders, and shall take precautions against infectious diseases and the spread of same, and shall maintain at all times satisfactory sanitary conditions around all shanties, tool and supply houses and on all other parts of the work.

7.19 PATENTS

The Contractor shall assume all responsibilities arising from the use of patented materials, equipment, devices, or processes used on or incorporated in the work.

7.20 PROPERTY RIGHTS OF MATERIALS

Nothing in the Contract shall be construed as vesting in the Contractor any right of property in the materials used after they have been attached or affixed to the work or the soil, or after payment has been made for 90 percent of the value of materials delivered to the site of the work or stored subject to or under the control of the City. All such materials shall become the property of the City upon being so attached or affixed or upon payment of 90 percent of the value of materials delivered to the site of the work or stored subject to or under the control of the City. As indicated in Subsection 7.05 of these Specifications, the Contractor will not be relieved of his responsibility for the care and protection of the work until final acceptance of the work by the City.

7.21 ASSIGNMENT OF CONTRACT

The Contractor shall not assign this Contract, or any part thereof, without the approval of the City or without the consent of surety unless the surety has waived its rights to notice of assignment. All assignments of funds are subject to the prior lien for services rendered or materials supplied for the performance of the work called for in favor of all persons, firms, or corporation rendering such services or supplying materials.

7.22 AMENDMENTS TO CONTRACT

Each and every provision of law and clause required by law to be inserted in the Contract for the work to be done under the Specifications shall be deemed to be inserted therein, and the Contract shall be read and enforced as though it were included therein; and if, through mere mistake or otherwise, any such provision is not inserted or is not correctly inserted, then upon the application of either party thereto, the Contract shall forthwith be physically amended to make such insertion.

7.23 VERBAL STATEMENTS NOT BINDING

It is understood and agreed that the written terms and provisions of this agreement shall supersede all prior verbal statements of the Engineer or other representatives of the City and such statements shall not be effective, or be construed as entering into or forming a part of, or altering in any way, whatsoever, the written agreement.

7.24 GUARANTEE

The Contractor shall guarantee the proper installation and performance for all equipment and facilities installed or work performed for a period of one year from the date of the filing of the Notice of Completion, or for such other period set forth in the Special Provisions. Any failure of such equipment, facilities or workmanship prior to the end of such one year or

other specified period shall be repaired or corrected by the Contractor at his sole expense in accordance with instructions of the Engineer. Reference is made to Subsections 1.11 and 5.08 of these Specifications.

SECTION 8 - PROGRESS AND PROSECUTION

8.01 SEQUENCE AND PROGRESS OF THE WORK

The Engineer shall have the power to direct the order and sequence of work, which in general shall be to coordinate the construction of the several parts of the Contract to a successful completion as rapidly as possible. If, at any time, appliances used, or to be used, appear to the Engineer as insufficient or improper for securing the quality of work required, or the required rate of progress, he may order the Contractor to increase efficiency, or to improve their character, and the Contractor shall conform to such order; but the failure of the Engineer to demand any increase of such efficiency or any improvement shall not release the Contractor from his obligation to secure the quality of work, or the rate of progress specified.

8.02 COMMENCEMENT OF WORK

Unless otherwise provided in the Special Provisions, the Contractor shall commence work under the Contract within fifteen (15) calendar days after the date of the Notice to Proceed and shall diligently prosecute the same to completion within the time limit provided in the Special Provisions. Should the Contractor begin work in advance of receiving the Notice to Proceed, as above provided, any work performed by him shall be considered as having been done at his own risk and as a volunteer and no payment is guaranteed for any such work performed.

8.03 TIME OF COMPLETION AND LIQUIDATED DAMAGES

It is agreed by the parties to the Contract that in case all the work called for under the Contract is not completed before or upon expiration of the limit as set forth in the Special Provisions, damage will be sustained by the City. Since it is and will be impractical to determine the actual damage which the City will sustain in the event of and by reason of such delay, it is therefore agreed that the Contractor will pay to the City the sum indicated in the Special Provisions for each and every day's delay beyond the time prescribed to complete the work; and the Contractor agrees to pay such sum as set forth in the Special Provisions, and in case the same is not paid, agrees that the City may deduct the amount thereof from any money due or that may become due the Contractor under the Contract. It is further agreed that in case the work called for under the Contract is not finished and completed in all parts and requirements within the specified time, the City shall have the right to extend or not to extend the time for completion as may seem best to serve the interest of the City. If the City decides to extend the time limit for the completion of the

Contract, the City shall further have the right to charge to the Contractor, his heirs, assigns, or sureties, and to deduct from the final payment for the work all or any part, as the City may deem proper, of the actual cost of engineering, inspection, superintendence, and other overhead expenses which are directly chargeable to the Contract, and which accrue during the period of such extension, except that the cost of final surveys and preparation of the final estimate shall not be included in such charges.

The Contractor shall not be assessed with liquidated damages, or the cost of engineering and inspection, during any delay in the completion of the work caused by acts of God or acts of the public enemy, the City, fire, epidemics, quarantine restrictions, strikes and freight embargoes, provided that the Contractor shall, within ten (10) calendar days from the beginning of such delay, notify the Engineer in writing of the causes of delay; and the Engineer's finding of the facts thereon shall be final and conclusive.

8.04 CONSTRUCTION SCHEDULE

After notification of award and prior to start of any work, the Contractor shall submit to the Engineer for approval his proposed construction schedule, when so requested by the Engineer. The construction schedule shall be in the form of a tabulation, chart, or graph and shall be in sufficient detail to show the chronological relationship of all activities of the project including, but not limited to, estimated starting and completion dates of various activities, procurement of materials, and scheduling of equipment. The construction schedule shall be consistent in all respects with the time and order of work requirements of the Contract.

If the Contractor desires to make a significant change in his method of operations after commencing construction, or if his schedule fails to reflect the actual progress, he shall submit to the Engineer a revised construction schedule in advance of beginning revised operations.

8.05 PRECONSTRUCTION CONFERENCE

Prior to construction and when set forth in the Special Provisions or when requested by the Engineer, a meeting will be called by the Engineer with the Contractor, subcontractors and interested agencies or parties affected by the work, to discuss the proposed work. The Contractor shall present his proposed construction schedule prior to or at this meeting.

8.06 NOTICE TO RESIDENTS

The Contractor shall, no less than five (5) calendar days prior to proceeding with the work in any given area, notify in writing all residents and tenants directly affected by the construction work of both the nature and the approximate time for the completion of the work. The notice shall be on the contracting firm's letterhead and shall be signed and shall include the project superintendent's name and telephone number. The Contractor shall, prior to commencing work in each given area, furnish the Engineer a copy of the notice given residents and tenants and shall certify the date, location and method by which the notice was delivered.

8.07 COOPERATION

The Contractor shall cooperate in all respects with all public and private agencies, including but not limited to the Consolidated Irrigation District, Consolidated Cable TV, Pacific Gas and Electric Company, Continental Telephone, the Avenal City Water, Sewer, Parks and Solid Waste Departments, and the fire and police departments. Should construction be under way by other forces or by other Contractors within or adjacent to the project area, or should work of any other nature be under way by other forces within or adjacent to said project area, the Contractor shall cooperate with all such other Contractors or forces to the end that any delay or hindrance to their work will be minimized, or avoided.

8.08 SUBCONTRACTORS

As indicated in Subsection 1.15 of these Specifications, the Contractor shall indicate on the proposal form the names of subcontractors proposed for the work and shall not employ any who the Engineer may, within a reasonable time, object to as incompetent or unfit.

The purchase of concrete, liquid asphalt, paving asphalt, pipelines, valves, fire hydrants, casing, or any other materials produced at and supplied from established and recognized commercial plants, together with delivery of such materials to the site of the work by means of vehicles owned or operated by such plants or by recognized commercial hauling companies, shall not be considered as subcontracting under these Specifications.

The Contractor shall be responsible for the coordination of all trades, subcontractors, and materialmen engaged upon the work. Neither the City nor the Engineer will undertake to settle any differences between the Contractor and his subcontractors or between subcontractors. In this regard, it is

recommended to the Contractor that local subcontractors and materialmen be used whenever possible as one of the best methods of maintaining the coordination and activity essential to proper job scheduling and completion.

All persons engaged in the work, including subcontractors, will be considered as employees of the Contractor. The Contractor will be held responsible for their work. The City will deal directly with, and make all payments to the Contractor only.

When subcontracted work is not being prosecuted in a manner satisfactory to the Engineer, the Contractor shall be notified to take corrective action within a specified time. If timely correction is not made upon issuance to the Contractor of written instructions from the Engineer, the subcontractor shall be removed immediately from the work, and shall not be reemployed thereon.

The Contractor agrees that he is fully responsible to the City for the acts and omissions of his subcontractors and of persons either directly or indirectly employed by them, as he is for the act and omissions of persons directly employed by him.

Nothing contained in the Contract documents shall create any contractual relation between any subcontractor and the City.

8.09 FAILURE TO PERFORM

If the City sues to compel performance or sues for breach of the 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.

8.10 TEMPORARY SUSPENSION OF WORK

The Engineer shall have the authority to suspend the work wholly or in part for such period as he may deem necessary due to unsuitable weather or due to such other conditions as are considered unfavorable for the suitable prosecution of the work, or for such time as he may deem necessary due to the failure on the part of the Contractor to carry out orders given or to perform any provisions of the work. The Contractor shall immediately obey such order of the Engineer to suspend the work, and shall not resume the work until ordered in writing by the Engineer.

8.11 USE OF COMPLETED PORTIONS

The City shall have the right to take possession of, use, or maintain and protect any completed portions of the work. However, taking possession, use, or maintenance and protection

shall not be deemed an acceptance of any work not completed in accordance with the Contract documents.

8.12 TERMINATION OF CONTRACT

If the Contractor should be adjudged as bankrupt; if he makes a general assignment for the benefit of his creditors; if a receiver should be appointed on account of his insolvency; if he or any of his subcontractors should persistently violate any of the provisions of the Contract; if he should persistently or repeatedly refuse or should fail, except in cases for which extension of time is provided, to supply enough skilled workmen or proper materials; if he should fail to make prompt payment to subcontractors or for material or labor; or persistently disregard laws, ordinances or the instructions of the Engineer, the City may, upon certification of the Engineer when sufficient cause exists to justify such action, serve written notice upon the Contractor and his surety of its intention to terminate the Contract, such notice to contain the reasons for such intention to terminate the Contract. Unless, within five (5) calendar days after the serving of such notice, such violations shall cease and satisfactory arrangements for correction thereof be made, the Contract shall, upon the expiration of said five (5) calendar days, cease and terminate. In the event of any such termination, the City shall immediately serve written notice thereof upon the surety and the Contractor; and the surety shall have the right to take over and perform the Contract, provided, however, that if the surety within ten (10) calendar days after the serving upon it of notice of termination does not give City written notice of its intention to take over and perform the Contract or does not commence performance thereof within the ten (10) calendar days stated above from the date of the serving of such notice, the City may take over the work and prosecute the same to completion by Contract or by any other method it may deem advisable, for the account and at the expense of the Contractor, and the Contractor and his surety shall be liable to the City for any excess cost occasioned the City thereby. In such event the City may, without liability for so doing, take possession of and utilize in completing the work such materials, appliances, plant and other property belonging to the Contractor as may be on the site of the work and necessary therefor. In such case, the Contractor shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the Contract price shall exceed the expenses of finishing the work, including compensation for additional managerial and administration services, such excess shall be paid to the Contractor. If such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the City. The expense incurred by the City, as herein provided, and damage incurred through the Contractor's default, shall be certified by the Engineer.

8.13 ACCEPTANCE OF CONTRACT

When the Engineer has made the final inspection and determines that the Contract has been completed in all respects in accordance with the Plans and Specifications, he will so certify and accept the completed work or, at the City's option, so certify to the Council, which may accept the completed work. The Engineer will in his certification give the date when the work was completed. This will be the date when the Contractor is relieved from responsibility to protect the work. This will also be the date to which liquidated damages will be computed.

The City's acceptance of any work by or on behalf of Contractor shall not be deemed a waiver of the City's rights to remedy by Contractor of latent defects resulting from defective materials or workmanship discovered after the City's issuance of its notice of completion.

SECTION 9 - MEASUREMENT AND PAYMENT

9.01 MEASUREMENT OF QUANTITIES FOR UNIT PRICE WORK

Unless specified otherwise, 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 is 2,000 pounds avoirdupois. The unit of liquid measure is the U.S. gallon.

Unless otherwise specified, quantities of work shall be determined from measurements or dimensions in horizontal planes. However, linear quantities of pipe, piling, fencing, and timber shall be considered as being the true length measured along the longitudinal axis.

Unless otherwise provided in the Special Provisions, volumetric quantities will be determined by the Engineer, and shall be the product of the mean area or vertical or horizontal sections and the intervening horizontal or vertical dimension. The planimeter shall be considered an instrument of precision adapted to the measurement of all areas.

When payment is to be made on the basis of weight, the weighing shall be done on scales furnished by and at the 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 of 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.

Other materials and items of work which are to be paid for on the basis of measurement shall be measured in accordance with the methods stipulated in the Specifications for the particular items involved.

Full compensation for all expense involved in conforming to the requirements specified 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.

9.02 COST BREAKDOWN

Upon request of the Engineer, the Contractor shall submit, in a form acceptable to the Engineer, a schedule showing the subdivision of his Contract, or lump sum bid price, into its various parts, stating quantities and prices for each item, to be made a basis for checking or computing monthly estimates, if such payments are specified. The prices

shall include all costs of each item. No payment will be made to the Contractor until such schedule has been submitted to and approved by the Engineer, if required by him.

9.03 FULL COMPENSATION INCLUDED IN BID AMOUNT

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 work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the acceptance by the City and for all risks of every description connected with the prosecution of the work; also for 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 his obligation to make good any defective work or material.

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

The lump sums and/or unit prices shown in the bid proposal shall include full compensation for all work and expenses appurtenant to the accomplishment of the project described in these Specifications in the manner indicated herein, including, but not limited to, all items delineated in these Contract documents for which specific bid items are not set up in the bid proposal. The Contractor shall proportionally spread all incidental costs associated with the work for which there are no separate bid items into the amount bid for those items of work for which there are bid items, and no separate or additional payment will be made for any requirement of the Contract not specifically listed on the bid proposal.

9.04 PROGRESS PAYMENTS

On City contracts, the City shall once in each month cause an estimate in writing to be made by the Engineer of the value of the total amount of the work done and acceptable material furnished and delivered by the Contractor on the ground and not used, or acceptable materials furnished and stored for use on the Contract (if such storage is within the limits of the project and is subject to or under the control of the City at the time of such estimate). Reference is made to Subsection 9.09 of these Specifications relative to the date of payments.

The Contractor shall furnish the Engineer a preliminary estimate of such materials and work, when requested by the Engineer. Such estimate shall be submitted on a form approved by the Engineer which shall be properly completed and executed. The Engineer shall have the authority to adjust the items as submitted on the preliminary estimate in accordance with his judgement of the amount of work performed or materials on hand, considering the fact that bid items include a proportionate share of incidental expenses involved in the work. The estimated value of any item of work shall in no case exceed the bid price for that Contract item of work.

The City shall retain 10 percent of the value of the materials so estimated to have been furnished and delivered and unused, or furnished and stored as aforesaid, as part security for the fulfillment of the Contract by the Contractor. The City shall also retain 10 percent of the value of all work done from each monthly payment. Reference is made to Subsection 9.08 of these Specifications relative to substitution of securities for retained amounts.

The City shall pay monthly to the Contractor while carrying on the work the balance not retained, as aforesaid, after deducting therefrom all previous payments and all sums to be kept or retained under the provisions of the Contract. No such estimate or payment shall be required to be made when, in the judgement of the Engineer, the work is not proceeding in accordance with the provisions of the Contract, or when in his judgement the total value of the work done since the last estimate amounts to less than five hundred dollars ($500.00).

No such estimate or payment shall be considered to be an acceptance of any defective work or improper materials.

9.05 FINAL PAYMENT

The Engineer shall, after the completion of the Contract, make a final estimate of the amount of work done thereunder and the value of such work; and the City shall pay the entire sum so found to be due after deducting therefrom 10 percent of the final estimate to be retained following final acceptance of the work. The final retained payment shall not be due and payable until the expiration of thirty-five (35) calendar days from the date of recordation of the "Notice of Final Acceptance" for the project by the City. Reference is made to Subsection 9.08 of these Specifications relative to substitution of securities for retained amounts.

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 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.

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. It is further agreed that no payment shall be construed to be an acceptance of any defective work or improper materials.

The Contractor further agrees that the payment of the final amount due under the Contract and the adjustment and payment for any work done in accordance with any alterations of the same, shall release the City, the City Council and the Engineer from any and all claims or liability on account of work performed under the Contract or any alteration thereof.

9.06 FINAL PAYMENT TO RELEASE OWNER

The acceptance by the Contractor of the final payment shall be and shall operate as a release to the City (or Owner, on private contracts) of all claims and all liability to the Contractor for all things done or performed for or relating to the work and for every act and neglect of the City and others relating to or arising out of the work, excepting only his claims, if any, for amounts withheld by the City, upon final payment. However, no payment, final or otherwise, shall operate to release the Contractor or his sureties from any obligation upon or under this Contract or the Contractor's bond.

9.07 CITY'S RIGHT TO WITHHOLD PAYMENTS

The City (or Owner, on private contracts) may withhold or nullify the whole or any part of any partial or final payment, to such extent as may reasonably be necessary to protect the City from loss on account of:

(a) Defective work not remedied, irrespective of when any such work be defective;

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

(c) Failure of the Contractor to make proper payments for labor, material, equipment, other facilities, or to subcontractors;

(d) A reasonable doubt that the work can be completed for the balance unearned; or

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

Whenever the City shall, in accordance herewith, withhold any monies otherwise due the Contractor, written notice of the amount withheld and the reason therefore shall be given to the Contractor; and when the Contractor shall remove the grounds for such withholding, the City shall promptly pay to the Contractor the amount withheld.

9.08 SECURITIES MAY SATISFY WITHHOLDING REQUIREMENT

In accordance with Government Code Section 4590, the provisions of Subsections 9.04 and 9.05 of these Specifications, pertaining to the retaining of 10 percent of the Contract price, may, at the Contractor's request and expense, be satisfied by depositing with the City, or a state or federally chartered bank as escrow agent, eligible securities equivalent to the amount to so be retained. Securities eligible for investment include those listed in California Government Code Section 16430 and bank and savings and loan certificates of deposit. The escrow agent shall pay such securities to Contractor upon satisfactory completion of the Contract. The Contractor shall be the beneficial owner of such securities and shall receive any interest thereon.

Any escrow agreement entered into pursuant to Section 4590 of the Government Code shall contain, as a minimum, the following provisions:

(a) The amount of securities to be deposited;

(b) The terms and conditions of conversion to cash in case of the default of the Contractor;

(c) A provision that the City shall not be prevented from withdrawing or converting said securities, as required to complete the Contract as a result of Contractor's default, except by court order; and

(d) The termination of the escrow upon final acceptance of the work by the City.

9.09 DATE OF PAYMENTS

Payment requests shall be submitted by the Contractor no later than the 20th day of the month, for work completed or materials furnished prior to that date. The City will make payment no later than the 5th day of the following month, when such payment will become due and payable. Payment requests submitted after the 20th day of the month will not be processed for payment in the following month, but will be processed for payment in the next succeeding monthly payment period, when such payment will become due and payable.

9.10 PAYMENT FOR EXTRA WORK

Extra work as previously defined in Subsection 2.03 of these Specifications, when ordered and accepted, shall be paid for under a written work order in accordance with the terms therein provided. Payment for extra work will be made at the unit price or lump sum previously agreed upon by the Contractor and the City (or Owner, on private contracts), or by force account.

When extra work is to be paid for on a force account basis, the Contractor shall receive the actual cost of all materials furnished by him as shown by his paid vouchers, plus 15 percent for overhead and profit, and for all labor and equipment that are necessary he shall receive the current prices in the locality, which shall have been previously determined and agreed to in writing by the Engineer and by the Contractor, plus 15 percent for overhead and profit. The price paid for labor by the Contractor shall include all payments imposed by State and Federal laws. The City reserves the right to furnish any material, equipment or labor deemed expedient, and the Contractor shall have no claim for overhead and profit on the cost of such City furnished materials, equipment or labor.

The Contractor shall maintain his records in such a manner as to provide a clear distinction between the direct costs of extra work paid for on a force account basis and the costs of other operations. The Contractor shall submit to the Engineer at the end of each day's work, in duplicate, an itemized report of labor, material, and equipment used in the performance of the work on that day, to be paid for on a force account basis. Such daily report, once agreed upon, shall be signed by the Contractor and the Engineer (or Inspector) and shall become the basis of payment for the work performed. Should there be any disagreement by the Inspector in the itemized report, he shall so state thereon before signing, and the Engineer will, after examining the evidence, make a judgement as to the amount of labor, material and equipment to be allowed for payment.

The Contractor shall calculate weekly on fully itemized reports 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. Such weekly reports shall be submitted to the Engineer in a timely manner, and once reviewed and approved by the Engineer, will be utilized in progress estimates and final estimates for payment purposes.

Payment as provided herein shall constitute full compensation to the Contractor for performance of extra work, and no additional compensation will be allowed therefor.

SECTION 10 - LABOR AND PREVAILING WAGES

10.01 GENERAL

The Contractor shall observe State and other laws governing labor; he shall carry compensation and Employer's Liability Insurance under the Workmens' Compensation Statute of the State; and upon request, he shall show proper evidence thereof covering all his labor.

Only competent workmen shall be employed on the work. Any person employed or subcontractor who is found to be incompetent, intemperate, troublesome, disorderly or otherwise objectionable, or who fails or refuses to perform his work properly and acceptably, shall be immediately removed from the work by the Contractor and not be reemployed on the work. All labor shall be especially skilled for each kind of work, and under the direction of a competent foreman, regardless of the kind and quality of material specified.

10.02 LABOR DISCRIMINATION

No discrimination shall be made in the employment of persons upon public works because of the race, color, or religion of such persons; and every Contractor for public works violating this section is subject to all the penalties imposed for a violation of Chapter 1 of Part VII, in accordance with the provisions of Section 1735 of the Labor Code.

10.03 HOURS OF LABOR

Eight hours constitutes a legal day's work. The Contractor shall forfeit, as a penalty to the City, twenty-five dollars ($25.00), or such other amount as may be hereafter specified in Section 1813 of the Labor Code, 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 Labor Code, and in particular, Sections 1810 to 1815 thereof, inclusive, except that work performed by employees of Contractors in excess of 8 hours per calendar day and 40 hours during any one calendar week, shall be permitted upon compensation for all hours worked in excess of 8 hours per calendar day at not less than one and one-half times the basic rate of pay, as provided in said Section 1815. Reference is made to Subsection 10.05 regarding payroll records.

10.04 PREVAILING WAGES

In accordance with the provisions of Section 1770 of the Labor Code, the Director of the Department of Industrial Relations of the State of California has determined the General Prevailing Rates of wages and employer payments for health and welfare, pension, vacation, travel time and subsistence pay, as provided for in Section 1773.8, apprenticeship or other training programs authorized by Section 3093, and similar purposes applicable to the work to be done.

A listing of said wages and employer payments are on file with the Clerk of the Board of Supervisors of Kings County, and are incorporated herein by reference, pursuant to Subsection 1773.2 of the Labor Code. The Engineer shall furnish the Contractor a copy of the above mentioned wage rates and employer payments and such copy shall be posted by the Contractor at the job site where it will be available to any interested party.

Any error in information furnished by the City does not relieve the Contractor from responsibility for payment of the prevailing rate of per diem wages and penalties pursuant to Labor Code Subsection 1770-1775.

The wages and employer payments to be paid for a day's work to all classes of laborers, workmen, or mechanics on the work contemplated by this Contract, shall be not less than the prevailing rate of pay for wages and employer payments for a day's work in the same trade or occupation in the locality within the State where the work hereby contemplated is to be performed, as determined by the Director of Industrial Relations. Each laborer, workman, or mechanic employed by a Contractor or by any subcontractor shall receive the wages and employer payments herein provided for. The Contractor shall pay twenty-five dollars ($25.00), or such other amount as may be hereafter specified by the Labor Code, per day penalty for each worker paid less than the prevailing rate of per diem wages. The difference between the prevailing rate of per diem wages and wage paid in each work shall be paid by the Contractor to each worker.

10.05 PAYROLL RECORDS

Each Contractor and subcontractor shall keep an accurate payroll record, showing the name, address, social security number, work week, and the actual per diem wages paid to each

journeyman, apprentice, worker, or other employee employed by him in connection with the public work. Such records shall be certified and available for inspection at all reasonable hours at the principal place of the Contractor as required by Labor Code Section 1776.

In addition, if specified in the Specifications, or if requested by the Engineer, certified copies of any payrolls shall be submitted within ten (10) calendar days following the close of the Contractor's or subcontractor's normal pay period or periods.

10.06 APPRENTICES

The Contractor agrees to comply with Chapter 1, Part 7, Division 2, Subsection 1777.5, et seq., of the California Labor Code. These sections require Contractors and subcontractors to employ apprentices in apprenticable occupations in a ratio of not less than one apprentice for each 5 journeymen (unless an exception is granted in accordance with Subsection 1777.5), and that Contractors and subcontractors shall not discriminate among otherwise qualified employees as apprentices solely on the ground of sex, race, religion, creed, national origin, ancestry or color. Only apprentices, as defined in Section 3077, who are in training under apprenticeship standards and who have written apprentice agreements will be employed on public works in apprenticable occupations.

The Contractor, or any subcontractor, who employs journeymen or apprentices in any apprenticable craft or trade and who is not contributing to a fund or funds to administer and conduct the apprenticeship program in any such craft or trade in the area of the site of the public work, to which fund or funds other Contractors in the area of the site of public work are contributing, shall contribute to the fund or funds in each craft or trade in which he employs journeymen or apprentices on the public work in the same amount or upon the same basis and in the same manner as the other Contractors do, but where the trust fund administrators are unable to accept such funds, Contractors not signatory to the trust agreement shall pay a like amount to the California Apprenticeship Council.

The responsibility for compliance with these provisions is fixed with the prime Contractor for all apprenticable occupations.

Information relative to number of apprentices, identification, wages, hours of employment and standards of working conditions shall be obtained by the Contractor from the Director of the Department of Industrial Relations of the State of California.

SECTION 11 - CLEARING AND GRUBBING

11.01 GENERAL

Clearing and grubbing shall consist of the removal and disposal of all objectionable materials, roots, existing concrete and other obstructions as indicated, within the limits of the project, as required by the Plans and Specifications and as directed by the Engineer.

11.02 PRESERVATION OF PROPERTY

Whether shown on the Plans or not, existing improvements, adjacent property, utility and other facilities, and trees and plants that are not to be removed shall be protected from injury or damage resulting from the Contractor's operations. Only trees and plants that are designated or marked for removal by the Engineer shall be removed.

Reference is made to Subsections 6.03 and 7.06 of these Specifications.

The Contractor shall make such investigations and examinations as are required to determine the existence and locations of all pipes, conduits, and other underground improvements and shall consult with and advise the owners of the utilities before undertaking any work that might endanger them.

The Contractor shall assume full responsibility for any damage to pipes, conduits, poles, or any other structures or utilities. He shall not make any claim for inconvenience, delay or added cost of performing the work which may be attributed in any degree to inaccuracy of information furnished by the City of Avenal relative to the locations, sizes, dimensions, depths, and character of any pipes, conduits, poles or other structures and utilities.

Existing survey monuments and stakes shall be fully protected from damage or displacement and they shall not be disturbed unless directed by the Engineer.

11.03 OPERATIONS

Unless otherwise specified, the entire area within the project limits shall be cleared and grubbed by the Contractor. No payment will be made to the Contractor for clearing and grubbing outside these limits, unless such work is authorized by the Engineer.

All of the work shown on the Plans and included in these Specifications that is located in public streets and alleys of the City of Avenal shall be done in accordance with City ordinances regulating the use of public streets and alleys within the City, except as otherwise provided herein.

The Contractor shall inform himself as to all regulations and requirements of the City of Avenal and shall conduct his operations in compliance therewith.

Within the limits of clearing, all stumps, large roots, buried logs, and all other organic material shall be removed 3 feet below the existing ground surface or 6 feet below finished grade, whichever is deeper.

Trees designated for removal shall be removed in such a manner as not to injure standing trees, plants, and improvements which are to be preserved. Tree branches extending over the roadway which interfere with the work shall be trimmed in a workmanlike manner by the Contractor at the direction of the City Engineer.

All concrete, asphalt-concrete and oil dirt within the right of way shall be removed by the Contractor unless designated to remain on the Plans.

Where a portion of an existing concrete facility is to be removed, it shall be cut to a minimum depth of 1¦ inches with an abrasive type saw at the first scoring line at or outside the planned joint and removed without damage to any portion that is to remain in place. If curbs and gutters cannot be cut off square and neat, the entire curb and gutter shall be removed to the nearest weakened plane or expansion joint. No patching at expansion joints will be permitted.

Where existing house foundations and floor slabs overlap into the project area, the whole foundation shall be removed. The portion beyond and outside the project area will be considered within the project area and included in the bid price of clearing and grubbing.

Existing manholes, drain wells, drainage structures, structures and headwalls to be abandoned shall be removed to at least 3 feet below finish grade, their bottom (if any remain) broken to prevent entrapment of water and the resulting void backfilled with soil and compacted. When existing pipes (or structures with pipes) are to be abandoned, the ends of all pipes shall be plugged with a wall of concrete not less than 0.5 foot thick.

All traffic signs and street signs within the limits of the improvement, if required, shall be removed, salvaged and

stockpiled at locations designated by the Engineer. The Contractor shall install (and ultimately remove) temporary traffic control devices, if required, at locations designated by the Engineer. Traffic control signs and street signs previously removed and salvaged shall be replaced upon completion of the work, and the cost of removal, replacement and temporary devices shall be included in the clearing and grubbing work.

11.04 REMOVAL AND DISPOSAL OF MATERIALS

All materials removed shall be lawfully disposed of by the Contractor at disposal sites outside the right-of-way. Reference is made to Subsection 7.08 of these Specifications.

All existing materials that are designated to be salvaged shall be removed, cleaned and hauled to the City Corporation Yard, Avenal, by the Contractor.

The roadway and adjacent areas shall be left with a neat and finished appearance. No accumulation of flammable material shall remain on, or adjacent to, the right-of-way.

11.05 MEASUREMENT

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

11.06 PAYMENT

The lump sum price bid for clearing and grubbing shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved in clearing and grubbing as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer, including the removal and disposal of all the resulting materials. Unless otherwise provided, all concrete removal shall be included in clearing and grubbing.

When the Contract does not include a pay item for clearing and grubbing as above specified, and unless otherwise provided in the Special Provisions, full compensation for any necessary clearing and grubbing required to perform the construction operations specified shall be considered as included in the price bid for other various items of work and no additional compensation will be allowed therefor.

SECTION 12 - EXCAVATION AND SUBGRADE PREPARATION FOR ROADWAYS AND OTHERSURFACE IMPROVEMENTS

12.01 GENERAL

This work shall consist of all excavation, grading, removal and replacement of material, placement of embankment, subgrade preparation and compaction and all other operations required in the construction of the finished earth surface for roadways and other surface improvements, including performing all operations necessary to excavate all materials, regardless of character and subsurface conditions, from the roadway prism or adjacent thereto; to excavate drainage and irrigation ditches; to excavate drainage channels; to excavate selected material from the roadway and borrow material for use as specified; to construct embankments, including the placing of selected material in connection therewith as specified; to backfill holes, pits and other depressions within the roadway area; to apply water; to remove and replace unsuitable material; to excavate and grade road approaches, driveways, and connections; to remove unstable material outside the roadway prism; to prepare basement material for the placing of other material thereon; all as shown on the Plans and as specified in these Specifications and the Special Provisions, and as directed by the Engineer; and furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work that may be required to construct and maintain the roadway facilities.

Whenever reference to finished grade is made, it shall be considered to be the finished surface of the completed facility.

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

Roadway, as used in this section, shall include alleys, easements or the sites of other surface improvement work.

12.02 TEST METHODS

Tests in connection with the work shall be made in conformance with the following:

Tests	California Test
Relative Compaction	216
Sand Equivalent	217
Resistance (R Value)	301
Sieve Analysis	302

Reference is made to Subsections 5.03 and 5.07 of these Specifications.

12.03 GRADE TOLERANCE

The finished grading plane shall conform to the following:

1. Where no subsequent layers of materials are to be placed thereon, the grading plane at any point shall not vary more than 0.10 foot above or below the grade established by the Engineer.

2. Where subsequent layers of materials are to be placed thereon, immediately prior to placing said materials the grading plane at any point shall not vary more than 0.05 foot above or below the grade established by the Engineer.

All cut slopes shall be rounded.

12.04 IMPORTED BORROW

The Contractor, at his expense, shall make his own arrangements for obtaining imported borrow and he shall pay all costs involved.

Imported borrow shall be of a quality suitable for the purpose intended, free of vegetable matter or other unsatisfactory material, and shall have a minimum R value of 55. All imported borrow shall be subject to the approval of the Engineer. The Contractor shall supply to the City, at the Contractor's expense, test results required by the Engineer to determine the suitability of any borrow proposed for import. These tests will be required at the original site of the proposed borrow material and also at the delivery site. The Contractor shall remove, at the Contractor's expense, any borrow placed which fails to meet the approval of the Engineer.

12.05 SELECT FILL

Select fill shall be defined as material which is excavated from a location within the right of way as designated by the Engineer and placed at the locations indicated on the Plans.

Select fill shall be placed in conformance with this Section 12.

12.06 CONSTRUCTION

The Contractor shall provide excavation, placement and compaction of embankment, grading, and preparation of subgrade to construct the roadway or other surface improvement to conform to the line, grade and cross-section shown on the Plans, or as

directed by the Engineer. Unless otherwise indicated, unsuitable or surplus excavated material shall be disposed of by the Contractor in accordance with Subsection 7.08 of these Specifications. If the quantity of acceptable material from the excavation is not sufficient to construct the embankments required by the work, the quantity of material needed to complete the embankments shall consist of imported borrow in conformance with Subsection 12.04 of these Specifications.

Embankments shall be constructed in layers. The loose thickness of each layer of embankment material before compaction shall not exceed 0.67 foot. Except as herein provided otherwise for the top 0.50 foot of subgrade, all embankment shall have a relative compaction of no less than 90 percent. Areas to receive embankment construction shall first be cleared of all debris, bushes, weeds, stumps, or other deleterious material, in accordance with Section 11 of these Specifications. If embankment material is to be placed on existing slope areas, the existing surface shall be plowed or scarified to produce a bond with the material to be placed.

Reference is made to Subsections 6.03 and 7.06 of these Specifications, relative to protection of utilities and preservation of property.

The subgrade to receive aggregate base or subbase, or asphalt-concrete, shall be prepared as follows:

The soil material shall be bladed or disced to a depth of 0.50 foot and all rocks, hardpan chunks or otherwise unsuitable material over 2.5 inches in size, shall be removed and disposed of off the project site.

The material thus disced or bladed shall be thoroughly mixed, watered and rolled to a relative compaction of not less than 95 percent.

Any soft, spongy or otherwise unstable areas shall be repaired by completely removing the material and replacing it with acceptable materials in accordance with these Specifications, at the Contractor's expense. Before aggregate base or asphalt-concrete paving is placed, the Engineer may require, at the Contractor's expense, a test roller of size and weight as approved by the Engineer to pass over the finished subgrade to ascertain that there are no such soft or spongy areas.

No aggregate base or asphalt-concrete paving shall be placed until the finished subgrade is in a stable condition satisfactory to the Engineer, regardless if said subgrade passed any prior compaction test.

Compacting shall extend to and include all areas where concrete improvements are to be constructed. The relative compaction of the top 0.50 foot of soil material under curb and/or gutter, under driveway approaches and under valley gutters shall be no less than 90 percent. The top 0.50 foot of subgrade under sidewalks shall have a relative compaction of no less than 90 percent. The cost of subgrade preparation and compaction under concrete improvements will be included in the respective bid items for concrete improvements.

No compaction test of subgrade shall be made until such time as the subgrade is finished to within 0.10 foot of finished subgrade. The Contractor shall notify the Engineer when the subgrade is ready for compaction testing, and the City Engineer will notify the appropriate testing laboratory designated to perform such tests. The Engineer shall specify the locations where compaction tests are to be made.

No excavation shall be made below the plane of the bottom of the curb and gutter subsequent to installing curb and gutter until backfill has been placed behind the curb.

Reference is made to Subsection 16.04 of these Specifications relative to adjusting existing facilities to finish grade.

12.07 LIME TREATMENT

Lime treatment of subgrade, including furnishing lime, mixing, spreading and compacting, and furnishing and placing curing seal, shall be provided by the Contractor at the locations indicated on the Plans or directed by the Engineer. Lime treatment of subgrade shall conform to Section 24 of the State Standard Specifications, except for the following:

1. Lime shall be high-calcium hydrated lime.

2. Removing and disposing of rocks or solids larger than 2.5 inches will not be paid for as extra work.

3. No reduction in 95 percent relative compaction requirement will be allowed for increase in lime content.

4. The curing seal shall be applied at the rate of 0.10 gallons per square yard of surface.

5. Subsection 24-1.07, Measurement, and Subsection 24-1.08, Payment, of the State Standard Specifications are hereby deleted.

12.08 MEASUREMENT

Measurement of excavation and subgrade preparation for roadways and other surface improvements will be by the cubic yard. The quantity will be the estimated "cut" required to excavate to the grading plane, including the volume of any existing surfacing or base materials but not including the volume of existing concrete work.

Measurement of imported borrow will be by the cubic yard, in place in the work and compacted.

Measurement of select fill will be by the cubic yard, in place in the work and compacted.

Measurement of lime treatment will be by the square yard of surface treated.

12.09 PAYMENT

The unit price bid per cubic yard for excavation and subgrade preparation for roadways and other surfaces (or roadway excavation) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. Placement of embankment and the preparation therefor is also included in this bid item.

The unit price bid per cubic yard for imported borrow shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer.

The unit price bid per cubic yard for select fill shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved in special handling and placement thereof, as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer.

The unit price bid per square yard for lime treatment shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. Included in this item will be furnishing lime; mixing, spreading and compacting; and furnishing and placing curing seal.

SECTION 13 - AGGREGATE SUBBASES AND BASES

13.01 GENERAL

This work shall consist of furnishing, spreading and compacting aggregate subbases and/or aggregate bases on a prepared subgrade or subbase, in conformance with the lines, grades, cross-sections and dimensions shown on the Plans, Standard Drawings and as hereinafter specified.

13.02 MATERIALS

Aggregate for subbases and bases, at the time they are deposited on the roadbed, shall be as follows:

1. Aggregate subbases shall be Class 2 conforming to Subsection 25-1.02A of the State Standard Specifications.

2. Aggregate bases shall be Class 2 with grading for 3/4 inch maximum aggregate, conforming to Subsection 26-1.02B of the State Standard Specifications.

13.03 SUBGRADE

The subgrade to receive aggregate subbase or aggregate base, immediately prior to spreading, shall conform to the compaction and elevation tolerance specified for the material involved and shall be free of loose or extraneous material. No aggregate subbase or aggregate base shall be placed until the subgrade has been tested, inspected and approved by the Engineer.

13.04 SPREADING AND COMPACTING

Aggregate subbases or aggregate bases shall be delivered to the roadbed as uniform mixtures, in separate operations. Each mixture shall be deposited and spread to the required compacted thickness by means which will maintain the uniformity of the mixture. Each layer shall be free from pockets of coarse or fine material.

Where the required thickness is 0.50 foot or less, the subbase or base material may be spread and compacted in one layer. Where the required thickness is more than 0.50 foot, the subbase or base material shall be spread and compacted in 2 or more layers of approximately equal thickness, and the maximum compacted thickness of any one layer shall not exceed 0.50 foot.

Aggregate subbases or aggregate bases, placed on road approaches and connections, street intersection areas, median strip areas, shoulder areas, and at locations which are inaccessible to the spreading equipment, may be spread in one or more layers by any means to obtain the specified results.

When the subgrade for aggregate subbase or aggregate base consists of cohesionless sand, and written permission is granted by the Engineer, a portion of the aggregate base may be dumped in piles upon the subgrade and spread ahead from the dumped material in sufficient quantity to stabilize the subgrade. Segregation of aggregate shall be avoided and each layer shall be free from pockets of coarse or fine material.

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

The relative compaction of each layer of compacted aggregate material shall be not less than 95 percent.

The surface of the finished aggregate subbase or aggregate base at any point shall not vary more than 0.05 foot above or below the grade established by the Engineer.

13.05 ADDITIONAL THICKNESS

In the event that soil conditions are encountered such that a satisfactory subgrade, subbase or base for pavement may not be obtained, the material lying below the subgrade shall be removed and the additional aggregate subbase or aggregate base material, as directed by the Engineer, shall be placed in accordance with the provisions of this section.

Measurement and payment for such additional roadway excavation, additional aggregate subbase or additional aggregate base shall be at the units of measure and unit prices bid for roadway excavation, aggregate subbase and/or aggregate base.

13.06 MEASUREMENT

Measurement of aggregate subbases and aggregate bases will be by the ton.

In conformance with Subsection 9.01 of these Specifications, the Contractor shall be responsible for furnishing the Engineer with a certified daily record of the weight of all said material which has been delivered to the project site. Said record shall become the basis of measurement for the materials itemized therein. In addition, each delivery truck shall carry to the project site a load slip for the material transported in said truck. The load slip shall be delivered to the Engineer by the

driver at the time and site of delivery of the truck load of material covered by the load slip.

13.07 PAYMENT

The unit price bid per ton for aggregate subbase shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer.

The unit price bid per ton for aggregate base shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer.

SECTION 14 - ASPHALT CONCRETE PAVEMENT

14.01 GENERAL

This work shall consist of furnishing and mixing aggregate and asphalt binder at a central mixing plant and spreading and compacting the mixture in accordance with Section 39 of the State Standard Specifications (as modified herein), as shown on the Plans and as indicated by the Engineer. The work shall also include furnishing and placing paint binder and seal coat, and furnishing and constructing asphalt-concrete dikes where shown on the Plans.

14.02 ASPHALT-CONCRETE MATERIALS

Asphalt-concrete shall be Type B, furnished, mixed and proportioned in accordance with Subsections 39-2 and 39-3 of the State Standard Specifications.

The asphalt binder to be mixed with aggregate shall be steam-refined asphalt conforming to the provisions of Section 92 of the State Standard Specifications, and shall be viscosity grade AR 8000 when the ambient temperature is 75' F or above, or viscosity grade AR 4000 when the ambient temperature is below 75' F, or as directed by the Engineer.

Aggregate material shall conform to the specifications and grading requirements of Subsection 39-2.02 of the State Standard Specifications for 3/4 inch maximum aggregate (medium) or 1/2 inch maximum aggregate (medium). Where a thickness of more than 2 inches of asphalt concrete is required, the first course shall be 3/4 inch maximum aggregate (medium) and the final course shall be 1/2 inch maximum aggregate (medium). Where a thickness of 2 inches or less of asphalt-concrete is required, the gradation shall conform to 1/2 inch maximum aggregate (medium).

14.03 PAINT BINDER

A paint binder of asphaltic emulsion shall be furnished and applied in accordance with the provisions of Section 94 of the State Standard Specifications and shall be applied to all vertical surfaces of existing pavement, curbs, gutters, and construction joints in the surfacing against which additional material is to be placed, to a pavement to be surfaced, and to other surfaces designated by the Engineer, in conformance with Subsection 39-4.02 of the State Standard Specifications.

Paint binder shall be applied in one application at a rate of from 0.02 to 0.10 gallon per square yard of surface covered. The exact rate of application will be determined by the Engineer.

14.04 SPREADING AND LAYING ASPHALT-CONCRETE

Prior to placement of asphalt-concrete, the base shall be inspected for any unsuitable areas. All unsuitable areas shall be removed and replaced as determined by the Engineer.

Asphalt-concrete shall be placed, spread and compacted in conformance with Subsections 39-5 and 39-6 of the State Standard Specifications, and as specified herein. Except on small, difficult and/or unique areas where the Engineer determines the use thereof to be impracticable, a self propelled paving machine shall be utilized for spreading and placing asphalt-concrete material.

Except where the Engineer determines the use thereof to be impracticable (such as on very short or irregular sections), spreading and placing equipment utilized in the work shall be equipped with fully automatic screed and grade sensing controls, which shall control the longitudinal grade and transverse slope of the screed. Automatic controls shall conform to, and be operated in accordance with, the following provisions:

Ski-type devices, with a minimum length of 30 feet, shall be used to provide a reference for the grade sensor. Skis shall be constructed and installed in such a manner that a reference to the average elevation of the existing pavement, along the length of the ski, is maintained at the sensor point. When placing surfacing adjacent to surfacing previously placed in conformance with these provisions, a joint matching shoe, of adequate size and type to properly sense the grade of the previously placed mat, may be used in lieu of the 30 foot ski upon approval by the Engineer. This shall be mounted at a location which shall provide an accurate reference for the surfacing being placed. This may require the ski to be mounted ahead of, and inside the outer limits of the screed. Automatic cross-slope control shall be accomplished by use of a ski and grade sensor on each side of the paving machine.

Automatic screed controls shall be installed in such a manner that the occasional manual adjustments, necessary to maintain the attitude of the screed parallel to the underlying pavement, can be readily accomplished, and so that with little or no delay, use of the automatic controls can be discontinued and the screed controlled by manual methods.

Should the automatic screed controls fail to operate properly during any day's work, the Contractor may use manual control of the spreading equipment for the remainder of that day, provided the quality of the work conforms to the requirements of Subsection 39-6.03 of the

State Standard Specifications. Should the methods and equipment used for the automatic control fail to result in the said quality of work, the paving operations shall be temporarily discontinued and the Contractor shall either make the necessary changes to the equipment or furnish other equipment conforming to the requirements specified herein, before paving is resumed.

If it is determined by the Engineer that the existing grade and cross-slope is too irregular for the automatic controls to provide either the quality of work required or to provide adequate control of the material, the use of the automatic controls shall be discontinued and the spreadingequipment adjusted by manual methods. Use of the automatic equipment shall be resumed when the Engineer has determined that it is again practical and so orders.

Asphalt-concrete shall be spread and compacted in layers, as set forth in Subsection 39-6.01 of the State Standard Specifications. Compacting and tolerances shall conform to Subsection 39-6.03 of the State Standard Specifications.

14.05 ASPHALT-CONCRETE DIKES

Asphalt-concrete for dikes shall be as specified in Subsection 14.02 of these Specifications. Asphalt-concrete dikes shall be constructed as shown on the Plans and directed by the Engineer. Dikes shall be shaped and compacted with an extrusion machine or other equipment capable of shaping and compacting the material to the required cross-section. Asphalt-concrete for dikes may be spread in one layer.

14.06 SEAL COAT

A fog seal coat of asphaltic emulsion shall be applied to all newly paved street surfaces in accordance with Subsections 37-1.01 through 37-1.05 of the State Standard Specifications. The seal coat shall be applied within 7 to 14 days after paving, weather permitting.

14.07 MEASUREMENT

Measurement of asphalt-concrete will be by the ton.

In conformance with Subsection 9.01 of these Specifications, the Contractor shall be responsible for furnishing the Engineer with a certified daily record of the weight of all asphalt-concrete material which has been delivered to the project site. Said record shall become the basis of measurement for asphalt-concrete pavement, or asphalt-concrete surfacing. In addition, each delivery truck shall carry to the project site a load slip for the material transported in said truck. The load slip shall be delivered to the Engineer by the driver at

the time and site of delivery of the truck load of material covered by the load slip.

Measurement of asphalt-concrete dikes will be by the lineal foot along the completed dike. In addition, the material utilized in constructing the dike will be included in the measurement for asphalt-concrete surfacing.

14.08 PAYMENT

The unit price bid per ton for asphalt-concrete surfacing shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. Full compensation for all costs involved in furnishing and applying paint binder and fog seal coat shall also be included in the amount bid for asphalt-concrete surfacing, and no separate measurement and payment will be made for furnishing and applying paint binder or fog seal coat.

The unit price bid per lineal foot for asphalt-concrete dike, together with the unit price bid per ton for asphalt-concrete surfacing, in combination, shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved in furnishing and installing asphalt-concrete dike as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. Full compensation for any necessary excavation and backfill involved in undercutting cut slopes for constructing dikes will be considered as included in the Contract price paid per lineal foot for asphalt-concrete dike and no additional compensation will be allowed therefor.

The provisions of Subsections 39-8.01 and 39-8.02 of the State Standard Specifications shall not apply.

SECTION 15 - CONCRETE SURFACE IMPROVEMENTS

15.01 GENERAL

This work shall consist of constructing concrete curbs, gutters, curb depressions, sidewalks, wheelchair ramps, driveway approaches, alley approaches, valley gutters, mowstrips and median caps of the form and dimensions shown on the Plans and Standard Drawings, as set forth in the Specifications and as directed by the Engineer.

All the aforementioned concrete improvements shall be constructed by using fixed forms, except that curbs, gutters, curb depressions and valley gutters may be constructed by using an extrusion or slip-form machine.

15.02 PORTLAND CEMENT CONCRETE

Concrete shall meet the requirements of Section 90 of the State Standard Specifications. Concrete for surface improvements, with the exception of that furnished for valley gutters (reinforced or unreinforced), shall be Class A or Class B, except as hereinafter provided. Concrete for reinforced or unreinforced valley gutters shall be Class A.

For extruded or slip-formed concrete improvements, the maximum size of aggregate used shall be at the option of the Contractor, but in no case shall the maximum size be larger than 1 inch nor smaller than 3/8 inch. When extruded or slip-formed concrete improvements are constructed using a 3/8 inch maximum size aggregate, the cement content shall be not less than 564 pounds (6 sacks) per cubic yard.

15.03 REINFORCEMENT

Where the use of steel reinforcement is indicated on the Plans or Standard Drawings, it shall be furnished and installed in accordance with Section 52 of the State Standard Specifications, except that Subsections 52-1.10 and 52-1.11 are hereby deleted.

15.04 SUBGRADE PREPARATION

Reference is made to Subsection 12.06 of these Specifications.

The subgrade shall be constructed true to grade and cross-section, as shown on the Plans or directed by the Engineer. It shall be thoroughly watered and rolled or hand tamped to obtain a relative compaction of no less than 95 percent under curbs and/or gutters, under driveway approaches and under valley gutters, and a relative compaction of no less

than 90 percent under sidewalks, mowstrips and concrete median caps prior to placing the concrete. All soft or spongy material shall be removed to a depth of not less than 0.5 foot below subgrade elevation for curbs, gutters, valley gutters and driveways and 0.25 foot below for caps, mowstrips, sidewalks and wheelchair ramps, and the resulting space filled with earth, sand or gravel of a quality that when moistened and compacted will form a stable foundation.

The subgrade and forms shall be wet immediately in advance of placing concrete.

15.05 CONSTRUCTION

Concrete shall not be placed on frozen or ice-coated ground or subgrade nor on ice-coated forms, reinforcing steel, structural steel, conduits, precast members, or construction joints. Under rainy conditions, placing of concrete shall be stopped before the quantity of surface water is sufficient to damage surface mortar or cause a flow or wash of the concrete surface, unless the Contractor provides adequate protection against damage. All concrete that has been frozen, or damaged by other causes, as determined by the Engineer, shall be removed and replaced by the Contractor at his expense.

Fixed form construction shall conform to Subsections 73-1.04, 73-1.05A and 73-1.06 of the State Standard Specifications, and as set forth herein. Extruded or slip-formed construction shall conform to Section 73-1.05B of the State Standard Specifications, and as set forth herein. The extrusion machine shall go no faster than the curb and/or gutter or valley gutter can be finished using good workmanlike practices.

Construction joints shall be as shown on the Standard Drawings, or as herein specified for both fixed form and extruded or slip-formed construction, as follows:

Expansion joints for curbs and gutters, sidewalks, mowstrips, valley gutters and median caps shall be constructed at no greater than 45 foot intervals, and at the ends of curb returns. Expansion joints for curbs and gutters shall also be constructed on each side of curb depressions for driveway approaches. Expansion joints for sidewalks shall also be constructed on each side of driveway approaches. Expansion joints for fence mowstrips shall occur at post locations. All expansion joints shall be tooled with a 1/4 inch maximum radius edger, and filled with 1/4 inch thick premolded joint filler conforming to ASTM Specification Designation D1751.

Weakened plane joints shall be placed at 15 foot intervals, except that for mowstrips they shall be placed at each post location not having an expansion joint.

Weakened plane joints may be made by the use of plastic materials. Plastic weakened plane joint material shall be at least 1 inch deep, T-shaped 1/16 inch thick plastic strip, with a minimum 3/4 inch wide pull-top stiffener. This plastic strip shall have a suitable anchor to prevent vertical movement. After preliminary troweling, the concrete shall be parted to a depth of approximately 2 inches with a joint knife or a thin metal straight edge. The plastic strip shall then be inserted in the impression so that the upper surface of the pull-top stiffener is flush with the concrete, and the pull-top stiffener shall be immediately peeled off. After the pull-top is removed, the concrete shall be floated to fill all voids adjacent to the strip. During final troweling, the edges at plastic control joints shall be finished to a radius not to exceed 1/8 inch using a slit jointer tool. The finished joint opening shall not be wider than 1/8 inch exclusive of radii.

The above spacing for construction joints shall be required in lieu of the spacing indicated in Section 73 of the State Standard Specifications.

Mowstrips may not be poured monolithically with sidewalks or other concrete improvements.

The surface of sidewalks, wheelchair ramps and driveway approaches shall be scored as shown on the Standard Drawings or as directed by the Engineer, utilizing a scoring tool which will leave the edges rounded.

Where steel dowels are set forth on the Plans to anchor proposed concrete curbs to existing pavement, adhesives may not be substituted therefor.

15.06 FINISH

Immediately upon stripping curb forms and prior to backfill, all rock pockets or honeycombs shall be repaired to the satisfaction of the Engineer.

Finish of concrete surface improvements shall be free from blemishes and shall be as follows:

Curbs - Trowel smooth and finish with a light brush

Sidewalks and mowstrips - Medium sweat finish

Gutters, valley gutters and median caps - Finish with medium broom

Driveway approaches - Finish with a medium broom, except wings shall be finished with a light broom and sidewalk area to receive a medium sweat finish

Handicap ramps - Finish as indicated on the Standard Drawings

Broomed surfaces to be used by pedestrian traffic shall be broomed transverse to the line of traffic.

15.07 TOLERANCES

The top and face of finished curbs 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 straightedge 10 feet long is laid on the top or face of the curb or on the surface of gutters, or valley gutters, the surface shall not vary more than 0.01 foot from the edge of the straightedge, except at grade changes or curves.

The surface of sidewalks, wheelchair ramps, driveway and alley approaches, mowstrips and median caps shall not vary more than 0.02 foot from a 10 foot straightedge, except at grade changes.

15.08 CURING

All surface concrete improvements shall be cured by application of an approved curing compound in conformance with the requirements of Subsection 90-7.01B of the State Standard Specifications.

15.09 BACKFILLING

After removal of forms, the area adjacent to the newly constructed concrete improvement shall be cleaned of all surplus concrete and other debris and the area filled with clean earth suitable for planting (except in front of the gutter). Backfill shall be placed behind the curb prior to any excavation in the street area below the plane of the bottom of curb and gutter.

Where there is a planter strip between the curb and the sidewalk, the planter strip shall be filled to within 1.5 inches of the top of curb and sidewalk with clean earth suitable for planting. The area of traffic divider (median) islands not to be capped with concrete shall be backfilled with clean earth suitable for planting to within 2 inches of a line extending between adjacent tops of curb.

15.10 MEASUREMENT

Quantities of concrete curb, concrete gutter, concrete curb and gutter, and concrete mowstrip shall be measured by the lineal foot. Curb depressions will be included in the measurement of length of concrete curb, or concrete curb and gutter, as the case may be.

Quantities of concrete sidewalks and wheelchair ramps, concrete driveway approaches, concrete alley approaches, concrete valley gutters and concrete median caps shall be measured by the square foot. Measurement of concrete driveway approaches and concrete alley approaches shall be made from the back of the curb to the back of the approach.

15.11 PAYMENT

The unit prices bid per lineal foot for concrete curb, concrete gutter, concrete curb and gutter, and concrete mowstrip shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer, including subgrade preparation.

The unit prices bid per square foot for concrete sidewalks and wheelchair ramps, concrete driveway approaches, concrete alley approaches, concrete valley gutters and concrete median caps shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer, including subgrade preparation. Compensation for reinforcement required for concrete valley gutters shall be included in the amount bid for concrete valley gutters.

SECTION 16 - MISCELLANEOUS STREET IMPROVEMENTS

16.01 GENERAL

This work shall consist of constructing miscellaneous street improvements, including redwood header boards, survey monument wells, and adjusting existing facilities to finish grade, all as shown on the Plans and/or Standard Drawings, as set forth in the Specifications and as directed by the Engineer.

16.02 REDWOOD HEADER BOARDS

Redwood header boards shall be 2 inches wide by 6 inches deep (nominal measurement), furnished and installed by the Contractor at all locations indicated on the Plans and Standard Drawings.

Header boards and stakes shall be construction heart redwood, rough graded in accordance with the current Standard Specifications for structural grades of California redwood approved by the Board of Review, American Lumber Standards Committee and published by the Redwood Inspection Service. All material shall be well manufactured. Only pieces consisting of sound wood, free from decay, will be accepted in the work.

Header boards shall be set to line and grade and securely staked to prevent movement with 1 inch by 4 inch redwood stakes, 18 inches in length, at a maximum of 5 foot spacing. Stakes shall be nailed to the header with a minimum of 4 each 8 penny galvanized nails per stake.

Measurement for 2 inch by 6 inch redwood header board will be by the lineal foot, as measured along the length of the header board. The unit price bid per lineal foot for 2 inch by 6 inch redwood header board shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer.

16.03 SURVEY MONUMENT WELLS

Survey monument wells shall be furnished and installed at the locations indicated on the Plans, and as directed by the Engineer. The survey monument well shall be furnished and constructed in conformance with Standard Type D, Alternate 2 of the State of California, Department of Transportation Standard Plans, dated July, 1984 (Plan A74-B, Page 14). It shall not be the Contractor's responsibility to survey and reset said monument, but it shall be the Contractor's responsibility to furnish and install the well and appurtenances.

Measurement for survey monument wells will be per each. The unit price bid per each for survey monument wells shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer.

16.04 ADJUSTING EXISTING FACILITIES TO FINISH GRADE

Existing facilities shall be adjusted to finish grade at the time of construction or reconstruction of street improvements. Such existing facilities shall include manhole frames and covers, water valve boxes and covers, water meter boxes and covers, and other similar existing facilities which must fit or match final street improvement grade.

Sewer and storm drain manhole frames and covers, and water valve boxes and covers shall be temporarily lowered below the grading plane and marked until paving has been accomplished. The manhole frames and covers, and valve boxes and covers shall then be raised to finish grade, concrete collars poured and asphalt-concrete patch placed, in accordance with the Standard Drawings and as directed by the Engineer.

Other existing facilities shall be adjusted to finish grade in accordance with the utility or facility authority involved, and as directed by the Engineer. Where the utility or facility authority involved desires to do the work with their own forces and/or materials, the Contractor shall pay all the costs associated therewith.

Quantities for adjusting existing facilities to finish grade will be measured on a lump sum basis. The Contractor shall make his own determination of the number and type of facilities to be adjusted to finish grade.

The lump sum price bid for adjusting existing facilities to finish grade shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer.

When the Contract does not include a pay item for adjusting existing facilities to finish grade as above specified, and unless otherwise provided in the Special Provisions, full compensation for any necessary adjustment of existing facilities to finish grade required shall be considered as included in the prices bid for the other various items of work and no separate payment will be made therefor.

SECTION 17 - STRIPING AND MARKING PAVEMENT

17.01 GENERAL

This work shall consist of furnishing and applying painted or thermoplastic traffic stripes (traffic lines) and pavement markings, including glass beads, and furnishing and placing raised pavement markers at the locations and in accordance with the details shown on the Plans or designated by the Engineer, and as specified in these Specifications and the Special Provisions.

For the purposes of these Specifications, traffic stripes (traffic lines) are defined as longitudinal centerlines and lanelines which separate traffic lanes in the same or opposing direction of travel, and longitudinal edgelines which mark the edge of the traveled way or the edge of lanes. Pavement markings are defined as transverse markings which include, but are not limited to, word and symbol markings, limit lines (stoplines), crosswalk lines, shoulder markings, parking stall markings, and railroad grade crossing markings. Pavement markers are raised pavement markers, reflectorized or non-reflectorized, of the type and color shown on the Plans and/or set forth in the Specifications.

17.02 MATERIALS

Thermoplastic material and glass beads shall conform to Subsection 84-2 of the State Standard Specifications.

Paint for traffic stripes and pavement markings shall conform to subsection 84- of the State Standard Specidication.

Raised pavement markers shall conform to Subsection 85-1 of the State Standard Specifications. Adhesive for raised pavement markers shall conform to Subsection 95-2.04 of the State Standard Specifications, for rapid set epoxy, or Subsection 95-2.05 of the State Standard Specifications, for standard set epoxy, as directed by the Engineer.

17.03 REMOVAL OF EXISTING MARKINGS

Where called for on the Plans and/or Specifications, existing pavement striping, symbols, legend, and markings proposed for removal shall be removed by wet sandblasting or other approved methods which will cause the least possible damage to the pavement. Dry sandblasting may be used in selected areas only with the permission of the Engineer and with approval of the air pollution control authority having jurisdiction over the area in which the work will be performed. Alternate methods of removal require prior approval of the Engineer.

Where their removal is called for on the Plans and/or Specifications, raised markers shall be removed by an approved method which will result in the least possible damage to the pavement. Where raised pavement markers are to remain, the Contractor shall take special care to protect existing reflective pavement markers and shall, at his expense, replace all coated markers.

17.04 PLACEMENT OF TRAFFIC STRIPES AND PAVEMENT MARKINGS

Preparation of surfaces and application of traffic stripe and pavement marking material shall conform to all requirements of Subsection 84-2.04 and 84-3.04 of the State Standard Specifications, and these Specifications. Tolerances and appearance shall conform to the requirements of Subsection 84-1.03 of the State Standard Specifications.

Word markings, letters, numerals, legends and symbols shall be applied utilizing suitable approved equipment together with approved stencils and templates. All markings shall be standard, and shall be identical with those used by the City of Avenal. Contractor shall borrow stencils for directional arrows and warning markings from the City of Avenal and return them in good condition.

When no previously applied figures, markings, or traffic striping are available to serve as a guide, suitable layouts shall be spotted in advance of the permanent application.

Where necessary, the Engineer will furnish the necessary control points for all required pavement striping and markings. Alignment and layout of the work by the Contractor shall conform to Subsection 84-1.02 of the State Standard Specifications. The Contractor shall provide an experienced technician to supervise the location, alignment, layout, dimensions, and application of the pavement striping and marking.

In areas of high traffic volume, the Contractor shall schedule work to apply traffic lines and markings in off-peak traffic hours, or on weekends.

The Contractor shall mark or otherwise delineate the traffic lanes in the new roadway or portion of roadway, or detour before opening it to traffic.

All markings and striping shall be protected from injury and damage of any kind while the material is drying. All adjacent surfaces shall be protected from disfiguration by spatter, splashes, spillage, and dripping of material.

The Contractor shall use proper and sufficient directional signs, warning devices, barricades, pedestals, lights, traffic cones, flagpersons, or such other devices to protect the work, workers and the public.

17.05 PLACEMENT OF RAISED PAVEMENT MARKERS

Preparation of surfaces and placement of raised pavement markers shall conform to the requirements of Subsection 85-1.06 of the State Standard Specifications, and these Specifications.

The Contractor shall provide an experienced technician to supervise the application of the raised pavement markers.

In areas of high traffic volume, the Contractor shall schedule work to apply traffic markers in off-peak traffic hours, or on weekends.

17.06 MEASUREMENT

Quantities of striping and marking pavement shall be measured on a lump sum basis, and shall also include any required removal of existing pavement striping or markings.

17.07 PAYMENT

The lump sum price bid for striping and marking pavement shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This work will also include furnishing and installing raised pavement markers where called for and removing existing markings, where called for.

SECTION 18 - TRENCH AND STRUCTURE EXCAVATION, BACKFILL, AND RESTORATION OFSURFACES

18.01 GENERAL

This work shall consist of all excavation and backfill necessary for the construction of pipelines, structures and other facilities, and the restoration of surfaces disturbed by such work, all as set forth in the Plans and Specifications, and as directed by the Engineer.

18.02 TRENCH AND STRUCTURE EXCAVATION

Excavations shall be made to the depths and widths required to accommodate construction of conduits and structures to specified dimensions, and to the lines and grades indicated on the Plans. Unless otherwise indicated on the Plans, excavations for pipe construction may be open cut.

Reference is made to Subsections 7.11, 7.12 and 7.13 of these Specifications relative to the Contractor's responsibility to comply with all Safety Orders issued by the State Division of Industrial Safety, including in particular those pertaining to the hazard of caving ground in excavations.

The Contractor shall be responsible for locating and protecting subsurface obstructions in the field, and shall notify the Engineer immediately if conflicts occur. Reference is made to Section 6 of these Specifications relative to existing utilities, and the protection thereof. The location of subsurface obstructions found in the field may necessitate a variance in the depth or alignment of proposed facilities.

When a trench or structure site is to be located in an existing oiled earth or pavement area, the existing surfacing to be removed shall be cut by methods approved by the Engineer along neat lines on each side of the trench or around the structure site. Existing surfacing, when removed, shall be kept separated from the material which is to be returned to the excavation. Failure to comply with this requirement shall be grounds for rejection of the contaminated material for use as backfill.

Material excavated from the trench shall be placed so as to offer the minimum obstructions to traffic. Reference is made to Subsections 7.06 and 7.15 of these Specifications relative to preservation of property and public convenience and safety.

Trenches shall be uniformly graded and prepared to provide a firm and uniform bearing for the entire length of the barrel of the pipe to be placed therein. Any portion of the trench excavated below the approved grade shall be corrected and brought up to grade with approved material thoroughly compacted.

Trenches bottoming in hardpan shall be excavated a minimum of 6 inches below the grade established for the bottom of the pipe and any couplings, and then backfilled to the pipe grade with select material, thoroughly compacted. No additional payment will be made for such over-excavation and refill.

In all trenches or structure sites where a firm foundation is not encountered, such as soft, spongy, or otherwise unsuitable material, the material shall be removed to a minimum of 12 inches, or to a depth determined by the Engineer, below the bottom of the pipe or structure, and for a width equal to at least 1/2 diameter on each side of the pipe, and the space backfilled with suitable material containing sufficient moisture to produce maximum compaction. The backfill material shall be free from lumps or other unsuitable material, and when compacted to the satisfaction of the Engineer, shall be finish graded as provided herein, or as required by the Engineer for structures. No additional payment will be made for such additional excavation or backfill.

The width of the trench at the top of the pipe shall not be greater than 16 inches more than the outside diameter of the barrel of the pipe to be laid therein.

Coupling or bell holes are required for all pipes with couplings or bells, and shall be excavated at each location where pipes are to be joined. Coupling or bell holes shall be of sufficient and adequate size to permit ease in making the joint and so the coupling or bell does not rest on the bottom of the hole excavated therefor.

Trenches for cast-in-place concrete pipe shall be graded and prepared to provide full, firm and uniform support by undisturbed earth or compacted fill throughout the bottom 220° of the pipe periphery.

The Contractor shall be responsible for drainage of trenches and other excavation areas, and such areas shall be kept as dry as practicable throughout the construction period. Any accumulation of water shall be removed by pumping or other approved method. Trenches damaged because of failure to provide temporary drainage control shall be repaired or reconstructed at the Contractor's expense. No drainage water may be pumped or otherwise deposited in any sanitary sewer system, unless otherwise approved by the Engineer. Reference is made to Subsection 7.14 of these Specifications relative to maintaining drainage in the construction area.

Reference is made to Subsection 18.04 for special requirements for progress of work of excavating and backfilling.

18.03 TRENCH AND STRUCTURE BACKFILL AND COMPACTION

Unless otherwise specified, material used for trench or structure backfill shall be granular native material free from debris, lumps, hardpan chunks, paving material, organic matter of other deleterious or unsuitable substances. Material shall be approved by the Engineer before use in the work.

Backfill of trenches shall conform to the standard drawings pertaining thereto, these Specifications, and the directions of the Engineer. Backfill for trenches in which precast pipe has been installed shall be placed in two phases, classified as Initial Backfill and Final Backfill.

Initial Backfill shall consist of placing and firmly compacting selected granular backfill material under the haunches of the pipe and up to the spring line of the pipe, and then filling to a level one foot above the top of the pipe, as directed by the Engineer, so as to form a firm bedding and protection for the pipe. After the pipe has been laid to line and grade, the trench shall be backfilled to the spring line of the pipe with selected native material placed by hand and compacted. Selected native material shall then be placed by hand to a level one foot above the top of the pipe. Selected excavated material shall be granular native material, free of all rocks, hardpan, paving material, organic matter or other deleterious substances, and any lumps over 2 inches in diameter.

Final Backfill for trenches in which precast pipe has been placed shall consist of placing and compacting backfill material into the remaining trench cavity following completion of initial backfill. Backfill material shall be returned to the trench in lifts not to exceed 8 feet in depth. Each lift shall be compacted to the bottom of the lift prior to placement of the next lift of backfill material.

Backfill for trenches in which cast-in-place concrete pipe has been constructed shall consist of placing backfill material into the remaining trench cavity. Backfill material shall be returned to the trench in lifts not to exceed 8 feet in depth. Each lift shall be compacted prior to placement of the next lift of backfill material. In no case shall backfill material be allowed to free-fall directly onto the pipe. Backfilling may proceed no sooner than 48 hours after construction of the pipe, and follow-up compaction using equipment which imparts load on the pipe or structures shall not proceed for a minimum of seven (7) calendar days following placement of the pipe unless this requirement is specifically waived by the Engineer, or as otherwise specified.

Structure backfill shall consist of placing and compacting backfill material around structures to the lines designated on the Plans or directed by the Engineer. Timing of compacting of structural backfill for poured in place structures shall be as specified above for cast-in-place concrete pipe.

The method of compacting and obtaining density requirements for all pipe trenches shall be such that the backfill material shall be completely compacted around the lower haunches of the pipe, the line and grade of the pipe not disturbed, and the pipe not damaged.

Where the City's water system is utilized for construction water, the Contractor shall obtain a water meter from the City of Avenal (fire hydrant meters are required for all users). The Contractor shall obtain the permission of the Engineer as to which fire hydrants are to be utilized. Flooding of trenches from the top is not permitted.

All backfill shall be compacted to a relative compaction of no less than 85 percent to within 24 inches of the surface, and the top 24 inches in surfaced streets shall be compacted to a relative compaction of no less than 95 percent. In new development streets and alleys to be subsequently recompacted and paved, and in non-paved areas, the top 24 inches shall be compacted to no less than 90 percent relative compaction. No free water will be allowed in the top 24 inches of backfill.

When the trench is to be surfaced, backfill shall be brought to a level which will make the top of the surfacing even with existing surfacing. Where trench is not to be resurfaced, backfill shall be brought even with adjacent undisturbed soil. The surface of the finished backfill in all areas shall be made even and uniform, free from depressions or raised areas.

Excess material shall be disposed of outside the right-of-way as set forth in Subsection 7.08 of these Specifications.

18.04 PROGRESS OF WORK OF EXCAVATING AND BACKFILLING

All work of excavation or backfilling shall be done as quickly as possible.

Existing surfacing at any location shall be removed from proposed trench areas or structure sites no sooner than 48 hours prior to excavation at that location. No surfacing shall be removed on Friday unless excavation and follow-up work will occur the same day.

No more than 600 lineal feet of trench shall be open ahead of any pipeline or other conduit in any street or alley, except upon written permission of the Engineer.

No excavation or trench shall be opened and left open more than 24 hours before the installation of the pipeline or other conduit which is to be placed in said excavation or trench. The backfilling of said excavation or trench shall be completed within twenty four hours after the installation of the facility for which the excavation was made, excepting for cast-in-place pipe installations and that portion of trenches or excavations to be used for connecting the extension of the installation, provided said portion is adequately barricaded and protected, and backfilled the following working day.

Backfill for cast-in-place concrete pipe shall be accomplished as soon as practicable and shall follow pipe construction by no more than 2 working days, provided that in no case shall backfill material be placed over the pipe sooner than 24 hours following construction of the pipe. Said trenches shall be adequately barricaded and access shall be provided for abutting properties and street intersections. Reference is made to Subsection 18.03 relative to compaction timing requirements.

Where an excavation or trench crosses a street or alley intersection, the excavation or backfilling shall be completed within 24 hours, or bridging capable of supporting vehicular traffic shall be provided for access across said excavation or trench.

All excavations located within a street or alley for the purpose of boring or jacking pits shall be properly barricaded and protected, and may be left open for a period of no more than seven (7) calendar days, unless an extension of time is approved by the Engineer in writing.

Immediately after trenches or other excavations have been backfilled and preliminarily compacted at street or alley crossings, temporary surfacing shall be placed in conformance with Subsection 18.05 of these Specifications and the standard drawing pertaining to trench backfill and surface replacement. Such surfacing shall remain in place and shall be diligently maintained until the permanent surfacing is to be placed.

Final pavement replacement shall be accomplished as soon as possible and practicable, and within the time limits specified in the Special Provisions.

18.05 RESTORATION OF SURFACES

Restoration of surfaces shall consist of restoring the surfaces of all trenches, surfaces at or around structure sites, or any other surfaces damaged or disturbed by the work, to the condition existing prior to commencement of the work, or to such

condition specified. Surfaces shall include, but not be limited to, pavement of any kind, grass, shrubbery or other landscaping, gravel, treated or untreated soil, etc. All work shall be done in accordance with these Specifications.

Restoration of paved surfaces shall conform to the standard drawing pertaining thereto and the Specifications, and as directed by the Engineer.

Temporary trench resurfacing shall consist of a minimum of 4 inches of cold mix asphalt-concrete mixed in a central plant, placed and diligently maintained by the Contractor until permanent trench resurfacing is installed. Temporary surfacing shall be placed at all street and alley crossings, and such other locations as specified or shown on the Plans, or directed by the Engineer. Temporary surfacing shall be removed by the Contractor prior to placing final resurfacing.

Final replacement of pavement shall be performed in a manner consistent with good construction practices and methods which, when completed, shall leave all areas requiring replacement of pavement with as neat an appearance as possible.

Areas to receive final pavement replacement shall be completely cleaned of all debris, rubbish, dirt, temporary paving, or any other deleterious material which might affect the quality of the work in any way. Cleaning shall be accomplished to a minimum of 6 feet outside the edges of trenches or other areas to receive pavement replacement. This distance may be increased by the Engineer as necessary to prevent contamination of the new work.

Where sawcutting of existing pavement edges is not shown on the standard drawing or specified, all damaged existing pavement shall be removed and the edges trimmed to neat lines by a method approved by the Engineer.

Where sawcutting of existing pavement edges is shown on the standard drawing or is specified, the cut shall be made on a straight line along both sides of trenches, and to neat lines around structures or other locations requiring pavement replacement. The cut shall be made a minimum of 3 inches in depth, and shall encompass all pavement damaged by the work or specified to be removed or replaced.

All edges of existing pavement, whether trimmed or sawcut, shall be protected from damage. Any edges damaged from any cause prior to or during paving operations, shall be re-cut or re-trimmed as directed by the Engineer, and no additional payment will be made therefor.

Where aggregate base is called for, it shall be furnished and placed in conformance with Subsections 13.01 through 13.05 of these Specifications.

Where concrete base is called for, concrete shall be Class A or Class B with one inch maximum aggregate, conforming to the requirements of Section 90 of the State Standard Specifications. The top surface of the concrete shall be given a rough rake finish while the mix is still workable with the corrugations parallel with the trench. Where called for on the Plans or Specifications or directed by the Engineer, calcium chloride of up to 2 percent by weight of the cement shall be added to the concrete mix.

A paint binder of asphaltic emulsion shall be furnished and applied, in conformance with Subsection 14.03 of these Specifications, to all vertical surfaces of existing pavement, curbs, gutters, or other surfaces against which asphalt-concrete pavement is to be placed. Paint binder shall also be applied to the top surface of the initial layer of asphalt-concrete if the pavement is to be replaced in lifts.

Contractor shall not commence surface paving until the subbase and/or base have been inspected and approved. Violation of this paragraph shall be cause for rejection of that portion of paving involved.

Asphalt-concrete shall be furnished and placed in conformance with Subsections 14.01 through 14.05 of these Specifications. When replacing pavement in existing pavement areas, the new pavement material shall not overlap the existing pavement edge. When compacted, the new pavement edge shall be flush with the existing pavement, and the surface shall be smooth, without humps or depressions. Except where the trench is located in the crown of the road, the top of the finished surfacing shall deviate no more than 1/8 inch, up or down, from a line struck off from two points on the existing road surface, one on each side of the trench. Deviation from this tolerance shall be cause for rejection of the surfacing.

Restoration of miscellaneous surfaces shall consist of replacing or restoring in-kind any surface damaged or disturbed by the work, including but not limited to, grass, landscaping of any kind, gravel, oiled dirt, concrete, or soil, all as directed by the Engineer. The surfaces of all trenches, excavations or other areas damaged or disturbed by the work, upon completion of miscellaneous surface restoration, shall conform to the elevations and character of the areas which existed before work commenced.

Reference is made to Subsection 2.05 of these Specifications relative to cleanup.

18.06 MEASUREMENT

Measurement for trench resurfacing will be by the lineal foot as measured along the centerline of the actual trench resurfaced, unless otherwise indicated in the Plans and/or Specifications.

18.07 PAYMENT

Payment for trench and structure excavation, backfill and compaction, shall be included in the amount bid for installing the pipe, conduit, structure or other facility to be installed in such trench or other excavation, such amount to include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer, and no separate payment shall be made for such trench and structure excavation, backfill, compaction, pavement cutting, pavement removal, jetting, maintaining drainage, or other related work.

The unit price bid per lineal foot for temporary trench resurfacing shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans and Standard Drawings, as set forth in the Specifications, and as directed by the Engineer, including maintaining the temporary surfacing and removing it prior to final resurfacing.

When the Contract does not include a pay item for temporary trench resurfacing as above specified, and unless otherwise provided in the Special Provisions, full compensation for any necessary temporary trench resurfacing required shall be considered as included in the prices bid for the other various items of work and no separate payment will be made therefor.

The unit price bid per lineal foot for final trench resurfacing shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans and Standard Drawings, as set forth in the Specifications, and as directed by the Engineer, including sawcutting or trimming existing pavement edges.

Unless otherwise provided in the Special Provisions, full compensation for restoration of miscellaneous surfaces shall be considered as included in the prices bid for the various items of work and no separate payment will be made therefor.

SECTION 19 - SANITARY SEWER FACILITIES

19.01 GENERAL

This work shall consist of furnishing all sewer pipe, wye branches, house branches, manholes, stub-outs, and other sewer facilities as shown on the Plans and Specifications, as indicated on the Standard Drawings and as directed by the Engineer. Also included is the testing and internal inspection of all sewer lines.

19.02 MATERIALS

Sewer pipe and fittings shall be vitrified clay or unplasticized polyvinyl chloride (PVC), as specified herein.

Vitrified clay pipe and fittings shall be extra strength, bell and spigot, and shall conform to ASTM Specification Designation C-278 with preformed factory fabricated plastisol joints complying with ASTM Specification Designation C-425. Vitrified clay sewer pipe shall also conform to standards of the Clay Products Institute. Each wye branch for sewer service shall be provided with an end cap approved by the pipe manufacturer for use with this product.

PVC gravity sewer pipe and fittings shall conform to the quality requirements and strength characteristics of ASTM D3034 "Type PSM Poly-Vinyl Chloride (PVC) Sewer Pipe and Fittings" (sizes 4 inch through 15 inch). The standard dimension ratio (SDR) shall be 35 minimum where the SDR is the ratio of pipe diameter to wall thickness. Minimum pipe stiffness shall be 46 pounds per square inch (psi). Pipe straightness shall be a maximum of 1/16th inch per foot unless otherwise approved. Pipe shall have integrated bell gasketed joints. Rubber sealing gaskets shall meet the requirements of ASTM D3212. Pipe bells shall have the rubber ring present in the bell groove at the factory. No solvent cement joints will be allowed. Standard lengths shall be 20 feet, and 12.5 feet, \ one inch. At manufacturer's option, random lengths of not more than 15 percent of total footage may be shipped in lieu of standard lengths.

PVC Pipe shall be clearly marked as follows at intervals of five feet or less:

- Manufacturer's name or trademark
- Nominal pipe size
- PVC cell classification (12454-B or 12454-C or 13364-B)
- Legend "Type PSM SDR-35 PVC Sewer Pipe"
- ASTM D3034

PVC Fittings shall be clearly marked as follows:

- o Manufacturer's name or trademark
- o Nominal size
- o Material Designation "PVC"
- o "PSM"
- o "ASTM D3034"

PVC fittings and accessories shall be as manufactured and furnished by the pipe supplier, or approved equal, and have bell and/or spigot configurations identical to that of the pipe. Injection molded PVC wye fittings shall be used for future house branch connection at the time of installation of the sanitary sewer main. Each wye branch for sewer service shall be provided with an end cap or plug approved by the pipe manufacturer for use with its product.

Precast reinforced concrete pipe, tapered sections and adjustment rings for manholes shall conform to ASTM Specification Designation C-478, Class II. Elliptical single line reinforcement is not allowed. Materials used in manhole frames and covers shall conform to ASTM Specification Designation 48-30, and shall conform to the standard drawing pertaining thereto. Concrete for manholes shall meet the requirements of Section 90 of the State Standard Specifications, and shall be Class A.

19.03 TRENCHING AND EXCAVATING

Trenching for sanitary sewer pipes and service laterals, and excavating for sewer manholes shall conform to the requirements of Section 18 of these Specifications.

19.04 SEPARATION CRITERIA

All sanitary sewers and water mains shall meet the separation standards of the "California Waterworks Standards", contained in Section 6430, Title 22, of the California Administrative Code, or shall be installed in accordance with alternate construction criteria as specified therein.

19.05 PIPE INSTALLATION

Construction of sewer lines shall begin at existing sewer line locations and shall proceed upstream with the spigot end of the pipe in the direction of flow, unless otherwise approved in writing by the Engineer. Existing sewer lines shall remain operational at all times.

Sewer pipe and fittings shall be laid and jointed in compliance with the manufacturer's recommendation and shall be carefully adjusted to grade by scraping away or filling and tamping the trench bottom. Use of blocks to support the pipe is

prohibited. Each joint of pipe must be fully pressed into place so that there will be no unevenness or settlement of one length of pipe with the other at the joint.

The Contractor shall furnish and use a laser device for control of alignment and grade of the sewer pipe. When conditions are such that this method is impracticable, such as on short pipe runs, the Contractor shall have an Engineer on the ground to set grade of each joint of pipe by means of an Engineer's level.

The grade line shown on the Plans indicates the flow line or invert of the pipe and all cuts, unless otherwise indicated, refer to this line.

All pipe shall be laid to true line and grade. Occasioned variations as follows will be permitted: above grade, 1/4 inch; below grade, not to exceed 1/2 inch; alignment not to exceed 2 inches if gradual over a distance of 20 feet.

The interior of the pipe shall be kept free from dirt and other foreign material as the laying progresses. Any pipe which shows undue settlement or is damaged shall be taken up and replaced or relaid at the Contractor's expense. The open ends of all sewer lines being installed must be covered to keep out animal life, etc., whenever the line is left unattended for any length of time, such as overnight. The end of any sewer that does not terminate at a manhole shall be closed at the bell end with a plug manufactured for that purpose.

PVC pipe exposed to the sun during the summer months must be allowed to cool before connection is made to manholes and other facilities, and prior to backfill.

19.06 INSTALLATION OF SERVICE LATERALS

Service laterals shall be furnished and installed by the Contractor at the locations shown on the Plans. Installation shall conform to the standard drawing pertaining thereto, the Plans and Specifications and the directions of the Engineer.

Pipe for sewer service laterals shall conform to the requirements of Subsection 19.02 of these Specifications, and shall be installed in accordance with the requirements of Subsection 19.05 of these Specifications.

Sewer service laterals 4 inches or 6 inches in diameter shall be connected to all sewer mains less than 18 inches in diameter at prefabricated wye fittings conforming to Subsection 19.02 of these Specifications, or shall be connected to similar pipe stub-outs from manholes. Sewer service laterals 4 inches or 6 inches in diameter may be connected directly to existing sewer mains 18 inches in diameter or greater, providing that a machine

core is used in connecting to the main sewer. Sewer service laterals 8 inches in diameter or greater connecting to sewer mains shall require the construction of a manhole at the point of connection. All connections shall be of materials and methods as approved by the Engineer.

Sewer wye fittings, unless otherwise specified or directed, shall be inclined at an angle of not greater than 45' from the horizontal. Service laterals shall extend from the sewer main to the right-of-way line of the street or alley, where the service lateral shall be promptly closed at the bell end with a plug manufactured for that purpose.

The Contractor shall mark the location of the end of the service lateral by putting an "S" mark on the curb. Said mark is to be chiseled into the concrete or stamped when the concrete has not set. In cases where a concrete curb does not exist, the Contractor shall mark the location of the terminus of the house branch by driving a 1/2 inch diameter by 24 inch long iron pipe or rod in the end of the trench before backfilling. The pipe or rod shall extend to within six inches of ground surface.

Excavations for laying service laterals shall be made in such a manner that at no time will an existing street be closed to traffic. Whenever service laterals are to be installed in existing major streets that have been resurfaced within the last five years, they shall be installed by boring methods rather than open cut trenches.

19.07 MANHOLES

Manhole structures shall be constructed at the locations shown on the Plans and Specifications, and as indicated on the standard drawings pertaining thereto. The exact locations of manholes will be indicated in the field.

Manholes shall be complete structures in place and backfilled including the furnishing and placing of all materials involved. Precast concrete pipe manholes shall consist of a poured in place concrete base section, reinforced concrete pipe section(s), cast iron frame and cover and a poured in place concrete collar with paving patch. Invert channels shall be smooth and semicircular in shape conforming to the inside of the adjacent pipe invert, or flow channels may be provided by use of the bottom half of the specified main pipe. The floor and wall of the manhole outside the channels shall be smooth and shall slope toward the channels.

The top of the manhole base section shall be keyed to receive the tongue end of the riser section. The key shall be formed in the freshly poured concrete by using a template manufactured to the dimensions of the riser section. If the riser is cast-in-place monolithically with the base section by using a

slip form or other means, the key may be omitted between the base and riser. If the base and riser sections are not poured monolithically, but separately, a key shall be provided in the base section. In either case, a key will be required in the top of the riser section to receive the tongue end of the tapered cone. Cast-in-place riser sections shall have the minimum wall thicknesses specified on the Standard Drawings.

The joints between the base and all precast elements of the manhole, including adjustment rings and manhole frame, shall be filled with cement mortar prior to joining the elements.

The interior of the manhole shall be troweled smooth with a wooden trowel, removing excess mortar extruded out of joints for the entire height of the manhole, from the manhole frame to the floor. All excess mortar and any other debris shall be removed from the manhole.

Changes in direction of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly.

Stub-outs shall be installed in manholes at the locations and sizes shown on the Plans. All stub-outs shall be sealed with a plug of a type approved by the manufacturer of the pipe.

All manholes shall be completed to finish grade with concrete collar and paving patch (where indicated) as shown on the Standard Drawings and as herein specified. In undeveloped areas where no street or alley surfacing is to be done in conjunction with or immediately after utility installation, the manhole cover shall be finished off to a level 1¦ inches above ground elevation and shall be provided with 12 inches of grade rings. In existing street areas where surfacing exists and no new street regrading is contemplated in conjunction with or immediately after utility installation, the manhole cover shall be brought to existing street grade and finished off. In areas where street or alley surfacing is to be done in conjunction with or immediately after utility installation, such as new subdivisions, manholes shall initially terminate with the top of the cone 6 inches below subgrade and shall be brought to street or alley surface with grade adjustment rings and completed after street paving is accomplished. Unless specifically otherwise indicated in the Special Provisions, it will be the responsibility of the sewer Contractor to return and install the manhole covers to finish grade as specified and as shown on the Standard Drawings.

The Contractor should be aware that connections to existing sewers will be "wet" and the Contractor shall make whatever arrangements are necessary to complete the manhole connections under the "wet" conditions.

Where necessary, mounds or dikes shall be placed around the perimeter of manhole covers to prevent rainwater or other inflow of water from entering the manholes. No steps shall be installed in manholes.

19.08 BACKFILLING, COMPACTING AND RESTORATION OF SURFACES

Backfilling, compacting and restoration of surfaces of trenches and excavations for sewer facilities shall conform to the requirements of Section 18 of these Specifications.

19.09 LEAKAGE TEST OF SEWER LINES AND SERVICE LATERALS

After completing the installation, backfill and compaction of a section of sewer line with service laterals, and after all other underground utilities (including gas, electric, telephone, cable television, water and storm drain) are in and compacted, but prior to the placement of aggregate base or asphalt-concrete pavement, the Contractor shall, at his expense, conduct a leakage test using low pressure air. The test shall be performed using the following procedures and under the supervision of the inspecting Engineer.

Each section of sewer between two successive manholes shall be tested by plugging all pipe outlets with suitable test plugs.

All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 pounds per square inch gauge pressure (psig). The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.

To commence the leakage test, air shall be slowly added until the internal pressure is raised to 4.0 psig. The compressor used to add air to the pipe shall have a blow-off valve set at 5 psig to assure that at no time the internal pressure in the pipe exceeds 5 psig. The internal pressure of 4 psig shall be maintained for at least two minutes to allow the air temperature to stabilize after which the air supply shall be disconnected and the pressure reduced to 3.5 psig. The time in minutes that is required for the internal air pressure to drop from 3.5 psig to the lower pressure indicated in the appropriate table below shall be measured and the results compared with the values tabulated below.

Gauges used to measure test pressures shall read from 0 psig to 10 psig (maximum) with 1/2 psig increments. If required, the Contractor shall supply necessary fittings to accept a City supplied gauge.

All gauging and testing shall be done outside the manholes and no one shall be allowed to enter the manholes while the line is pressurized.

PVC Gravity Sewer Pipe

Minimum Acceptable Time Required for Pressure Decrease from 3.5 to 3.0 psig

Pipe Diameter (Inches)	Test Time (Minutes)	(Seconds)
4	2	32
6	3	50
8	5	6
10	6	22
12	7	39
15	9	30

Vitrified Clay Sewer Pipe

Minimum Acceptable Time Required for Pressure Decrease from 3.5 to 2.5 psig

Pipe Diameter (Inches)	Test Time (Minutes)	(Seconds)	Minimum Distance Between Manholes (Feet)	K Value
4	2	0	430	.428
6	2	45	380	.592
8	3	45	320	.702
10	4	46	260	1.10
12	5	40	215	1.58
15	7	0	170	2.47
18	8	36	145	3.56
21	10	6	125	4.85
24	11	6	105	6.34
27	12	42	95	8.02
30	14	1	85	9.90
33	15	0	75	12.0
36	16	41	70	14.3
39	18	5	65	16.7
42	19	24	60	19.4

The above tabulated values shall be used for the respective diameter pipes except where the distance between successive manholes is less than the above tabulated values, in which case, the following formula will be used to determine the test time:

T=KL
T=test time in seconds
K=value from table
L=distance between successive manholes in feet

Failure of the leakage test will be grounds for rejection of the section tested, until discovery and correction of the reason for the failure, and successful retesting of the section.

19.10 DEFLECTION TEST OF PVC SEWER LINES

PVC sewer pipe, which is designated as flexible in nature, shall be tested for excessive deflection. This test shall be performed after backfilling and compaction but prior to the placement of aggregate base or asphalt-concrete surfacing, and prior to television inspection as specified in Subsection 19.11 of these Specifications.

The Contractor shall demonstrate that the maximum pipe deflection does not exceed 5 percent by pulling a properly sized rigid ball or a mandrel through the main line pipe. A "rubber flush ball" does not meet this requirement for deflection testing.

Failure of the deflection test shall be grounds for rejection of the section tested, until correction of the reason for the failure and successful retesting of the section.

19.11 TELEVISION INSPECTION OF INTERIOR OF INSTALLED PIPE

The Contractor shall furnish closed circuit television equipment for an interior inspection of the newly installed sewer mains. The television check of the sewer mains shall be made after leakage and deflection tests have been performed and prior to placing of street aggregate base or asphalt paving. Any broken pipe, separation of joints, or any pipe exceeding the permitted tolerances for line and grade shall be replaced or repaired.

Any pipe repaired or replaced as a result of television inspection shall be retested for leakage and deflection. A VHS format tape cassette of the television inspection (1/2 inch wide tape) shall be provided the City at no additional cost to the City. The Contractor shall be responsible for all costs associated with furnishing the television inspection and making final repairs to the sewer mains.

19.12 MEASUREMENT

Measurement for sewer main installation and service lateral installation shall be by the lineal foot of pipe installed, and shall be the actual horizontal length installed, measured through wye fittings.

Measurement for wye fittings shall be per each wye fitting installed.

Measurement for manholes shall be per each manhole installed.

19.13 PAYMENT

The unit price bid per lineal foot for sewer mains shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the pipe, trenching, backfilling, compacting, testing and internal inspection.

The unit price bid per lineal foot for service laterals shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the pipe, trenching, backfilling, compacting and testing.

The unit price bid per each for wye fittings shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer, in excess of the cost of installing main line pipe and service lateral pipe. This shall include, but not be limited to, furnishing and installing the wye fitting and plug, trenching, backfilling, compacting, testing and internal inspection.

When the contract does not include a pay item for wye fittings as above specified, and unless otherwise provided in the Special Provisions, full compensation for wye fittings shown on the plans shall be considered as included in the prices bid for other sewer pipeline items of work and no separate payment will be made therefore.

The unit price bid per each for manholes shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the manhole and stub-outs, excavation, backfill and compaction, returning and adjusting manhole lids and frames to final grade following street or alley construction or reconstruction, and connections to all pipes, wet or otherwise.

SECTION 20 - STORM DRAINAGE FACILITIES

20.01 GENERAL

This work shall consist of furnishing and installing storm drain pipe, laterals, manholes, inlets, and other structures as shown on the Plans, as required by the Specifications, and as directed by the Engineer.

20.02 MATERIALS

Storm drains shall be constructed by the installation of precast (prefabricated) pipe, or, where specifically set forth on the Plans or Special Provisions, may be cast-in-place concrete pipe for sizes 24 inches or greater in diameter.

Precast pipe for storm drain pipelines and laterals shall be as follows:

1. Pipe 24 inches in diameter and smaller shall be reinforced concrete pipe (RCP), non-reinforced concrete pipe (NRCP) or asbestos-cement pipe (ACP), as specified herein.

2. Pipe larger than 24 inches in diameter shall be reinforced concrete pipe.

3. Where called for on the Plans or in the Special Provisions, reinforced concrete pipe or non-reinforced concrete pipe shall be fitted with rubber gasket joints and asbestos-cement pipe shall be furnished with rubber gasket couplings, all as specified herein.

4. Unless otherwise required as in (3) above, reinforced concrete pipe and non-reinforced concrete pipe may be jointed with cement mortar joints, and asbestos-cement pipe may be jointed with plastic sleeve couplings, all as herein specified.

5. All precast pipe shall be of the strength class shown on the Plans or specified in the Special Provisions.

The bearing strength equivalency of the alternate precast pipe products shall be determined by the following table, the basis of equivalency being the minimum 3-edge bearing strength, or D-load, to produce the ultimate load for the class of pipe equivalent to reinforced concrete pipe as specified in ASTM Specification Designation C76:

PRECAST PIPE BEARING STRENGTH EQUIVALENCY

RCP (ASTM C76) CL V	CL II	CL III	CL IV	CL V
Non-Reinforced Concrete Pipe (ASTM C76)	CL II 1500D	CL III 2000D	CL IV 3000D	CL V 3750D
Asbestos-Cement Pipe (ASTM C663)	CL II 1500D	CL III 2000D	CL IV 3000D	CL V 3750D
Asbestos-Cement Pipe (ASTM C428):				
12" Diameter	CL1500	CL2400	CL3300	CL4000
15" Diameter	CL2400	CL3300	CL4000	CL5000
18" Diameter	CL2400	CL3300	CL5000	CL6000
21" Diameter	CL3300	CL4000	CL6000	CL7000
24" Diameter	CL3300	CL4000	CL6000	

The pipe strength class, as designated on the Plans, will have been determined for vertical load under trench conditions specified in Subsection 18.02 of these Specifications. The Contractor shall exercise precautionary measures against trench cave-ins by providing adequate shoring or other devices to minimize the development of adverse trench conditions. Should the trench conditions exceed in width the specified trench conditions, the Contractor shall provide a recognized special bedding, approved by the Engineer, which is adequate to maintain pipe strength equivalent to specified trench conditions. No additional compensation will be paid for such special bedding. In lieu of special bedding and the class of pipe designated on the Plans, the Contractor may provide a higher strength class of pipe in accordance with the manufacturer's recommendation for the conditions under which the pipe is placed, with no additional payment therefor.

All reinforced concrete pipe shall be manufactured in accordance with ASTM Specification Designation C76, as latest amended or revised. Where reinforced concrete pipe with rubber gasket joints (RGRCP) is set forth on the Plans or in the Special Provisions, rubber-gasketed joints shall conform to the requirements of ASTM Specification Designation C443 and shall be flexible and able to withstand expansion, contraction and settlement.

Non-reinforced concrete pipe shall conform to ASTM Specification Designation C76, except for steel reinforcement.

Asbestos-cement pipe, where plastic sleeve couplings are specified, shall conform to the requirements of ASTM Specification Designation C663 (Type II). Plastic sleeve couplings shall comply with the requirements of ASTM Specification Designation D1248, Type I, Class C, Grade P14.

Asbestos-cement pipe, where rubber gasket couplings are specified, shall conform to the requirements of ASTM Specification Designation C428 (Type II). The coupling shall be manufactured from material of the same composition as the pipe and shall meet the same crushing strength requirements as required for the pipe. The coupling shall utilize 2 solid rubber sealing rings or gaskets of uniform cross-section. The rubber rings or gaskets shall conform to the requirements of ASTM Specification Designation D1869.

Where set forth on the Plans or Special Provisions, pipe 24 inches in diameter and greater may be cast-in-place concrete, as herein specified.

Cast-in-place concrete pipe shall be constructed of portland cement concrete conforming to the provisions of Section 90 of the State Standard Specifications, and these Specifications. Concrete shall be either Class "A" (564 pounds of cement per cubic yard), or Class "B" (470 pounds of cement per cubic yard), and shall develop a minimum compressive strength of 2800 pounds per square inch (psi) at 28 days. The combined aggregates for pipes 48 inches or less in diameter shall conform to the grading limits for the one inch, maximum size specified in Subsection 90-3.04 of the State Standard Specifications. For pipes larger than 48 inches in diameter, the combined aggregates shall conform to the grading limits for the 1½ inch, maximum size specified in said Subsection 90-3.04. Admixtures shall not be used without written permission from the Engineer or unless elsewhere provided for in these Specifications or in the Special Provisions. The allowance for slump shall be not more than 3 inches.

Concrete for manholes, inlets and other structures shall meet the requirements of Section 90 of the State Standard Specifications, and shall be Class A unless otherwise indicated on the Plans and/or Standard Drawings. The allowance for slump shall be no more than 3 inches.

Cement mortar for use in pipe joints, pipe patching and structure patching shall be composed of one part portland cement and two parts of clean, well-graded sand of such size that it will pass a No. 8 sieve. An admixture of hydrated lime, fire clay or diatomaceous earth may be used in the mortar to facilitate workability, and the amount of such material used

will be limited as ordered by the Engineer. Quick setting cement may be used when the Engineer determines that conditions so warrant. No mortar shall be used in which water has been added to the dry ingredients for a period of over 30 minutes.

Precast reinforced concrete pipe, tapered sections and adjustment rings for manholes shall conform to ASTM Specification Designation C-478, Class II. Elliptical single line reinforcement is not allowed. Materials used in manhole frames and covers shall conform to ASTM Specification Designation A48, Class 25 and shall conform to the standard drawing pertaining thereto.

All precast risers for outfall structures shall be Class II pipe. Cast-in-place risers may be used for all outfall structures up to 72 inches in diameter. The minimum wall thickness for cast-in-place risers shall be 8 inches.

All metal parts for inlets, outlets and other miscellaneous structures (except outfall structure cages) shall be structural grade steel, except those permitted to be cast iron by the project Plans or Standard Drawings, and bar reinforcement shall be furnished and installed in conformance with the requirements of Subsection 52 of the State Standard Specifications, except that Subsections 52-1.10 and 52-1.11 are hereby deleted. All exposed metal parts, unless otherwise specified, shall be painted or dipped with an asphaltum paint approved by the Engineer.

Exposed metal parts for all outfall structure cages shall be galvanized by the hot-dip method with the large pieces meeting the requirements as set forth in ASTM Specification Designation A123, and nuts, bolts and small pieces meeting the requirements as set forth in ASTM Specification Designation A153.

20.03 TRENCHING AND EXCAVATING

Trenching for storm drain main line pipes and laterals, and excavating for manholes, inlets and other drainage structures shall conform to the requirements of Section 18 of these Specifications, and as indicated in this Section 20.

20.04 PRECAST PIPE INSTALLATION

Construction of all precast storm drain pipelines shall proceed upstream with the spigot end of the pipe in the direction of flow, unless otherwise approved in writing by the Engineer. Existing drain lines shall remain operational at all times.

All precast storm drain pipe shall be laid and jointed in compliance with the manufacturer's recommendation and shall be carefully adjusted to grade by scraping away or filling and

tamping the trench bottom. Use of blocks to support the pipe is prohibited. Each joint of pipe must be fully pressed into place so that there will be no unevenness or settlement of one length of pipe with the other at the joint. All storm drain pipe shall be laid to true line and grade, except that pipe laterals shall be installed at the depth and grade specified by the Engineer after exposing of existing intersecting utilities by the Contractor. The Contractor shall allow in his bid price for the various lateral pipe installation items full compensation for any increase or decrease in anticipated depth of trench because of the location of intersecting utilities, shown on the Plans or not. Laterals, as herein used, shall be taken to mean the pipeline which is installed to connect a storm drain inlet or outlet to the main storm drain, either directly or at a manhole.

The open ends of all lines being installed must be covered to keep out animal life, etc., whenever the line is left unattended for any length of time, such as overnight.

The ends of all precast pipe sections shall be of such design that when properly laid they shall have a smooth and uniform interior surface. Both ends of pipe sections shall be substantially free of cracks and broken edges. Pipe so found to be damaged shall be rejected for use in the work. Each joint shall be sealed as specified herein to prevent leakage.

Reinforced concrete pipe with elliptical reinforcement shall be placed with the minor axis in the vertical position. For reinforced concrete pipe or non-reinforced concrete pipe, sealing of joints shall be accomplished with cement mortar or rubber gaskets, as indicated on the Plans or specified in the Special Provisions, and shall conform to the following specifications:

1. Cement Mortar Joints: The ends of the concrete pipe shall be thoroughly wetted and cleaned prior to the application of mortar. The ends of the pipe shall then be completely filled with mortar for the full periphery of the joint. The 2 sections to be joined shall be firmly placed together in such a manner that the bell or groove end of the pipe fits truly and snugly over the tongue end so that mortar completely fills the joint. The interior surface of the joint shall be brushed smooth and all surplus mortar removed. The completed interior surface of the joint shall be as flush as possible with the pipe walls.

   An external mortar band at least 4 inches wide and 3/4 inches thick shall be applied to the joint by first thoroughly cleaning and wetting the areas immediately adjacent to the joint and placing mortar around the upper 270° of the pipe at the joint. The width and thickness

of the external band shall be completely and immediately covered with an impervious membrane which shall be adequately anchored. After jointing procedure has commenced, there shall be no movement of the pipe whatsoever in subsequent operations. Material shall be placed uniformly on either side of the pipe to prevent any movement. No walking in the trench or working over the pipe after it has been laid, except as may be necessary in tamping the earth and refilling, will be permitted until the pipe has been braced as specified above.

Backfilling and compacting of the pipe trench beyond the placement of support material shall not be commenced within 16 hours of jointing the pipe sections, or until, in the opinion of the Engineer, the cement in the joints has acquired a suitable degree of hardness. In no case shall water be allowed to rise in or about the pipe before the joint mortar has become thoroughly set.

All openings in the pipeline must be tightly covered or closed to prevent the drying out of the mortar by circulation of air within the line, until the pipeline is completed.

2. Rubber Gasket Joints: The ends of the pipe shall be thoroughly cleaned immediately prior to joining sections of pipe. The 2 sections joined shall be firmly placed together in such a manner that the tongue or gasket end of the pipe "homes" on the bell end of the pipe. No appreciable gap shall exist at the completed joint, except as permitted by the Engineer at locations where curves in the pipe alignment are specified or required. Excessive gaps in any case shall be cause for rejection of the work, and corrective measures shall be taken when ordered by the Engineer.

For asbestos-cement pipe, sealing of joints shall be accomplished with a sleeve coupling designed to maintain alignment and ensure tight, flexible joints. Couplings shall be of the plastic sleeve type or of the rubber gasket type, as indicated in the Plans or Special Provisions. The ends of the pipe shall be thoroughly cleaned immediately prior to joining sections of pipe and installation of the coupling. The 2 sections joined shall be firmly placed together in such a manner that each succeeding section of pipe is forced "home" as far as possible into the coupling. No appreciable gap shall exist at the completed joint, except as permitted by the Engineer at locations where curves in the pipe alignment are specified or required. Excessive gaps in any case shall be cause for rejection of the work, and corrective measures shall be taken when ordered by the Engineer.

20.05 CAST-IN-PLACE PIPE CONSTRUCTION

Cast-in-place concrete pipe, where indicated on the Plans and/or Special Provisions, shall be constructed to the lines, grades, and at the locations indicated, and as specified herein.

Reinforced concrete pipe may be substituted for cast-in-place concrete pipe at any location and shall comply with the following provisions:

1. Substituted pipe shall have the same internal diameter as specified for cast-in-place pipe. The pipe class and joint type shall be as specified, or as determined by the Engineer.

2. Payment shall be at the unit price bid for cast-in-place concrete pipe with no additional compensation paid therefor, except as specifically provided otherwise in the Special Provisions.

The nominal internal diameter of the cast-in-place concrete pipe shall be the size indicated on the Plans. The actual internal diameter of the pipe at any point shall not be more than 5 percent less than the nominal internal diameter, and the actual internal cross-sectional area of the pipe at any point shall not be less than the cross-sectional area of a circle computed from the nominal internal diameter. The Contractor may be allowed to construct pipe of larger sizes than that specified on the Plans; however, any and all deviations in sizes from that specified must be approved by the Engineer.

Minimum wall thickness for the various sizes of pipe shall conform to the following table:

Internal Diameter	Minimum Wall Thickness for Pipe
24"	2-1/2"
30"	3"
36"	3-1/2"
42"	4"
48"	5"
54"	5-1/2"
60"	6"
66"	6-1/2"
72"	7"
78"	7-1/2"
84"	8"
90"	8-1/2"
96"	9"

Excavation for cast-in-place concrete pipe shall conform to the requirements of Section 18 of these Specifications. The trench shall be excavated to the lines and grades established by the Engineer. The trench shall be of the proper width and the bottom of the trench shall be shaped to the external diameter of the pipe to be constructed.

The City makes no guarantee as to the types of soil or of soil conditions within the project limits. The Contractor shall perform whatever soils or other tests as he deems necessary to make himself fully aware, prior to submitting a bid proposal, of the soil types or conditions which may prevail throughout the project site. Tests so performed shall be conducted at the Contractor's expense, and no compensation will be paid therefor.

Where unstable trench conditions are encountered, the Contractor shall attempt to stabilize the trench by shoring or, wherever practicable, by sloping the sides of the trench above the top of the pipe.

Where the Engineer determines, due to unstable trench conditions or other reasons, that it is not feasible to place cast-in-place concrete pipe, the Contractor shall place reinforced concrete pipe of the same size and class indicated on the Plans or Bidder's Proposal, or as specified in the Special Provisions.

Construction of cast-in-place concrete pipe may be considered as not feasible when the trench walls are not stable below a distance above the bottom of the trench equal to half the diameter of the pipe. The Engineer, however, shall be the sole judge as to the feasibility of constructing cast-in-place concrete pipe as shown on the Plans. Construction of cast-in-place concrete pipe shall be considered as feasible where 50 feet or more of stable trench is encountered.

Pipes shall be constructed in conformity with the prescribed lines and grades obtained from stakes set by the Engineer.

All surfaces against which concrete is to be placed shall be free from standing water, mud and debris and shall be firm enough to prevent contamination of the concrete by earth or other foreign material. Absorptive surfaces against which concrete is to be placed shall be moistened thoroughly so that the moisture will not be drawn from the freshly placed concrete.

When placing operations cease or are delayed for any reason for more than 30 minutes, the end of the pipe shall be left rough with a slope of approximately 30' and the ends of the pipe shall be securely closed by heavy canvas or other acceptable material to prevent excessive dehydration of the concrete already placed. The joint so formed when placing operations again commence shall conform to the requirements of Subsection 20.06 of these Specifications.

Cast-in-place concrete pipe shall be constructed in one placement around the complete periphery of the pipe by means of a traveling pipe-casting machine approved by the Engineer. The bidder may be required to furnish evidence of successful in-service performance of pipe produced by the pipe-casting machine under similar working conditions.

The concrete shall be vibrated, rammed, tamped or worked with suitable appliances until the concrete has been consolidated to the maximum practicable density, free of rock pockets and closed snugly against all surfaces of forms. The concrete shall completely fill the forms.

Unless otherwise specifically indicated in the Special Provisions, pipe shall be cast-in-place in a manner such that as forms are lapped, the lap ridges formed in the interior walls of the pipe face downstream in the direction of flow.

Forms used in the work shall be clean and reasonably free of concrete adhering to the surface of the forms from previous operations. Immediately prior to use in the work, each form shall be sprayed or otherwise coated with an approved form oil. Forms used shall be of sufficient strength to withstand vibrating of concrete and which will

provide interior dimensions of the pipe in accordance with the tolerances set forth in these Specifications. Damaged forms shall not be used in the work and shall be removed from the job site.

Immediately after finishing of the exposed exterior surface of the pipe, it shall be covered with an approved polyethylene or plastic membrane which shall be anchored sufficiently to keep the surface covered.

Unless the pipe terminates at a structure which is closed to the air, the ends of the pipe, as well as any other openings, shall be securely closed with an impermeable membrane for a minimum of 7 days or until the structure is constructed, if sooner. Precaution shall be used to make the structure reasonably airtight for a minimum of 7 days, except when work is taking place inside the pipe.

The finished surface of the concrete pipe shall be substantially free of fractures, cracks and surface roughness.

The exterior exposed surface of the pipe shall have a steel screeded finish. A hand trowel shall be used, as construction progresses, to smooth areas not sufficiently smoothed by the pipe-casting machine. All finishing of the exterior shall be accomplished immediately as pipe construction progresses.

The interior surface of the pipe shall be finished as soon as possible or practicable after placing of the pipe, and shall be equivalent to a steel screeded finish. All honeycombed or minor voids shall be chipped out, filled and smoothed with cement mortar. Major voids shall be repaired with portland cement concrete (Class A or B) in a manner prescribed by the Engineer.

Excessive longitudinal ridges along the sides of the interior of the pipe shall be chipped back and smoothed with cement mortar, as directed by the Engineer.

Form lap offsets exceeding the limits established below shall be chipped back and smoothed with mortar.

Pipe Diameter (Inches)	Maximum Offset (Inches)
24 - 30	3/8
36 - 42	1/2
48 - 66	5/8
72 - 90	7/8
96 -	1

During cast-in-place concrete pipe pouring operations, the Contractor, if requested, shall assist the Engineer in securing 3 standard test cylinders for each 50 cubic yards of concrete, or portions thereof, per day. Test cylinders shall be cured by approved methods. Cylinders shall be tested for compressive strength by a recognized testing laboratory. The cost of such tests will be at the Contractor's expense and certified copies of the results will be submitted to both the Contractor and the Engineer. One of the cylinders will be tested at the end of 7 days; one of the test cylinders will be tested at the end of 28 days; and one of the test cylinders will be held to be tested at the discretion of the Engineer, all in accordance with the procedures established by the ASTM Specification Designation C39. Failure of the 28 day test to achieve the 28 day strength requirement shall be grounds for rejection of the section of pipe represented by the test cylinder.

20.06 CONSTRUCTION JOINTS

Whenever 2 sections of pipe are to be joined where standard joints are not available, such as joining reinforced concrete pipe to cast-in-place concrete pipe or asbestos-cement pipe, or where construction of cast-in-place concrete pipe stops short of a manhole or other structure and construction will continue at a later time, the resulting joint shall be reinforced by constructing a concrete collar around the joint. This collar shall extend one foot each side of the joint around the full periphery of the pipe, and shall be equal in thickness to the wall thickness of the joined pipe, but in no case less than 4 inches. The area to receive the collar shall be thoroughly cleaned and dampened immediately prior to constructing the collar. The cost of construction joints shall be included in the various items requiring construction of concrete collars, and no separate payment will be made therefor.

20.07 MANHOLES

Manhole structures shall be constructed at the locations shown on the Plans and Specifications, and as indicated on the standard drawings pertaining thereto. Exact locations of manholes will be indicated in the field. Materials for manholes shall conform to the requirements of Subsection 20.02 of these Specifications, and the Standard Drawings.

Manholes shall be complete structures in place and backfilled including the furnishing and placing of all materials involved. Manholes shall consist of a poured in place concrete base section, reinforced concrete pipe or cast-in-place concrete riser section(s), a reinforced concrete taper section, cast iron frame and cover and a poured in place concrete collar with paving patch. Invert channels shall be smooth and semicircular in shape conforming to the inside of the adjacent pipe invert. The floor and wall of the manhole outside the channels shall be smooth and shall slope toward the channels. All entering and leaving pipes shall be placed flush with the inside edge of the manhole, except that all edges shall be rounded with cement mortar to a 3 inch radius as specified on the Standard Drawings.

The top of the manhole base section shall be keyed to receive the tongue end of the riser section. The key shall be formed in the freshly poured concrete by using a template manufactured to the dimensions of the riser section. If the riser is cast-in-place monolithically with the base section by using a slip form or other means, the key may be omitted between the base and riser. If the base and riser sections are not poured monolithically, but separately, a key shall be provided in the base section. In either case, a key will be required in the top of the riser section to receive the tongue end of the tapered cone. Cast-in-place riser sections shall have the minimum wall thicknesses specified on the Standard Drawings.

The joints between the base and all precast elements of the manhole, including adjustment rings and manhole frame, shall be filled with cement mortar prior to joining the elements.

The interior of the manhole shall be troweled smooth with a wooden trowel, removing excess mortar extruded out of joints for the entire height of the manhole, from the manhole frame to the floor. All excess mortar and any other debris shall be removed from the manhole.

Changes in direction of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly.

All manholes shall be completed to finish grade with concrete collar and paving patch (where indicated) as shown on the

Standard Drawings and as herein specified. In undeveloped areas where no street or alley surfacing is to be done in conjunction with or immediately after utility installation, the manhole cover shall be finished off to ground elevation and shall be provided with 12 inches of grade rings. In existing street areas where surfacing exists and no new street regrading is contemplated in conjunction with or immediately after utility installation, the manhole cover shall be brought to existing street grade and finished off in conformance with the Standard Drawings. In areas where street or alley surfacing is to be done in conjunction with or immediately after utility installation, such as new subdivisions, manholes shall initially terminate with the top of the cone 6 inches below subgrade and shall be brought to street or alley surface with grade adjustment rings and completed after street paving is accomplished. Unless specifically indicated otherwise in the Special Provisions, it will be the responsibility of the storm drain Contractor to return and install the manhole covers to finish grade as specified and as shown on the Standard Drawings.

20.08 INLETS, OUTLETS AND OTHER DRAINAGE STRUCTURES

Storm drainage structures such as inlets, outlets, outfall structures and other miscellaneous drainage structures shall be furnished and installed by the Contractor as indicated on the Plans and Specifications, as shown on the Standard Drawings, and as directed by the Engineer.

Materials shall conform to the requirements of Subsection 20.02 of these Specifications and as indicated on the Standard Drawings.

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 the concrete. All dirt, chips, sawdust, nails, and other foreign matter shall be completely removed from forms before any concrete is deposited therein. Forms previously used shall be thoroughly cleaned of all dirt, mortar, and foreign matter before being reused. Before concrete is placed in forms, all surfaces against which the concrete will be placed shall be thoroughly coated with form oil. Prior to placing concrete, the Contractor shall have all forms checked by the Engineer for alignment and grade.

Storm drain inlets, outlets or outfall structures may be constructed either by completely forming the interior and exterior of the structure, or by forming only the interior and upper section and neat pouring concrete for the lower section against undisturbed earth that has been excavated to the lines and grades indicated on the Plans or as directed by the Engineer. Subgrade for inlets or outlets shall be compacted to a relative compaction of no less than 95 percent.

Storm drain inlets or outlets shall be constructed monolithically (one pour), or if the Contractor elects, the structures may be constructed in 2 sections (2 pour) as provided in the details of the Standard Drawings, with no additional payment made therefor.

Depths of storm drain inlets or outlets may vary according to the depth and grade at which the lateral pipe must be installed in order to avoid existing utilities. The Contractor shall allow in his bid price for the various inlet or outlet structures full compensation for any possible increase or decrease in the anticipated depth because of adjustment in depth of lateral pipes.

Lateral pipes connecting to storm drain inlets and outlets shall be installed flush with the inside walls of the structure, except that pipe edges shall be smoothed and rounded with cement mortar to a 3 inch radius as specified in the Standard Drawings for the type of inlet or outlet installed.

Existing concrete work shall be removed and replaced as necessary to install proposed inlets and outlets, with full compensation therefor included in the price bid for said inlets and outlets. A concrete pavement saw shall be used, unless determined to be impractical by the Engineer or unless some other method approved by the Engineer, such as removal of concrete to an adjacent expansion joint, obtains as satisfactory a result as sawcutting in removing of all existing concrete pavements, curbs, sidewalks, and gutters. A minimum of 1¦ inch depth of sawcut shall be used. No separate payment shall be made for concrete sawcutting and full compensation therefor shall be included in the various bid items of work involving sawcutting.

The surface finish of the exterior exposed surfaces of concrete shall conform to the sidewalk, curb and gutter finish as required by Subsection 15.06 of these Specifications, or as directed by the Engineer. The interior surface shall have a wood trowel finish. Excessive voids shall be chipped and repaired as directed by the Engineer.

Grading work in the immediate vicinity of the installed inlet structures shall be done by the Contractor as directed by the Engineer so as to provide for the movement of surface water to the newly installed inlet. Full compensation for said grading work shall be included in the price bid for inlet structures, and no separate payment will be made therefor.

Plugs for storm drains shall be double row brick and mortar plugs installed as directed by the Engineer.

20.09 BACKFILLING, COMPACTING AND RESTORATION OF SURFACES

Backfilling, compacting and restoration of surfaces of trenches and excavations for storm drainage facilities shall conform to the requirements of Section 18 of these Specifications. Backfill for cast-in-place concrete pipe will consist of final backfill as therein specified.

The Contractor shall exercise every precaution against damage to the pipe, including damage from backfill or compaction operations. Any damaged pipe shall be removed from the work or repaired as directed by the Engineer, at no cost to the City.

20.10 MEASUREMENT

Measurement for storm drain pipe installation shall be by the lineal foot of pipe installed. The length of pipe to be paid for will be the slope length designated by the Engineer exclusive of manholes or other structures. When pipes enter a structure at an angle different from a right angle and are cut to conform to the faces of the structure or of a slope, the quantity to be paid for will be measured along the centerline of the pipe to the inside face of the structure, or to the face of the slope.

Measurement for manholes shall be per each manhole installed.

Measurement for inlets or outlets shall be per each inlet or outlet installed.

Measurement for outfall structures shall be per each outfall structure installed.

20.11 PAYMENT

The unit price bid per lineal foot for precast pipe storm drain installation shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the pipe, trenching, backfilling, compacting, placing construction joints, all connections to existing or proposed facilities and all plugs.

The unit price bid per lineal foot for constructing cast-in-place concrete pipe shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be

limited to, constructing the pipe, trenching, backfilling, compacting, concrete cylinder tests, construction joints, all connections to existing or proposed facilities and all plugs.

The unit price bid per each for manholes shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the manhole, excavation, backfill and compaction, returning and adjusting manhole lids and frames to final grade following street or alley construction or reconstruction, and connections to all pipes, wet or otherwise.

The unit price bid per each for inlet or outlet structures shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and constructing the structure, excavation, backfill and compaction, surface grading work, removing and replacing existing concrete work, and connections to all pipes, wet or otherwise.

The unit price bid per each for outfall structures shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and constructing the outfall structure, furnishing and installing the grate or fence cage, excavation, backfill and compaction, and connections to all pipes, wet or otherwise.

SECTION 21 - WATER DISTRIBUTION FACILITIES

21.01 GENERAL

This work shall consist of furnishing and installing water mains, water services, fire hydrants, valves, valve boxes, and all appurtenances, including excavation and backfill, at the locations and sizes shown on the Plans. All work shall be done in accordance with the Plans and Specifications, the Standard Drawings and as directed by the Engineer.

21.02 MATERIALS

All materials used in constructing water facilities shall be new, and shall conform to the following specifications.

1. Polyvinyl Chloride Pressure Pipe (PVC): Polyvinyl chloride (PVC) water pipes shall conform to the requirements of A.W.W.A. 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. 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. The bell shall consist of an integral wall section designed to be at least as strong as the pipe wall. Sized and dimensions shall be as listed in the A.S.T.M. 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% may be furnished in random lengths. Random lengths shall not 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.

Pipe stiffness using F/AY for P.V.C. class water pipe is as follows:

CLASS	DR	F/AY
150	18	435
200	14	914

Randomly selected samples shall withstand without failure the pressure test described in A.S T.M. D1599 including the bell and spigot joints.

Pipe shall withstand the impact test described in A.S.T.M. D2444 with no visible evidence of shattering or splitting after impact. Pipe couplings shall be Ring-Tite or Fluid-

Tite manufacture to conform to A.W.W.A. Standard C400-77 latest edition for asbestos cement water pipe. All fittings used are to be case iron A.W.W.A. Class 150, Ring-Tite or Fluid-Tite, or flanged City-approved equal. A plug fitting with coupling shall be used a the end of lines and on unused ends of all fittings to plug the line or fitting.

2. Ductile Iron Water Pipe and Fittings: Ductile iron pipe shall be manufactured in 18 foot nominal laying lengths, and shall be constructed in accordance with ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, as latest amended. Ductile iron pipe shall be thickness Class 50, unless otherwise indicated. Ductile iron pipe shall be manufactured with cement mortar lining and seal coated in accordance with ANSI/AWWA C104/A21.4, as latest amended. Rough or uncoated lining shall be cause for rejection of the pipe.

The ductile iron pipe shall be of the bell and spigot type, centrifugally cast to conform to the preceding specifications in all respects, except details of the joint. The joint shall be of the push-on boltless type, capable of being deflected after assembly, employing a single gasket to effect the joint seal, such as manufactured by the United States Pipe and Foundry Company or the Pacific States Cast Iron Pipe Company, known as the "Tyton Joint", or approved equal, and shall conform to ANSI/AWWA C111/A21.11, as latest amended. The Bidder shall furnish the joint complete with all rubber gaskets and accessories.

The fittings for ductile iron pipe shall conform to ANSI/AWWA C110/A21.10, as latest amended, and shall have push-on boltless joints, cast iron flanged joints or mechanical joints conforming to ANSI/AWWA C111/A21.11, designed for use with the specified ductile iron pipe. Short bodied "TrimTyton", or approved equal, fittings may be utilized. Flanged joints are required where shown on the Standard Drawings. The wall thickness of fittings shall be the equivalent of ductile iron Class 54. The working pressure rating shall be 350 psi. Fittings shall be cement mortar lined and seal coated as specified under ANSI/AWWA C104/A21.4. Push-on fittings shall be capable of being deflected after assembly.

3. Gate Valves: Gate valves shall conform to the requirements of AWWA Standard Specification C-500, and shall be Mueller Co. valve, or City approved equal, with iron body, bronze mounted, double disc, non-rising stem with one "O" ring seal above and below the thrust collar, nut operated, and turning counterclockwise to open.

Valves shall be manufactured to be compatibly jointed with the water pipe or fittings being valved. Valves for connection to PVC pipe shall have Ring-Tite or Fluid-Tite

fittings, valves for connection to ductile iron pipe shall have slip-on joint ends and valves for direct connection to fittings shall have flanged ends. Valves at hydrant and/or wet tap locations shall be flanged on one side to directly connect to the tee on the main supply side of the valve, as shown on the Standard Drawings.

4. Valve Boxes: Each valve shall be provided with a valve box in conformance with the standard drawing pertaining thereto. Valve boxes shall be precast concrete with heavy cast iron ring seating a deeply ribbed cast iron cover and provided 8" diameter clear opening, and shall be Brooks No. 3RT, Christy No. 65 traffic box, or approved equal. Cover marking shall read "Water". A one piece 8 inch inside diameter asbestos-cement or PVC riser extension shall be provided to allow unobstructed access to the valve operating nut.

5. Fire Hydrants: Fire hydrants shall be furnished as indicated on the standard drawing pertaining thereto, shall be of the wet barrel type with each outlet operated by an independent valve. Inlet to hydrant shall be 6 inch formed

to connect to feeder pipe. Hydrants shall be provided with break-off fittings and with 30 inch bury and extensions as necessary.

6. Copper Tubing: All copper tubing shall be new and conform to the latest revision of ASTM Specification Designation B 88 as latest amended. The tubing shall be made of copper having a purity of at least 99.9 percent as determined by electrolytic assay, except that silver may be counted as copper.

Seamless copper tubing shall be of one grade and shall be designated type "K" soft as listed in the above specifications. The tubing is to be furnished in annealed 60 foot coils except for 1 1/2 and 2 inch sizes, which may, on approval, be furnished in 20 foot lengths and crated. The tubes shall be clean, smooth, round, of proper dimension, free from grooving, indentations, cracks, flaws and scale and shall not crack when flaring.

The name or trademark of the manufacturer and a symbol indicative of the type shall be permanently marked at intervals not greater than 18 inches on the tubing.

7. Other Service Material: All service material shall be as indicated on the Standard Drawings, and as directed by the Engineer.

8. Nuts, Bolts, Screws and Fasteners: All nuts, bolts, screws and fasteners used for connecting flanges, valve body parts, etc., below the ground surface shall be manufactured of nickel-cadmium steel, or approved equal (equipment within valve boxes is considered below ground). Nuts and bolts used for above ground installation on pipe flanges, etc., shall be hexagonal head machine bolts and hexagonal nuts conforming to ASTM Specification Designation A307, Grade B. All bolt threads shall be lubricated with graphite and oil. Exposed portions of nuts and bolts shall be coated with a bitumastic material to retard corrosion.

9. Concrete Thrust Blocks: Concrete for thrust blocks shall be Class A or Class B in conformance with Section 90 of the State Standard Specifications.

21.03 TRENCHING AND EXCAVATING

Trenching and excavating for water mains and service lines shall conform to the requirements of Section 18 of these Specifications.

21.04 SEPARATION CRITERIA

All water mains and sanitary sewers shall meet the separation standards of the "California Waterworks Standards", contained in Section 6430, Title 22, of the California Administrative Code, or shall be installed in accordance with alternate construction criteria as specified therein.

21.05 INSTALLATION OF WATER MAINS, FITTINGS AND VALVES

Proper implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe, fittings, and valves shall be carefully lowered into the trench or excavation by means of a derrick or other suitable tools or equipment in such manner as to prevent damage to the pipe or fittings. Severe damage shall be grounds for rejection of the material. Any repairable damage to the pipe, lining or fittings shall be repaired by the Contractor at his expense. The Contractor shall be responsible for any damage to materials until the time of acceptance of the finished work.

As installation progresses, all pipe, valves, fittings, hydrants, etc., shall be thoroughly cleaned of all dirt, rocks and other debris that may be found in the interior of the material as stockpiled. If considered necessary by the Engineer, he may direct the Contractor to swab the pipe to clean it. At the end of each day's work, all ends of the pipe shall be closed by means of a special bulkhead or by other means approved by the Engineer.

Water pipe and fittings shall be installed in compliance with the manufacturer's recommendations, with each length of pipe having an even bearing on a properly prepared trench bottom for its entire length, with depressions cut for couplings, bells and fittings. Optional alternate methods of supporting the pipe slightly above the bottom of the trench on earth mounds may be implemented by the Contractor if approved by the pipe manufacturer and the procedures are carried out in strict compliance with his instructions. Use of blocks to support pipe or fittings is prohibited.

Rubber gasketed joints shall be made in compliance with the manufacturer's recommendations and as follows:

The gasket seat in the socket and the gasket shall be wiped clean with a cloth. The gasket shall be placed in the socket with the large end entering first. It shall then be sprung into the gasket seat so that the groove fits over the head in the seat. A thin film of lubricant shall then be applied to the inside surface of the gasket that will come in contact with the entering pipe.

The plain end of the pipe to be entered shall be wiped clean and placed in proper alignment with the bell of the pipe to which it is to be joined. In some cases it may be desirable to apply a thin film of lubricant to the outside of the plain end.

The joint shall then be made by exerting sufficient force on the entering pipe (by methods approved by the Engineer) so that its plain end is moved past the gasket until it makes contact with the base of the socket and has been shoved "home". Allowance shall be provided, in making the joint, for expansion of the pipe.

Whenever necessary to deflect the pipe from a straight line either in vertical or horizontal plane to avoid obstructions, or where long radius curves are permitted, the degree of deflection of joints shall be approved by the Engineer.

Pipe may be cut by methods approved by CAL-OSHA which will produce a square cut. No wedge type roller cutters will be allowed. PVC pipe, machined overall, in lengths shorter than 3.25 feet may be used to make connections where approved by the Engineer. Such PVC pipe shall conform to AWWA C-900 and shall be pressure rated equal to, or greater than, the main line pipe.

Valves and fire hydrants shall be installed as indicated on the Standard Drawings and as directed by the Engineer. Hydrants shall be installed plumb, with steamer outlet facing the curb.

Concrete thrust blocks shall be provided on water mains at all points in the line where a change in direction of more than 5 degrees occurs, at all gate valves 10 inches or larger, at all fire hydrant buries and at all dead ends. Thrust blocks shall be installed between the fittings and undisturbed earth of the trench wall and shall be at least the minimum dimensions shown on the Standard Drawings. For conditions not covered on said standard, the bearing area shall be as required by the Engineer.

Wet tap connections shall be made at the locations shown on the Plans and as directed by the Engineer.

21.06 VALVE BOX INSTALLATION

Valve boxes shall be installed as shown on the Standard Drawings. The valve box cover shall be centered over the valve operating nut, with boxes and extensions plumb.

In existing surfaced areas, valve boxes shall be installed to finish grade, concrete collars poured and the pavement patched. In undeveloped areas where no surfacing exists or is contemplated in conjunction with the water installation, valve boxes shall be brought to a level 1 1/2 inches above existing ground elevation and concrete collars poured. In areas where street or alley surfacing is to be done in conjunction with or immediately after utility installation, such as new subdivisions, valve boxes shall be installed to finish grade after paving has been completed, a concrete collar poured, and the pavement patched. Unless specifically provided otherwise in the Special Provisions, it will be the responsibility of the water Contractor to return and install the valve box to finish grade as specified.

21.07 WATER SERVICE INSTALLATION

Water service lines (including domestic metered service lines and fire service lines), equipment and appurtenances shall be installed in accordance with the manufacturer's recommendations, as shown on the Plans and indicated on the Standard Drawings. The Contractor shall mark the location of water service lines by putting a "W" mark on the curb face. Said mark is to be chiseled into the concrete or stamped when the concrete has not set.

21.08 BACKFILLING, COMPACTING AND RESTORATION OF SURFACES

Backfilling, compacting and restoration of surfaces of trenches and excavations for water facilities shall conform to the requirements of Section 18 of these Specifications.

21.09 STERILIZATION OF WATER FACILITIES

Prior to pressure testing and prior to acceptance of work, the entire pipeline including all valves, fittings, hydrants, service laterals, and other accessories shall be sterilized in accordance with AWWA Specification C 601 which provides detail specifications for:

(a) Limiting contaminated materials from entering the water mains during construction or repair;

(b) Removing, by flushing, contaminating materials that may have entered the water main during construction or repair;

(c) Disinfecting any residual contamination that may remain after cleaning;

(d) Determining the bacteriologic quality of fresh water in the main after disinfecting the main.

All mains shall be flushed with potable water after completion of construction and prior to disinfection. The Contractor shall provide a sufficient number of suitable outlets at the end(s) of the line(s) being sterilized in addition to those required by the Plans, to permit the main to be flushed with water at a velocity of at least 5.5 feet per second over its entire length. The outlets provided shall meet the requirements for fittings as specified for the type main constructed. Temporary blow-offs may be installed during the sterilization and flushing to satisfy those requirements. Drainage facilities shall be constructed such that the water lines cannot be contaminated through flushing outlets.

After flushing, chlorine gas or chlorine compound solution made with liquid chlorine, calcium hypochlorite in solution or sodium hypochlorite solution shall be water mixed and introduced into the mains to form a chlorine concentration of approximately 100 parts per million (ppm) or that which will provide a minimum residual of 50 ppm in all parts of the line after 24 hours have elapsed. During the sterilization process, all valves, hydrants, and other accessories shall be operated. After chlorination, the water shall be flushed from the line at its extremities until the replacement water tests are equal chemically and bacteriologically to those of the permanent source of supply.

The placing of HTH capsules or tablets in pipe sections during the laying process will be considered as an acceptable method of introducing chlorine for the test.

The chlorine water solutions shall be diluted to a chlorine concentration of not more than 100 ppm and not less than 50 ppm measured in the water lines. The Contractor shall keep adequate chlorine residual testing and indicating apparatus available on the site during the entire sterilization period.

After final flushing, the flushing fittings shall be plugged with devices intended for this purpose, at the pressure class of the pipe. Where water main is coated, plugs and outlets shall be similarly coated.

Bacteriologic samples of water for the specified bacteriologic test shall be taken from each end of the sterilized main (located downstream of the point of introduction of chlorine disinfectant), and at other locations as determined necessary by the Engineer. When an entire water main is to be tested, it shall be completely isolated from the existing system. Bacteriologic samples shall be taken a minimum of 48 hours after the mains have been flushed of all chlorine. Such samples shall be obtained by the Contractor using pipe and fittings supplied by the Contractor as directed by the Engineer. Bacteriologic samples shall be obtained in the following manner:

At corporation stops, risers shall be installed that will discharge water directly downward towards the ground. The discharge point of the risers shall be a minimum of 2 feet above the ground. Risers shall include the necessary bends to accomplish the foregoing, and shall be equipped with in-line valves near the discharge points to regulate the flow. The Contractor shall provide and supply these hookups, full compensation therefor to be included in the amount bid for the various water main bid items.

For mains over 1,300 feet in length with no services, samples in addition to those obtained at each end shall be taken at intermediate points in such a manner that at least one sample is taken for each 700 feet of main.

The recommended procedure of sterilizing and testing water mains is as follows:

1. Chlorine residual of between 50 and 100 ppm is introduced into the water mains;

2. 24 hours later, treated water is flushed from the water mains;

3. 48 hours after flushing, water samples are taken for bacteriologic tests;

4. 96 hours after samples are taken, results of water samples are reported to the Contractor;

5. If the bacteriologic tests show a coliform M.P.N./100 ML water of 2.2 or less on all samples, the water facilities tested will be considered clear. In the event the coliform number is above 2.2, the sterilization procedure shall be commenced again within 24 hours of notice by the City that the bacteriologic tests failed.

Should the end of any of the foregoing periods fall on a City nonworking day, the order of procedure will be continued to the next regular City working day.

21.10 HYDROSTATIC PRESSURE TEST

After the pipe and all appurtenances have been laid, backfill has been placed and compacted and all compaction tests have passed, but prior to placement of aggregate base or pavement material, a hydrostatic pressure test shall be conducted for each reach between adjacent valves. Valves shall be in a closed position. The test time period shall be 30 minutes and shall consist of subjecting the reach of pipeline being tested to a hydrostatic pressure of 100 pounds per square inch gauge (psig). In addition, a hydrostatic test shall be conducted on the entire pipeline, while completely isolated from any existing water mains, for a period of one hour at a hydrostatic pressure of 100 psig. All valves in the pipeline shall be in the open position during system testing. Any leaks, failures, or imperfect construction revealed by such test shall be promptly corrected by the Contractor and retested until all visible leakage has been stopped and test results do not exceed the allowable leakage as set forth below.

The allowable leakage shall be determined from the following table. The allowable leakage is calculated by multiplying the table value for the average test pressure and for the diameter of pipe tested by the duration of the test in hours by the total number of joints in the line divided by 100.

Average Test Pressure at lowest point in line (PSIG)	50	75	100	125	150	200	220
Pipe Diameter, (Inches)	Allowable Leakage per 100 Couplings (Gallons Per Hour)						
4	0.71	.87	1.00	1.02	1.23	1.42	1.5
6	1.06	1.29	1.51	1.68	1.84	2.12	2.2
8	1.42	1.72	2.00	2.24	2.45	2.84	3.0
10	1.77	2.15	2.50	2.79	3.07	3.54	3.7
12	2.12	2.58	3.00	3.35	3.68	4.24	4.5

Tests shall not be made until at least 36 hours after the last concrete thrust or reaction blocking shall have been cast with high early strength cement or at least 7 days after the last concrete thrust or reaction blocking shall have been cast with standard cement. All equipment, testing and repair shall be furnished by the Contractor.

20.11 MEASUREMENT

Measurement for water main installation and fitting installation shall be by the lineal foot of pipe installed, and shall be the actual horizontal length installed, measured through fittings.

Measurement for gate valves shall be per each gate valve installed.

Measurement for fire hydrants, complete, shall be per each fire hydrant assembly installed.

Measurement for water service lines shall be per each water service line installed.

Measurement for fire service lines shall be per each fire service line installed.

21.12 PAYMENT

The unit price bid per lineal foot for water mains and fittings shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the pipe and fittings, installing concrete thrust

blocks, trenching, backfilling, compacting, testing, sterilization and all incidentals.

The unit price bid per each for gate valves shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the valve and valve box, installing concrete thrust blocks, trenching, backfilling, compacting, testing, sterilization, returning and installing valve box to final grade following street or alley construction or reconstruction, and all incidentals.

The unit price bid per each for fire hydrants, complete, shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the hydrant assembly (pipe, fittings, structures, break-off fittings, bury, extensions, gate valve and valve box), furnishing and installing protection posts where required, excavation, backfill and compaction, returning and adjusting valve box to final grade following street or alley construction or reconstruction, testing, sterilization, and all incidentals. Unless otherwise indicated in the Special Provisions, the cost of furnishing and installing any wet tap required for the hydrant shall be included in the unit price bid for fire hydrants, complete.

The unit price bid per each for water service lines shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the service pipe and appurtenances (including all taps, fittings,

stops, saddles, spacers, meter box and lid, etc.), trenching, backfilling, compacting, testing, sterilization, adjusting meter box to finish sidewalk grade, and all incidentals.

The unit price bid per each for fire service lines, complete, shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, furnishing and installing the fire service pipe, fittings, structures, gate valve and valve box, thrust blocks, connection to main pipe, and all excavation,

backfill and compaction, returning and adjusting valve box to final grade following street or alley construction or reconstruction, testing, sterilization, and all incidentals. Unless otherwise indicated in the Special Provisions, the cost of furnishing and installing any wet tap required for the fire service line shall be included in the unit price bid for fire service lines, complete.

Payment for wet taps, except those directly associated with fire hydrant or fire service installation, shall be as set forth in the Special Provisions or on the Bid Proposal.

SECTION 22 - JACKING PIPE

22.01 GENERAL

This work shall consist of furnishing, boring, and jacking into place the type of pipe shown on the Plans or specified in the Special Provisions at locations and between the limits shown on the Plans or specified, and in accordance with these Specifications, the Standard Drawings and as directed by the Engineer.

Reinforced concrete pipe with rubber gasket joints, as a carrier pipe, as specified below, may be jacked into place directly without a jacked steel casing. All other carrier pipe must be installed within a jacked steel casing.

22.02 MATERIALS

The casing pipe (or reinforced concrete pipe jacked without casing pipe) designated on the Plans shall be of the size and class (or strength designation) shown on the Plans or specified, except that the class of pipe designated has been determined for vertical loads only. Additional facilities, reinforcement, or strength of pipe required to withstand jacking pressure shall be determined and furnished by the Contractor at his expense.

Where reinforced concrete pipe, as a carrier pipe, is specified to be jacked into place directly without a jacked steel casing, said reinforced concrete pipe shall be furnished with rubber gasket joints, all in conformance with Subsection 20.02 of these Specifications. The reinforced concrete pipe shall be constructed such that no bells protrude from the outside periphery of the pipe. Sleeves for joints on reinforced concrete pipe shall be furnished and manufactured of galvanized steel, stainless steel, or fiberglass, sufficient in strength to withstand all loads, and which will maintain a water tight joint.

Steel casing pipe shall have a wall thickness not less than that shown on the Plans, and shall be butt welded of sheets conforming to ASTM A-570 commercial grade or of plate conforming to ASTM A-283. All field joints also shall be butt welded full circumference or by other means approved by the Engineer. Joints to be field welded shall be shop cut to ensure a true 90° to the longitudinal axis of the pipe. Use of a jacking band to reinforce the end of the pipe receiving the jacking thrust will be required. It shall be the Contractor's responsibility to provide joints which are capable of resisting the jacking stresses without failure.

Carrier pipe to be installed within steel casing shall be as indicated on the Plans and/or Special Provisions.

Redwood blocks for supporting carrier pipe within steel casing shall be construction heart redwood, rough graded in accordance with the current standard specifications for structural grades of California redwood approved by the Board of Review, American Lumber Standards Committee and published by the Redwood Inspection Service. All material shall be well manufactured. Only pieces consisting of sound wood, free from decay, will be accepted in the work. Redwood blocks shall be v-cut to fit the contour of the pipe.

Concrete for plugs to be placed at ends of casing pipe as shown on the Standard Drawings shall be Class B, in conformance with Section 90 of the State Standard Specifications.

22.03 EXCAVATION OF JACKING AND RECEIVING PITS

Excavation of jacking and receiving pits shall conform to the requirements of Section 18 of these Specifications, and shall be sheathed, shored, sloped or braced in accordance with the Safety Regulations of the State of California, Department of Industrial Relations, Division of Industrial Safety. Reference is made to Subsection 7.13 of these Specifications.

Reference is also made to Subsection 7.12 of these Specifications, relative to the Contractor's responsibility for protecting workers and others from toxic or explosive gases.

22.04 BORING AND JACKING

Pipe shall be jacked in conformity with the prescribed lines and grades obtained from the stakes set by the Engineer. Excavation for the pipe shall be accomplished by boring or by hand digging. Sluicing or jetting with water will not be permitted.

The excavated hole, whether bored or hand dug, shall not be more than 0.10 foot in diameter greater than the outside limits of the casing (or reinforced concrete pipe jacked without casing pipe). If the nature of the material is such that caving will likely occur and which may result in a greater space than above specified, a metal shield or jacking head shall be installed which extends a minimum of 18 inches ahead of the jacked casing or pipe. The metal shield shall cover a minimum of the upper 1/2 of the periphery of the jacked casing or pipe. Excavation shall not proceed beyond the shield.

Where ground conditions at the face of the jacking pit are such that sloughing or caving of ground is likely to occur at the face of the excavation upon commencement thereof, the face of the pit shall be made stable so that an excessive void is not carried with the face of the excavation for the length of the casing or pipe. This may be accomplished by solid sheathing at

the portal of the jack, or excavating and backfilling the face of the pit with cohesive material.

Cavities or voids outside the limits specified above, regardless of cause, shall be backfilled with sand, soil, cement, or cement mortar as directed by the Engineer. The method by which backfill is to be performed shall be approved by the Engineer. All casing pipe 24 inches in diameter or larger, and all reinforced concrete pipe 24 inches in diameter or larger, shall be furnished with preinstalled fittings suitable for attachment to grout pumping equipment. Such grout connections, unless otherwise indicated on the Plans, shall be placed at 30', 120', 240' and 330', measured clockwise, from vertical, around the circumference of the casing or pipe, and at intervals in each row, along the pipe, of no greater than 10 feet. Alternate bottom holes shall be staggered, and alternate top holes shall be staggered, so that one hole will occur at the top every 5 feet and one hole will occur at the bottom every 5 feet.

Immediately after completion of the jacking or boring operation, lean grout shall be injected through the grout connections in such a manner as to completely fill all voids outside the casing pipe or reinforced concrete pipe resulting from the jacking or boring operation. The lean grout shall consist of one part portland cement to not more than 4 parts sand by volume, placed at low pressure. Grout pressure is to be controlled so as to avoid deformation of casing pipe and/or avoid movement of the surrounding soil. Sand for grout to be placed outside the casing shall be of such fineness that 100 percent will pass a No. 8 sieve and not less than 35 percent will pass a No. 50 sieve. After completion of grouting, the grout connections shall be closed with cast-iron threaded plugs.

In general, excavated material shall be removed from the casing or reinforced concrete pipe as jacking progresses and no accumulation of excavated material within the casing will be permitted. Should appreciable loss of ground occur in installations where the face of the excavation is accessible, the voids shall be backpacked promptly to the extent practicable with an approved soil cement.

For jacked reinforced concrete pipe, if the annular space in the joints on the inside of the pipe exceeds one inch, the space shall be filled with cement mortar for the full periphery of the joint and finished smooth and flush with the interior walls of the pipe. Filling and finishing annular spaces shall be accomplished after the entire installation is completed for larger pipe.

Where carrier pipe is to be installed within a jacked casing, carrier pipe as shown on the Plans or indicated in the Special Provisions shall be installed within the casing pipe to the

lines and grades shown on the Plans, and as indicated on the standard drawing pertaining thereto. The carrier pipe shall be supported on skids during the installation of the pipe. The skids shall be installed in such a manner as to relieve the couplings from all load and bearing. At the successful completion of the installation, concrete end seals (concrete plugs) shall be installed in accordance with the standard drawing. Care shall be taken during the placement of these seals that the pipe is not damaged, deflected or displaced.

22.05 GRADE TOLERANCE

Reinforced concrete pipe jacked into place without steel casing shall not vary from theoretical alignment and grade at the time of completion of jacking by more than 0.50 foot in 100 feet for storm drain, and 0.10 foot in 100 feet for sanitary sewer.

Steel casing pipe of the minimum size and thickness specified on the Plans shall be installed in place to grades required to install the carrier pipe at the design grade. The Contractor's attention is called to the fact that extreme care will be required in placing the casing pipe so as to permit the construction of the carrier pipe to the lines and grades shown on the Plans. It shall be the Contractor's responsibility for selecting a size of casing, at or above the minimum specified, in order that the jacking may be done with a sufficient degree of accuracy to permit installation of the carrier pipe to the grade as shown on the Plans within the tolerances set forth in these Specifications for the particular carrier pipe installed. Any and all increased costs resulting from the Contractor's use of steel casing pipe with greater diameter or thickness than the minimum specified shall be borne solely by the Contractor. Variations from theoretical alignment and grade of the steel casing pipe at the time of completion of jacking shall not exceed one percent of the distance from the jacking point.

22.06 BACKFILL, COMPACTION AND RESTORATION OF SURFACES FOR JACKING AND RECEIVING PITS

Jacking and receiving pits shall be backfilled and compacted, and the surface restored, in accordance with Section 18 of these Specifications.

22.07 MEASUREMENT

Measurement for reinforced concrete pipe with rubber gasket joints (without steel casing), jacked into place, shall be by the lineal foot of pipe jacked into place as shown on the Plans or directed by the Engineer.

Measurement for steel casing pipe jacked into place shall be by the lineal foot of casing pipe jacked into place as shown on the Plans or directed by the Engineer.

Where carrier pipe is indicated on the Plans to be placed within a jacked casing pipe, carrier pipe will be measured by the lineal foot of pipe installed.

22.08 PAYMENT

The unit price bid per lineal foot for reinforced concrete pipe with rubber gasket joints, jacked into place, shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to, excavating, backfilling and compacting the jacking and receiving pits, boring and tunneling, furnishing and installing the pipe complete with grout fittings, furnishing and installing metal shields, grouting and backfill of voids, and all incidentals.

The unit price bid per lineal foot for steel casing, jacked into place, shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to excavating, backfilling and compacting the jacking and receiving pits, boring and tunneling, furnishing and installing the casing complete with grout fittings, furnishing and installing metal shields, furnishing and installing skids and tie downs, grouting and backfill of voids, sealing ends of casing, and all other incidental work over and above that associated with the normal work of furnishing and installing the carrier pipe in a trench situation.

Carrier pipe to be placed in casing as shown on the Plans will be paid for as normal in-trench pipe as set forth in these Specifications for the particular type of pipe to be installed.

SECTION 23 - CHAIN LINK FENCE

23.01 GENERAL

This work shall consist of constructing chain link fence at locations shown on the Plans, and in accordance with the details shown in the project Plans or Standard Drawings, and as specified in these Specifications and the Special Provisions, and as directed by the Engineer.

23.02 MATERIALS

All ferrous materials shall be new and galvanized. Imperfectly galvanized material or material upon which serious abrasions of the galvanizing occur shall not be used in the work.

A certificate of compliance may be required from the manufacturer of all products used in constructing chain link fence, including posts, and shall be submitted to the Engineer in conformance with Subsection 5.04 of these Specifications.

1. Height: The fence shall stand at a height of 6 feet above the grade indicated on the Plans when erected.

2. Fabric: Chain link fence fabric shall conform to the specifications of ASTM Specification Designation A392, Class 1 zinc coating. The wire used in the manufacture of the fabric shall be 11 gage, and woven into approximately 2 inch mesh. The upper edges of the fabric shall have the wire ends bent back to form a closed loop (knuckled).

3. Posts and Braces: The base material for the manufacture of steel pipe used for posts and braces shall conform to the specifications of ASTM Specification Designation A120, standard weight, and the base material for the manufacture of other steel sections used for posts and braces shall be good commercial quality weldable steel. Posts and braces shall conform to the following requirements:

Corner and End Posts (round pipe only)

Pipe: 2 7/8 inches outside diameter (O.D.)
5.79 lb./ft. weight

Line Posts

Pipe: 2 3/8 inches O.D.
3.65 lb./ft. weight

H Section: 2 x 2 1/4 inches
4.1 lb./ft. weight

Gate Posts (round pipe only)

Individual Gate Width (feet)	O.D. (inches)	Weight (lb./ft.)
Up thru 6	2 7/8	5.79
7 thru 13	4	9.11
14 thru 18	6 5/8	18.97
Over 18	8 5/8	24.70

Braces

Pipe: 1 5/8 inches O.D.
2.27 lb./ft. weight

H Section: 1 1/2 x 1 5/16 inches

All posts shall be fitted with rainproof caps designed so as to fit securely over the top of the posts, and carry the top tension wire, except that the top of H Section posts may be open-slotted in such a manner as to securely hold the top tension wire in position without vertical movement. Such slotting shall allow removal and replacement of a post without disturbing the top tension wire.

All posts shall be of a total length of not less than 9 feet as shown in the Standard Drawings, except that where post caps are used which hold tension wires, the post may be shortened a sufficient amount so that the top of the cap is at the approximate level of the fence fabric, but no lower. In no case, however, shall the post be shorter than 8 feet 8 inches where post caps are used,

nor shall the length embedded in the concrete footing, including any mowstrip, be less than 3 feet.

Posts and braces shall be galvanized in accordance with ASTM Specification Designation A123.

4. Extension arms, stretcher bars and other required fittings and hardware: Extension arms, stretcher bars and other required fittings and hardware shall be steel or malleable iron or wrought iron and shall be galvanized in accordance with ASTM Specification Designation A153.

5. Tension wires: Tension wires shall be a minimum of 7 gage (0.177 inch diameter) coil spring steel of good commercial quality. Tie wires and hog rings shall be at least 9 gage (0.148 inch diameter) steel. Post clips shall be at least 6 gage (0.192 inch diameter) steel. Tension wires, tie wires, post clips, and hog rings shall be galvanized in accordance with the provisions of ASTM Specification Designation A116, Coating Class 3.

6. Wire Strands for Extensions: Wire strands for extensions shall be 9 gage (0.148 inch) diameter galvanized steel of a good commercial quality. Three strands shall be installed where extensions are called for on the Plans.

7. Gates: Drive gates shall be of the widths designated in the Contract item. Walk gates shall be 4 feet wide. Gates shall be constructed in accordance with the Standard Drawings.

Gate frames shall be constructed of not less than 1¦ inch inside diameter galvanized standard weight pipe conforming to ASTM Specification Designation A120. Gate frames shall be cross trussed with 3/8 inch adjustable truss rods. The adjuster shall be provided with flat and lock washers and shall be "double-nutted", as directed by the Engineer, to lock the adjuster. The corners of gate frames shall be fastened together and reinforced with a malleable iron fitting designed for the purpose, or they may be welded and regalvanized as provided herein.

All abraded and damaged galvanized surfaces or welded areas shall be regalvanized or may be cleaned and painted with 2 coats of zinc oxide, zinc dust paint conforming to the requirements of Federal Specification MIL-P-15145, the paint to be properly compounded in a suitable vehicle in the ratio of one part zinc oxide to 4 parts zinc dust, by weight.

Chain link fence fabric specified for the fence shall be attached to the gate frame by the use of stretcher bars and the tie wires as specified for fence construction, and suitable tension connectors spaced at approximately one foot intervals.

The gates shall be hung by at least 2 steel or malleable iron hinges not less than 3 inches in width, so designed as to securely clamp to the gate posts and permit the gate to be swung back against the fence.

Gates shall be provided with a combination steel or malleable iron catch and locking attachment of approved design. Stops to hold gates open and a center rest with catch shall be provided for all double gates. Walk gates shall be provided with stops only.

8. Concrete: Concrete for post footings shall be Class "B", and shall conform to the requirements of Section 90 of the State Standard Specifications.

Reference is made to Subsection 5.03 of these Specifications, which is modified herein. In addition to any of the requirements of said Subsection 5.03, one post from each lot of posts, and one brace from each lot of braces, to be used in the work shall be tested in accordance with the requirements of ASTM Specification Designation A120. If that post or brace fails, 2 additional posts or braces from the same lots will be tested. If either of the 2 additional sampled posts or braces fails, the entire lot of posts will be rejected.

23.03 CLEARING AND GRUBBING

Clearing and Grubbing shall conform to the requirements of Section 11 of these Specifications.

23.04 EXCAVATION AND PREPARATION OF SUBGRADE

Any required excavation or embankment construction shall be to the lines and grades shown on the Plans or established by the Engineer. Excavation, embankment construction and preparation of subgrade shall conform to the requirements of Subsections 12.01 through 12.07 of these Specifications. Unless otherwise indicated, minimum relative compaction of finished fence pad shall be 90 percent.

The area around each gate shall be graded to allow all gates to be swung back against the fence without dragging on the ground surface.

23.05 CONSTRUCTION

Line posts shall be spaced not farther apart than 10 feet from center to center, and unless otherwise specified, shall be set vertically.

All posts shall be set in concrete footings conforming to details shown on the Standard Drawings. Unless otherwise directed by the Engineer, footings shall be crowned at the top to permit water to flow away from the posts.

End, corner and gate posts shall be braced to the nearest line post as shown on the Standard Drawings, with horizontal braces used as compression members and galvanized 3/8 inch steel adjustable truss rods used as tension members. The adjuster shall be provided with flat and lock washers, and shall be "double-nutted", as directed by the Engineer, to lock the adjuster. Where the distance between corner and/or gate posts is 1,000 feet or greater, line posts shall be braced horizontally and trussed in both directions at intervals not to exceed 1,000 feet, as shown on the Standard Drawings. The tension wires shall be interrupted at this location by cutting and attaching them to one of the braced line posts. Tension wires shall then be continued from this same line post to the next corner or gate post.

Changes in line where the deflection angle is 10 degrees or more shall be considered as corners, and corner posts with bracing specified for corners shall be installed.

Chain link fabric shall be fastened on the outside of the posts surrounding the area being fenced, unless otherwise directed by the Engineer.

The fabric shall be stretched and securely fastened to the posts, and between posts the top and bottom edges of the fabric shall be fastened to the tension wires. Tension wires shall be stretched tight and attached to corner or gate posts in a manner approved by the Engineer.

The fabric shall be fastened to end, corner and gate posts with 1/4 inch by 3/4 inch stretcher bars and not less than 1/8 inch by 3/4 inch stretcher bar bands spaced at one foot intervals. The fabric shall be fastened to line posts with tie wires or post clips and to tension wires with tie wires or hog rings. The wire or clip fasteners shall be spaced 14 inches apart on line posts, with a minimum of 6 per post, and 18 inches apart on tension wires.

All bolted fixtures, including gate hinge attachments, turnbuckles, or other adjusters, clamps, or any device which is bolted, shall be provided with flat washers behind bolt heads, except where stove bolts are used, and flat and lock washers behind nuts. All turnbuckles or other adjusters shall be "double-nutted" to lock the adjuster.

Where post extensions and strands of wire are specified, the wire shall be stretched tight and fastened to extension arms with tie wires or hog rings. Where the wire terminates, it shall be securely tied to the extension arm.

23.06 MEASUREMENT

Measurement for 6 foot chain link fence will be by the lineal foot of chain link fence installed as shown on the Plans, to be determined by the Engineer from actual measurements, the width of gate openings being deducted.

Measurement of gates will be per each for each type of gate installed as shown on the Plans. A gate unit complete in place shall include one gate, or in the case of double gates, one double unit, with all necessary fittings, hardware, and gate posts with braces, latches, stops, and other devices required by the Standard Drawings, Plans or Specifications.

23.07 PAYMENT

When the Contract does not include a pay item for clearing and grubbing, or for excavation and preparation of subgrade, as above specified, and unless otherwise provided in the Special Provisions, full compensation for any necessary clearing and grubbing, and any excavation and preparation of subgrade required to prepare the fence pad to the grades shown on the Plans or indicated by the Engineer shall be considered as included in the prices bid for the various fence construction items of work and no separate payment will be made therefor.

The unit price bid per lineal foot for 6 foot chain link fence shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to clearing and preparing the fence pad (where no separate item is provided therefor), furnishing and installing the fence, providing samples and tests, furnishing and installing post extension arms and strands of wire where indicated, and all incidentals.

The unit price bid per each for each type of gate shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the

Specifications, and as directed by the Engineer. This shall include, but not be limited to clearing and preparing the fence pad (where no separate item is provided therefor), furnishing and installing gates, providing samples and tests, furnishing and installing post extension arms and strands of wire where indicated, and all incidentals.

SECTION 24 - CONCRETE MASONRY WALL

24.01 GENERAL

This work shall consist of furnishing all materials and constructing a concrete masonry wall at the locations as shown on the Plans. Included is the footing construction, reinforcing steel, concrete masonry units and other facilities to complete the wall as indicated on the Standard Drawings, and as specified herein. Concrete masonry wall shall be installed to the lines and grades shown on the Plans or as directed by the Engineer.

24.02 MATERIALS

Materials for concrete masonry wall construction shall be as follows:

1. Concrete Masonry Units: Hollow load bearing masonry units shall be Grade A units conforming to the ASTM Specification Designation C90 and in addition the requirements of the Quality Control Standards of the Concrete Masonry Association. All masonry units shall be sound and free of cracks and other defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction. Minor cracks incidental to the usual method of manufacture, or minor chipping resulting from customary methods of handling in shipment and delivery, shall not be deemed grounds for rejection.

2. Cement: Cement shall be Type I or Type II portland cement conforming to ASTM Specification Designation C150.

3. Mortar: Mortar shall be freshly prepared and uniformly mixed in the ratio of one part portland cement, 1/4 part minimum to 1/2 part maximum lime putty or hydrated lime, damp loose sand not less than 2 1/2 and not more than 3 times the sum of the volumes of the cement and lime used (4 1/2 parts maximum), and shall conform to ASTM Specification Designation C270. If plastic type cement is used, lime putty shall be omitted.

4. Grout: Grout for pouring or pumping shall be as follows:

   A. Grout for pouring shall be of "fluid consistency"and shall conform to ASTM Specification Designation C476. "Fluid consistency" shall mean as fluid as possible for pouring without segregation of the constituent parts. It shall be freshly prepared and uniformly mixed in the ratio of volumes as follows:

Type	Grout Space in its Least Dimension (Inches)	Portland Cement (parts)	Damp Loose Sand (parts)	Damp Loose Aggregate (parts)
Fine	Less than 3	1	2 1/4 min-3 max	-
Coarse	3 or more	1	2 min-3 max	1 to 2

B. Grout for pumping shall be of "fluid consistency" as defined above and shall have not less than seven sacks of cement in each cubic yard of grout.

5. Lime: Hydrated lime shall conform to ASTM Specification Designation C207.

6. Aggregate: Aggregate for mortar shall conform to ASTM Specification Designation C144. Aggregate for grout shall conform to ASTM Specification Designation C404.

7. Concrete: Portland cement concrete for footing shall be Class A and conforming to the requirements of Section 90 of the State Standard Specifications.

8. Reinforcing steel: Reinforcing steel shall be deformed bars conforming to ASTM Specification Designation A15 and A305, except that 1/4 inch ties may be plain bars. Wire reinforcement shall conform to ASTM Specification Designation A82.

24.03 CLEARING AND GRUBBING

Clearing and Grubbing shall conform to the requirements of Section 11 of these Specifications.

24.04 EXCAVATION AND PREPARATION OF SUBGRADE

Any required excavation or embankment construction for the wall footing shall be to the lines and grades shown on the Plans or established by the Engineer. Excavation, embankment construction and preparation of subgrade shall conform to the requirements of Subsection 12.01 through 12.06 of these Specifications. Unless otherwise indicated, minimum relative compaction of finished subgrade for wall footing shall be 90 percent.

24.05 CONSTRUCTION

The wall and footing construction shall be of the highest quality workmanship and all walls shall be laid true, level, plumb and neat and in accordance with the Plans and the standard drawing pertaining thereto.

Forms for footing construction shall be straight and true. The exposed (after wall construction) finish top surface of the footing shall be a medium sweat finish.

Mortar and grout shall be mixed by placing half of the water and sand in the operating mixer. Then the cement, lime and remainder of the sand and water shall be added. After all ingredients are in the batch mixer, they shall be mechanically mixed for not less than 5 minutes. Hand mixing shall not be employed unless specifically approved. The mortar should be retempered with water as required to maintain high plasticity. Retempering on mortar boards shall be done only by adding water within a basin formed with the mortar and the mortar reworked into the water. Retempering may only be done prior to hardening of the mortar. Any mortar and grout which is unused after 1¼ hours from initial mixing time shall be discarded.

For bonding the masonry to the foundation, the top surface of the concrete foundation shall be clean and with laitance removed and aggregate exposed before starting the masonry construction. The starting joint on foundations shall be laid with full mortar coverage on the bed joint, except the area where grout is to contact the foundation.

Mortar joints shall be straight, clean, and uniform in thickness and shall be tooled. Tooling shall be done when the mortar is partially set but still sufficiently plastic to bond. All tooling shall be done with a tool which compacts the mortar, pressing the excess mortar out of the joint rather than dragging it out. Joints which are not tight at the time of tooling shall

be raked out, pointed, and then tooled. If it is necessary to move a masonry unit after it has been once set in place, the unit shall be removed from the wall, cleaned and set in fresh mortar. Lintels, capping units and all bearing plates set by the mason shall be set in a full bed of mortar.

All cells, containing reinforcement or not, are to be filled with grout. All grout shall be puddled or vibrated in place to consolidate without separation. Mortar droppings should be kept out of the grout space. Mortar that projects into the grout space shall be removed so that protrusions will not restrict the flow of grout (grout will tend to bridge at these locations and require too much puddling or vibration to assure complete filling of grout space). Vertical cells to be filled shall have a vertical alignment to maintain a continuous unobstructed cell area not less than 2 inches x 3 inches. Cells containing reinforcement shall be solidly filled with grout and pours shall be stopped 1.5 inches below the top of a course to form a key at pour joints.

Reinforcing bars shall be straight except for bends or hooks as detailed on the Standard Drawings. Horizontal reinforcing bars shall be laid on the webs of the masonry units in continuous masonry courses, consisting of bond-beam or channel units, and shall be solidly grouted in place. Vertical reinforcing steel shall have a minimum clearance of 1/4 inch from the masonry, and not less than one bar diameter between bars. Wire reinforcement shall be completely embedded in mortar or grout. Joints with wire reinforcement shall be at least twice the thickness of the wire.

Concrete scum, and grout stains on the wall shall be removed immediately. After the wall is constructed, it should not be saturated with water for curing or any other purpose. At the conclusion of the masonry work, the Contractor shall clean all the masonry, remove equipment used in the work, and remove all debris, refuse, and surplus masonry material, and dispose of them away from the premises.

24.06 MEASUREMENT

Measurement for concrete masonry wall will be by the lineal foot of concrete masonry wall installed as shown on the Plans, to be determined by the Engineer from actual measurement.

24.07 PAYMENT

When the Contract does not include a pay item for clearing and grubbing, or for excavation and preparation of subgrade, as above specified, and unless otherwise provided in the Special Provisions, full compensation for any necessary clearing and grubbing, and any excavation and preparation of subgrade required to prepare the subgrade and pad for the wall

foundation, as shown on the Plans or indicated by the Engineer, shall be considered as included in the price bid for concrete masonry wall and no separate payment will be made therefor.

The unit price bid per lineal foot for concrete masonry wall shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to clearing and preparing the wall pad and subgrade (where no separate item is provided therefor), constructing concrete footing, furnishing and placing reinforcing steel, concrete block, mortar and grout, and all incidentals.

SECTION 25 - LANDSCAPE IRRIGATION SYSTEMS

25.01 GENERAL

This work shall consist of furnishing and installing landscape irrigation systems as indicated on the Plans and Specifications and as directed by the Engineer.

The Plans and Specifications are intended to include everything requisite and necessary to the proper installation of the work, whether each individual necessary item is mentioned or not, and the Contractor is required to provide for the same.

All work herein specified or called for on the Plans, on the detail drawings or set forth in the Special Provisions shall be executed in accordance with all governing ordinances, laws and regulations and shall meet all local conditions. Any changes and/or additions in work necessary to meet ordinances, laws, regulations and/or conditions will be made without additional expense to the City, but such changes shall have the prior written approval of the Engineer.

25.02 DESIGN

The objective of the Plans and Specifications is to provide an assembled and installed landscape irrigation system which will operate in an efficient and satisfactory manner so that the finished system shall efficiently irrigate all areas to be covered and shall prove satisfactory in all aspects to the City. The Contractor shall not willfully install the irrigation facilities as indicated on the Plans when it is obvious in the field that obstructions or grade differences exist that might not have been considered in the design. Such obstructions or differences should be brought to the attention of the Engineer for consideration of adjustment in proposed facility locations.

Reference is made to Subsection 1.10 of these Specifications. The Contractor shall examine carefully the site of work. It will be assumed that the Contractor has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and quantity of work to be performed and materials to be furnished, and as to the requirements of the Specifications.

The Plans are essentially diagrammatic, and because of the scale of the drawings, it is not feasible to indicate all offsets, fittings, etc., which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all his work, and plan his work accordingly, furnishing such fittings and other material as may be required to meet such conditions. The Contractor shall install the system in the most direct and workmanlike manner, so

that conflicts between sprinkler systems, planting, and other architectural features will be avoided.

25.03 MATERIALS

Any material specified by name and/or model number in the Specifications or on the drawings shall be deemed to be used for the purpose of identifying the materials and insuring the specific use of that material in the construction of the system. No substitutions will be permitted without prior written approval of the Engineer. All materials used in the system shall be new and without flaws or defects of any type and shall be the best of their class and kind. All materials shall have a minimum guarantee of one year against material defects or defective workmanship.

If substitution of material is desired by the Contractor, sufficient descriptive literature and material samples must be furnished to establish the material as an equal substitute. In addition, the Contractor must state his reasons for desiring substitute materials.

Wherever such terms as "or equal" or "approved equal" or other terms of a similar meaning are used in the Specifications or on the Plans, they shall mean:

(a) Equal in the quality of materials used, in structural strength and in detail of construction;

(b) Equal in performance, mechanically and technically;

(c) Equal in finish, or in characteristics permitting the specified finish to be applied;

(d) Equal in arrangement of plan. If substitutions for specified projects require a rearrangement of pipe work, head spacing, etc., such rearrangement must, in the opinion of the Engineer, be equal in convenience and practicability to the original arrangement. If such arrangement is approved by the Engineer, and should it involve additional cost, such cost must be borne by the Contractor; and

(e) Equal in price. Materials and equipment which are equal in quality and utility are competitive products and are approximately equal in price on the open market. If approval is requested for materials or equipment materially cheaper than the specified products, the City will require the specified product, unless cost savings are passed on to the City.

Equipment or materials installed or furnished not in conformance with the Plans and Specifications, or substituted

material installed or furnished without prior written approval of the Engineer, is subject to rejection. Said rejected equipment or material shall be removed from the site by the Contractor at his own expense.

Material used in landscape irrigation systems shall conform to the following requirements:

1. PVC Pipe and Fittings: All main line or pressure supply line shall be Class 200 polyvinyl chloride (PVC) "O" ring pipe (rubber gasketed joint), conforming to AWWA Standard C900, as manufactured by J-M Manufacturing Company, Inc., Certain-Teed, or Class 315-1120/1220 solvent weld PVC pipe with Schedule 80 fittings for pipes 2 inches and larger in diameter, and Schedule 40-1120/1220 solvent weld PVC pipe with Schedule 40 fittings for pipes less than 2 inches in diameter, as manufactured by the Swanson Company, Certain-Teed, or approved equal. All lateral supply line pipe (downstream of control valves) shall be Class 200-1120/1220 solvent weld PVC pipe with Schedule 40 fittings as manufactured by the Swanson Company, Certain-Teed or approved equal. PVC pipe shall be continuously marked with identification of the manufacturer, type, class, and size. All fittings shall be identified as to pressure rating or schedule.

2. Asbestos-Cement Pipe and Fittings: All pipe 4 inches and larger may be Class 150 asbestos-cement as manufactured by J-M Manufacturing Company, Inc., Certain-Teed, or approved equal. Fittings for asbestos-cement pipe shall be tapped couplings with threaded brass inserts or cast iron fittings of the same pattern as the pipe.

3. Galvanized Iron Pipe and Fittings: All galvanized iron pipe shall be standard weight butt-welded steel screwed pipe. Fittings shall be malleable iron, galvanized, screwed with beaded pattern.

4. Galvanized Pipe Risers, Nipples, and Swing Joints: Galvanized pipe for risers and nipples, unless otherwise indicated on the Plans or Specifications, shall be ASA Schedule 40, seamless, galvanized mild steel screwed pipe. All threaded fittings shall be galvanized screwed malleable mild iron. Where specifically set forth on the Plans, risers and swing joint nipples may be polyvinyl chloride, Schedule 80, threaded pipe.

5. Sprinkler Heads: Sprinkler heads shall be as shown on the Plans or as indicated in the Special Provisions.

6. Drip Emitters: Drip emitters shall be of the type and performance as indicated on the Plans or Special Provisions.

7. Drip Filters: Filters shall be capable of efficiently removing foreign particles which would clog emitters. Each filter shall be a flushable type and contain a replaceable stainless steel element. Filters shall contain a 200 mesh screen or smaller as prescribed by the emitter manufacturer. The filter shall be of the type and performance as indicated on the Plans or Special Provisions.

8. Gate Valves: Gate valves for main lines shall be AWWA approved, nonrising stem, bronze fitted and bedded on a 4 inch thick concrete pad and installed in a suitable valve box.

9. Pressure Regulating and Pressure Sustaining Valves: Where called for on the Plans, pressure regulating and/or pressure sustaining valves shall be furnished and installed. They shall be of the type and performance as set forth on the Plans and/or Special Provisions.

10. Automatic Control Valves: Automatic control valves shall be as shown on the Plans or indicated in the Special Provisions. They shall be electrically activated and shall have manual flow control and manual open/close control. Each remote control valve shall be wired such that each can be independently operated at the controller.

11. Valve Boxes: Valve boxes for gate valves and single remote control valves shall be Brooks No. 12 Series, or equal, cover marked "irrigation".

12. Controllers: Automatic controllers shall be as specified on the Plans and/or Special Provisions and shall provide all necessary features for programming as is shown on the irrigation design plan. Each controller shall be encased in a sturdy, lockable, weatherproof mounting box and must be easily accessible for maintenance. There shall be no time lags between sections or stations and the controller will be of a compatible type for operating the automatic control valves furnished. The controller shall be mounted as recommended by the manufacturer, and as shown on the Plans or directed by the Engineer.

13. Control Wiring (24 Volt): Electric control lines from controller to automatic valves shall be one continuous color direct burial UF wire of a different color than the 110 volt service to controllers. The 24 volt common ground shall be of one continual color and a different color than the other 24 volt lines.

14. 110 Volt Electric Wiring: All 110 volt AC wiring shall be installed in accordance with local electric codes. 110 volt service to controllers shall consist of one black and one white wire. All wiring shall be buried to a minimum

depth of 20 inches. Wire shall be furnished in minimum 250 foot reels and spliced only at connections. All splices in wiring shall be made watertight using approved methods.

15. Booster Pump: Booster pump units shall be of the type and performance as specified on the construction Plans.

16. Backflow Prevention Devices: Backflow prevention units shall be as shown on the Plans and/or indicated on the Special Provisions. Such devices shall conform to the applicable plumbing code. For all drip irrigation systems, approved reduced pressure principle backflow prevention units shall be installed. After being installed at the project site, the backflow prevention unit must be tested and approved as functioning properly by a certified backflow preventer tester. Written and dated approval of the unit must be supplied to the City prior to any final inspection of the irrigation system. All cost associated with the testing of the unit shall be the responsibility of the Contractor.

The Contractor shall be responsible for correct procedures in loading, unloading, stacking, transporting, and handling all materials to be used in the system. The Contractor shall avoid rough handling which could affect the useful life of equipment. Pipe shall be handled in accordance with the manufacturer's recommendations on loading, unloading and storage.

25.04 CLEARING AND GRUBBING

Clearing and grubbing shall conform to the requirements of Section 11 of these Specifications.

25.05 TRENCHING AND EXCAVATING

Unless otherwise indicated, all trenches and excavations for landscape irrigation systems shall be open vertical construction sufficiently wide to provide ample working space around the work installed and ample space for backfilling operations. Depth of trench shall be so as to provide the necessary cover over pipes as specified herein.

Reference is made to Section 18 of these Specifications relative to trenching and excavating.

25.06 INSTALLATION

Installation of all facilities shall be in conformance with manufacturer's recommendations, and as specified herein, and as directed by the Engineer.

Plastic (PVC) pipe, except for "O" ring pipe, shall run from side to side of trench bottom to allow for expansion and contraction.

All main line or pressure supply line pipe (on upstream side of control valves) shall be installed with a minimum of 24 inches cover and in accordance with the manufacturer's published recommendations. The trench depth for lateral line PVC pipe (on downstream side of control valves) shall be such as to provide 12 inches of cover on pop-up spray lines and drip emitter lines, and 18 inches of cover on rotary pop-up lines.

Where 2 or more pipes are installed in the same trench, a minimum of 4 inches of horizontal clear separation shall be provided between adjacent pipes.

The bottom of the trench shall be free of rocks, clods, and other sharp-edged objects. The Contractor shall load plastic pipe lengths at centers with small amounts of backfill to prevent arching and whipping under pressure. No water will be permitted in pipe until the above has been accomplished. Joints shall be left exposed for inspection during pressure testing.

Automatic valve control wires shall be placed in the water supply line trench alongside the pipe or buried at a minimum depth of 18 inches.

All remote control valves shall be of the sizes shown on the Plans, installed complete with specified valve boxes and covers.

Irrigation systems shall be constructed to the sizes, grades and locations shown on the Plans. Irrigation lines shown on the Plans are "essentially diagrammatic". Locations of all sprinkler heads, drip system emitters, etc., shall be established by the Contractor at the time of construction. Typical spacings of the sprinkler heads and drip emitters are shown on the Plans and shall be exceeded only with written permission of the Engineer.

Connections and controls shall be functionally as shown on the Plans, but physically shall be the most direct and convenient method while imposing the least hydraulic friction.

The Contractor shall provide and keep up to date a complete set of as-built drawings which shall be corrected daily to show any approved changes in sprinkler locations, controller locations, piping locations, and other deviations from the original irrigation design drawing as provided to him. All isolated valve locations shall be shown with actual measurements to reference points so they may be located easily in the field. Upon completion of the work, the Contractor shall furnish the City with a complete set of as-built drawings showing the irrigation system as installed.

Plastic (PVC) pipe shall be installed in conformance with the manufacturer's recommendations and as follows:

1. PVC pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer.

2. PVC pipe shall be cut with a hand saw or hack saw in a manner so as to insure a square cut. Burrs at cut ends shall be removed prior to installation so that a smooth, unobstructed flow will be obtained.

3. All PVC to PVC joints shall be solvent-weld joints. Only the solvent recommended by the pipe manufacturer shall be used.

4. The solvent-weld joints shall be made in the following manner:

(a) The mating pipe and fitting shall be thoroughly cleaned with a primer recommended by the pipe manufacturer.
(b) A uniform coat of solvent shall be applied to the outside of the pipe with a nonsynthetic bristle brush.
(c) Solvent shall be applied to the fitting in a similar manner.
(d) A light coat of solvent shall be reapplied to the pipe and quickly inserted into the fitting.
(e) The pipe or fitting shall be given a quarter turn to ensure even distribution of the solvent and to make sure the pipe is inserted to the full depth of the fitting socket.
(f) The joint shall be held in position for 15 seconds.
(g) Excess solvent that appears at the outer shoulder of the fittings shall be wiped off.

5. Care should be taken so as not to use an excess amount of solvent, thereby causing a burr or obstruction to form on the inside of the pipe.

6. The joints shall be allowed to set at least 24 hours before pressure is applied to the system.

Jointing, in general, shall be performed by competent tradesmen specially trained in this type of work and using tools and equipment recommended by the manufacturers of the pipe, fittings or equipment.

On all asbestos-cement or "O" ring PVC water lines, the Contractor shall furnish and install thrust blocks at all changes in direction of piping and at all connections or branches from the mains, in accordance with the manufacturer's recommendations. Thrust blocks shall be formed by pouring

concrete between the pipe and trench wall. Thrust blocks shall be of adequate size and so placed as to take all thrusts created by the maximum internal water pressure.

All lateral lines shall be thoroughly flushed prior to the installation of any automatic valves or sprinkler heads.

All materials and equipment shall be installed in a neat and workmanlike manner and shall follow the recommendations of the manufacturers of the materials, and the instructions of the Engineer.

25.07 BACKFILL AND COMPACTION

Unless otherwise specified, material used for backfill shall be granular native material free from debris, lumps, hardpan chunks, paving material, organic matter of other deleterious or unsuitable substances. Material shall be approved by the Engineer before use in the work.

Backfilling of trenches containing plastic pipe shall be done when pipe is cool to avoid excessive contraction in cold weather. Such backfilling may be done in early morning hours or the pipe may be water cooled prior to backfilling procedures.

Backfill shall be compacted and evened off with the adjacent soil level. In hardpan or rocky soil areas, selected material shall be used in filling from the bottom of the trench to a level 4 inches above the top of the pipe. The top 3 inches of backfill shall contain no rocks or hardpan chunks larger than 2 inches in diameter.

Backfill shall be compacted by flooding and wheelrolling, or other approved means. The Contractor shall be responsible for trench settlement for a period of one year after job acceptance.

25.08 TESTING AND ADJUSTMENT

Asbestos-cement and PVC main lines (upstream of control valves) shall be tested under a gauge pressure of 125 pounds per square inch (psig), said pressure to be maintained for a period of not less than 2 hours. PVC lateral lines (downstream of control valves) shall be tested under a gauge pressure of 75 psig, said pressure to be maintained for a period of not less than one hour. Such tests shall be performed prior to final backfill. All leaks shall be repaired and all defective materials replaced to the satisfaction of the Engineer, and the testing and repairs repeated until the system is approved.

Sprinkler heads in proposed turf areas shall be installed one inch above grade and lowered to finish grade after the lawn is established. Any damage to lawn caused by lowering of the heads shall be repaired by the Contractor to the Engineer's satisfaction.

After the installation of automatic controller, valves, sprinkler heads, drip emitters and other equipment, the complete system shall be operated in the presence of the Engineer. Any defective or inoperative material shall be repaired or replaced to the satisfaction of the Engineer. The Contractor shall balance and adjust the various components of the system so the overall operation of the system is most efficient. This includes a synchronization of the controllers, adjustments to heads and emitters, and individual station adjustments on the controllers.

The Contractor shall furnish all materials and labor required to correct any inadequacies of coverage due to site conditions or unauthorized deviations from the Plans. If such corrections or additions are required in the sprinkler system, the Contractor shall make all adjustments and corrections without any extra cost to the City.

25.09 SYSTEM GUARANTEE

Reference is made to Subsection 7.24 of these Specifications. The entire irrigation system shall be guaranteed by the Contractor to give satisfactory service, and the Contractor shall guarantee the quality of materials, equipment and workmanship, including settling of backfilled areas below finish grade, for a period of one year following the date of the filing of the Notice of Completion for all of the work by the City.

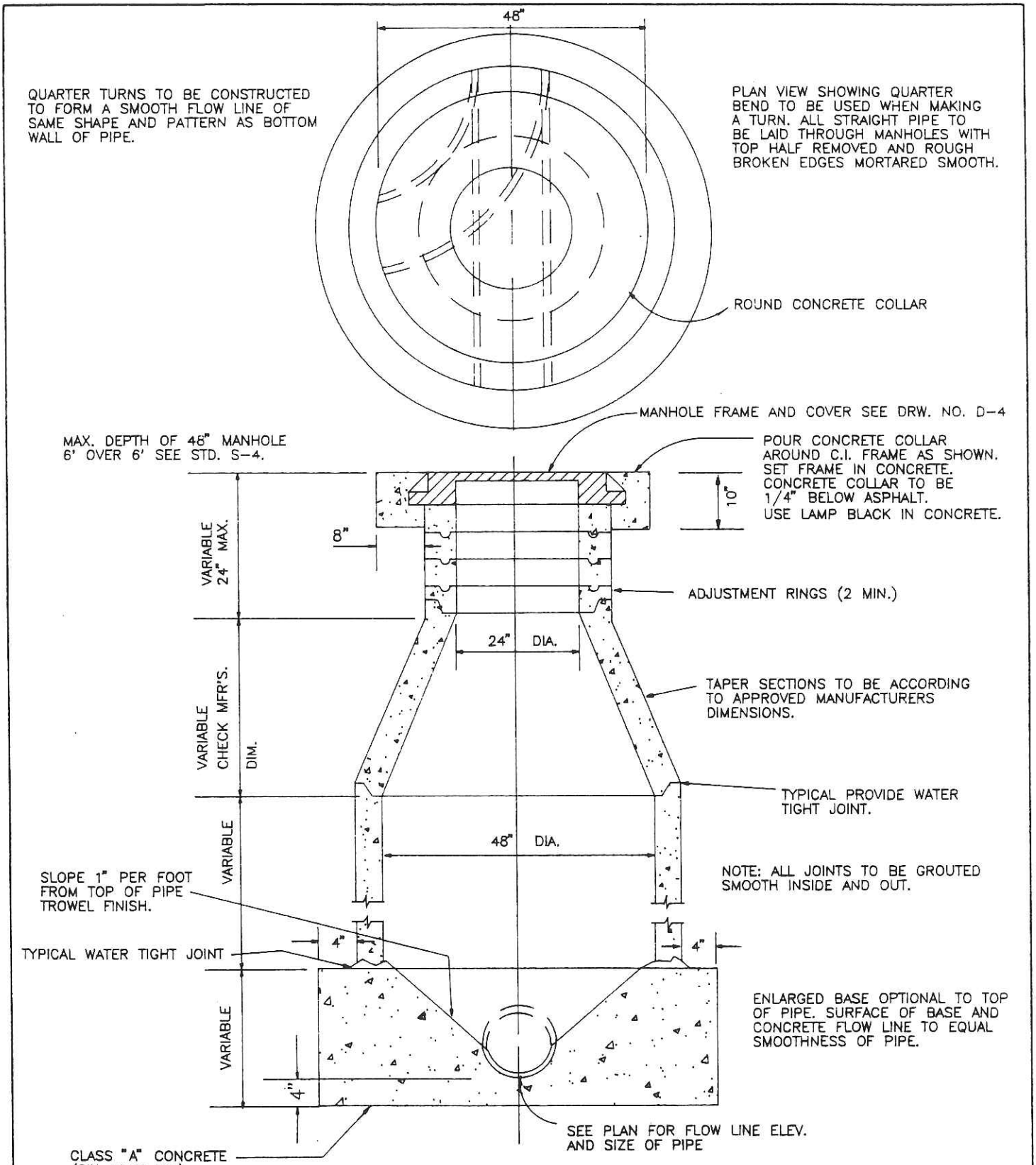
If, within one year from the date of the filing of the Notice of Completion for all of the work, problems develop resulting from inferior or faulty materials or workmanship, or settlement occurs requiring adjustments in pipes, valves, emitters, heads, sod, or paving to the proper level of the permanent grades, the Contractor, as part of the work under his Contract, shall make all adjustments and corrections without extra cost to the City, including the complete restoration of all damaged planting, paving, or other improvements of any kind.

25.10 MEASUREMENT

Landscape irrigation systems will be measured by the lump sum for the entire system, complete in every detail.

25.11 PAYMENT

The lump sum price bid for landscape irrigation system shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved therein as shown on the Plans, as set forth in the Specifications, and as directed by the Engineer. This shall include, but not be limited to clearing and grubbing, furnishing and installing all equipment such as pipe, fittings, heads, emitters, valves and valve boxes, controllers, wiring, electric service, water service, backflow preventers, filters, providing excavation, backfill and compaction, testing, adjusting, guaranteeing, and all incidentals.



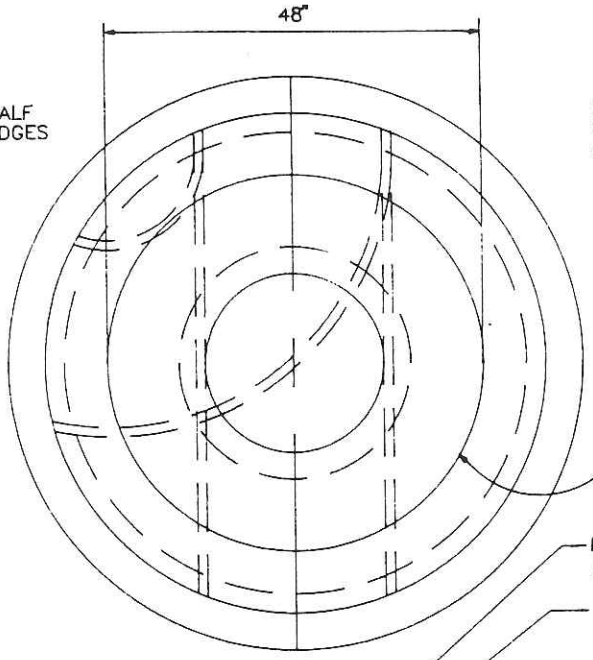
NOTE: PRECAST PIPE, ADJUSTMENT RINGS AND TAPERED SECTIONS SHALL BE CLASS II RCP IN ACCORDANCE WITH A.S.T.M. C76. ELLIPTICAL SINGLE LINE REINFORCEMENT WILL NOT BE PERMITTED.

48" SEWER MANHOLE WITH PRECAST SECTIONS & CAST IRON FRAME & COVER	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. D-1

ALL STRAIGHT PIPE TO BE LAID THROUGH MANHOLES WITH TOP HALF REMOVED AND ROUGH BROKEN EDGES MORTARED UP SMOOTH

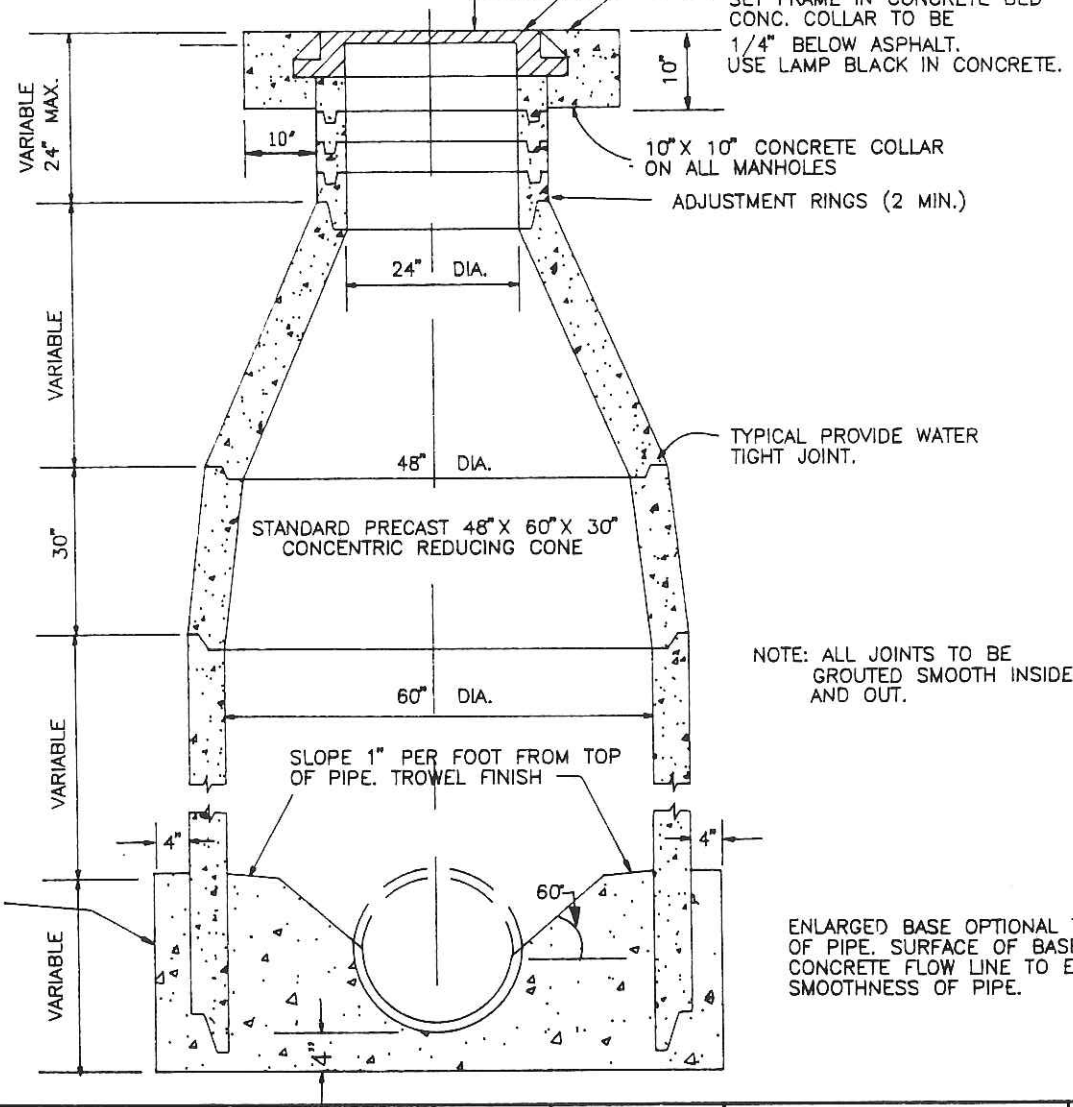
QUARTER TURNS TO BE CONSTRUCTED TO FORM A SMOOTH FLOW LINE OF SAME SHAPE AND PATTERN AS BOTTOM OF PIPE.

NOTE: SECTIONS TO MEET ASTM SPECIFICATIONS C-76 CLASS II RCP FOR CONCRETE PIPE FOR RESPECTIVE DAIMETERS.



PLAN VIEW SHOWING QUARTER BEND TO BE USED WHEN MAKING A TURN.

NOTE: WHEN PIPE IS CUT ALL EXPOSED REINFORCING STEEL TO BE COATED WITH 2" OF CONCRETE.

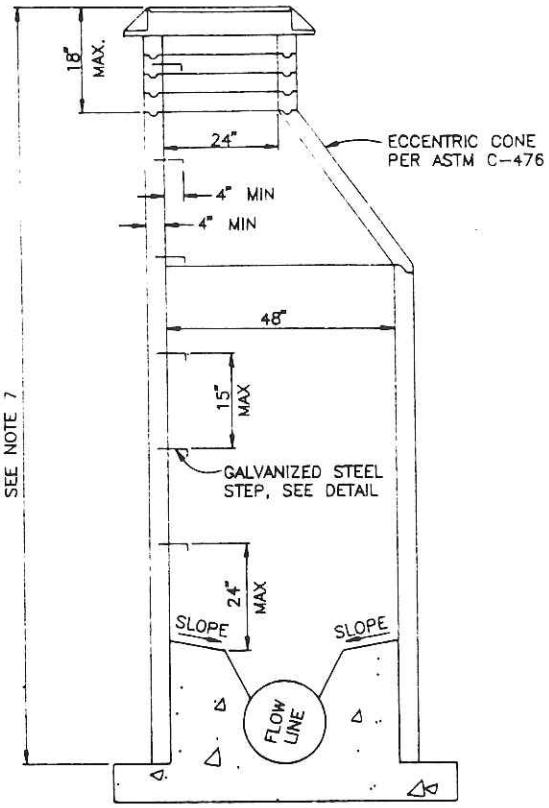


NOTE: ALL JOINTS TO BE GROUTED SMOOTH INSIDE AND OUT.

ENLARGED BASE OPTIONAL TO TOP OF PIPE. SURFACE OF BASE AND CONCRETE FLOW LINE TO EQUAL SMOOTHNESS OF PIPE.

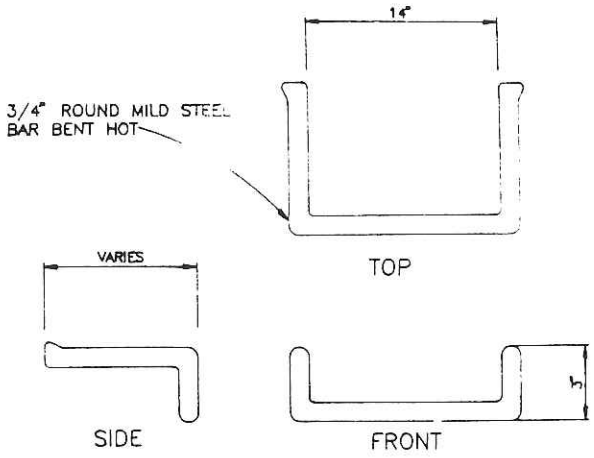
60" SEWER MANHOLE WITH PRECAST SECTIONS & CAST IRON FRAME & COVER

REVISIONS	CITY OF AVENAL	STD. NO. D-2
	CITY ENGINEER _____ DATE _____	



MANHOLE WITH STEPS

NO SCALE



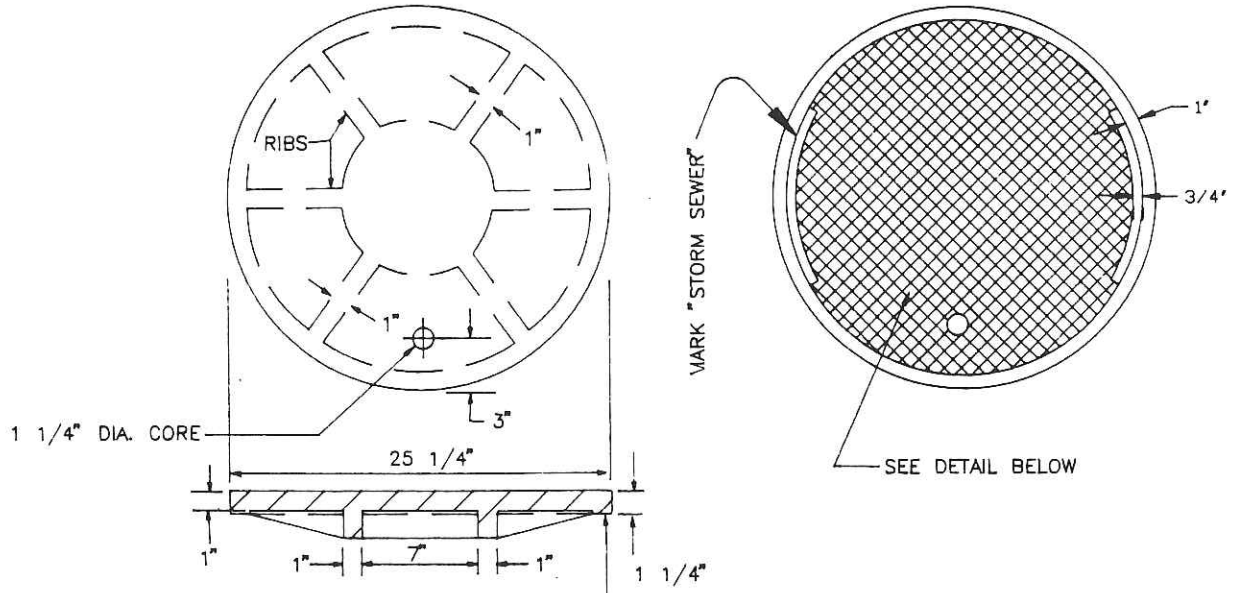
STEP DETAIL

NOTES:

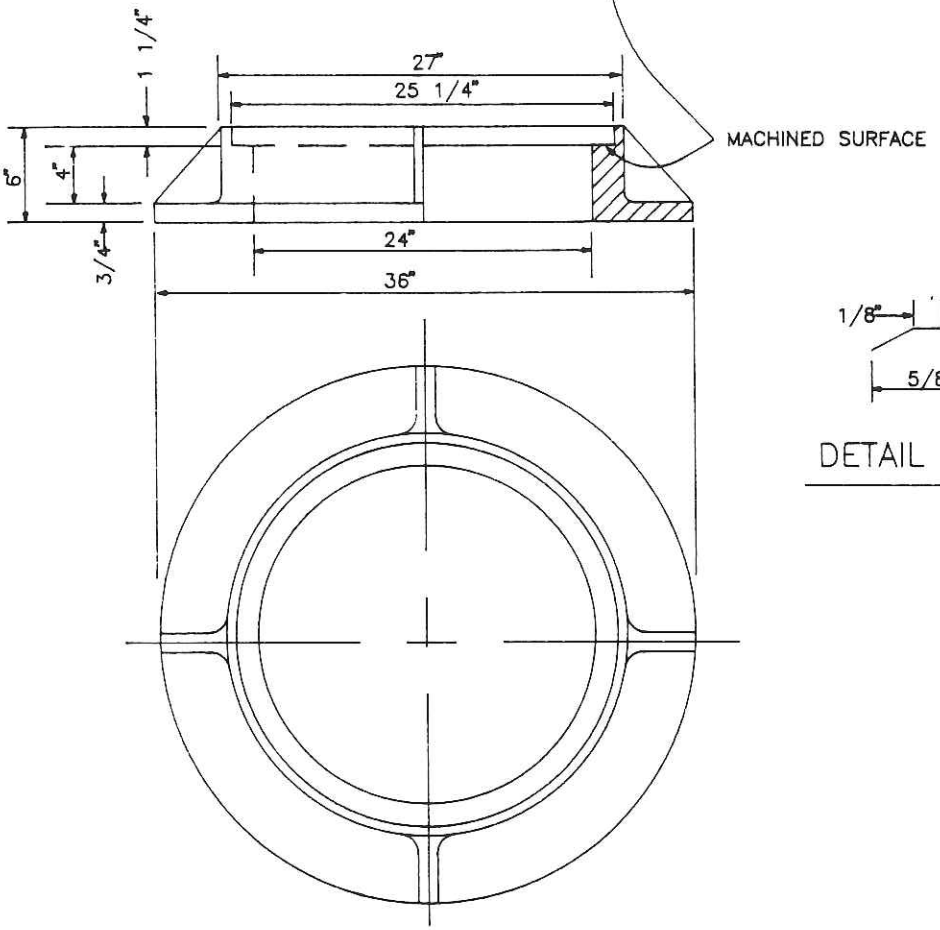
1. CONSTRUCTION OF MANHOLE SHALL BE IN ACCORDANCE WITH THE SEWER MANHOLE STANDARD D-1, EXCEPT AS MODIFIED HEREON..
2. AN ALTERNATE STEP MAY BE USED SUBJECT TO THE APPROVAL OF THE ENGINEER.
3. ALL STEPS WILL BE FIRMLY AND RIGIDLY SET WITH EPOXY GROUT OR EPOXY.
4. STEPS SHALL BE GALVANIZED AFTER BENDING.
5. COST OF STEPS SHALL BE INCLUDED IN PRICE OF THE MANHOLE.
6. IN MANHOLES WITH LATERAL LINE CONNECTIONS, THE STEPS SHALL BE PLACED IN THE WALL WITH NO LATERALS, OR THE WITH THE LEAST DIAMETER LATERAL, SUCH THAT A CONTINUOUS VERITICAL ALIGNMENT OF STEPS MAY BE ACHIEVED.
7. MANHOLES WITH STEPS SHALL BE USED WHENEVER THE DISTANCE BETWEEN THE MANHOLE FLOW LINE AND THE TOP OF COVER IS EQUAL TO OR GREATER THAN 12 FEET.

SEWER MANHOLE WITH STEPS

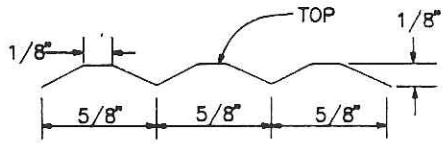
REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER DATE	D-3



MANHOLE COVER



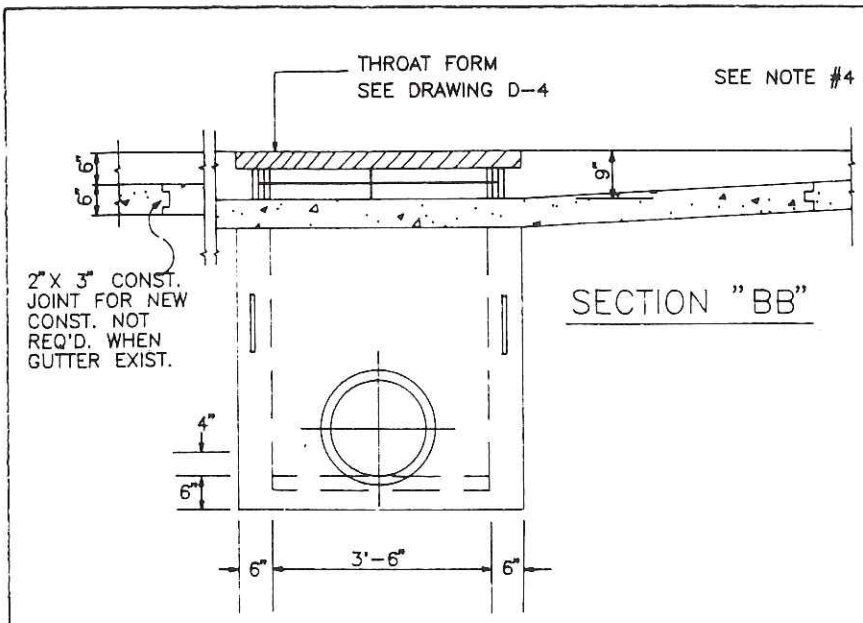
MANHOLE FRAME



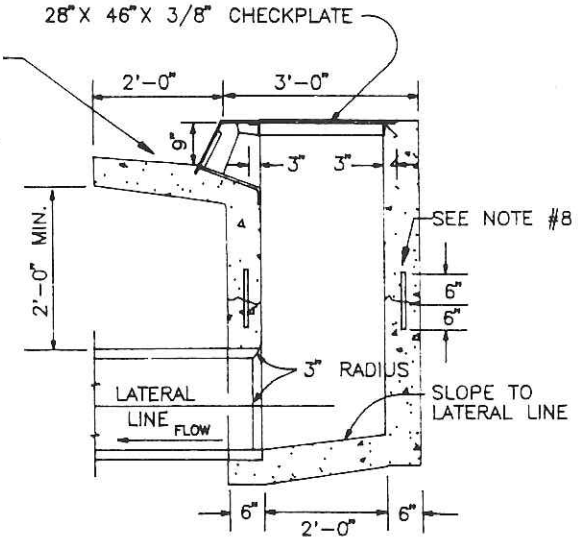
DETAIL OF WAFFLE PATTERN

CAST IRON MANHOLE FRAME & COVER

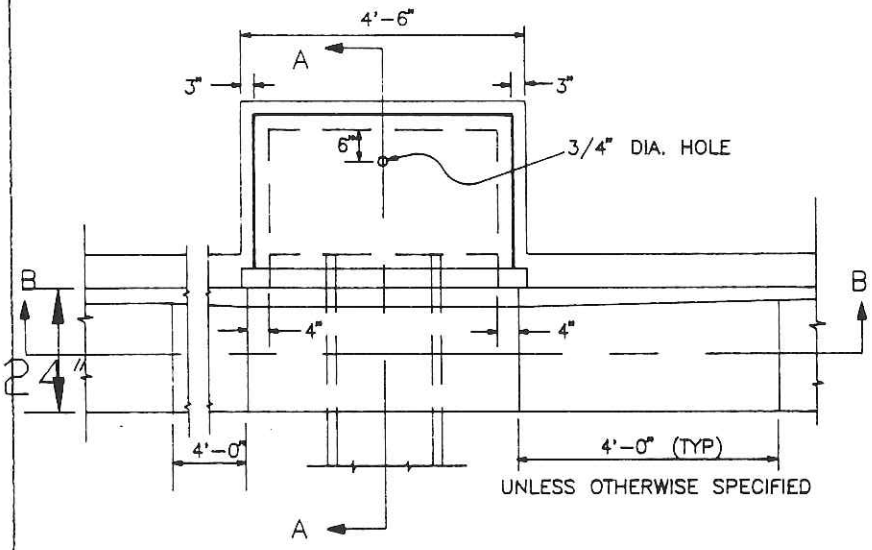
REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER DATE	D–4



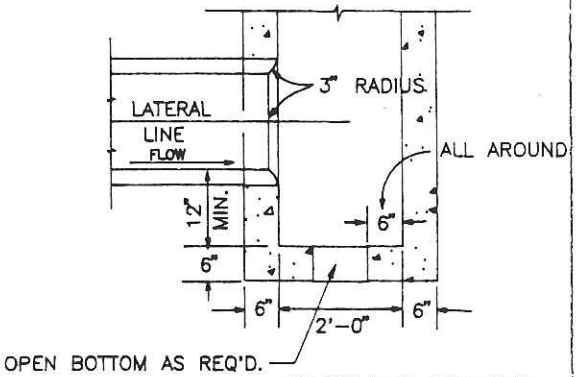
SECTION "BB"



SECTION "AA"



PLAN



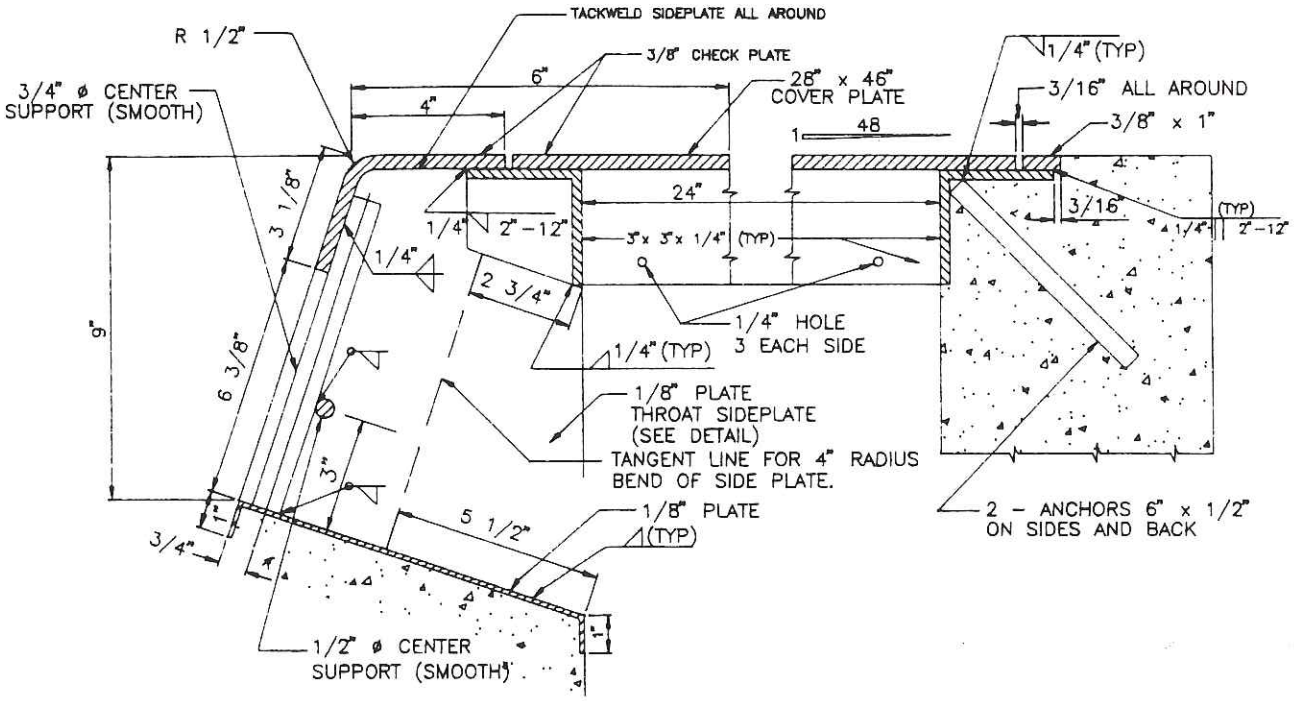
OUTLET DETAIL
(SEE NOTE #4)

NOTES:

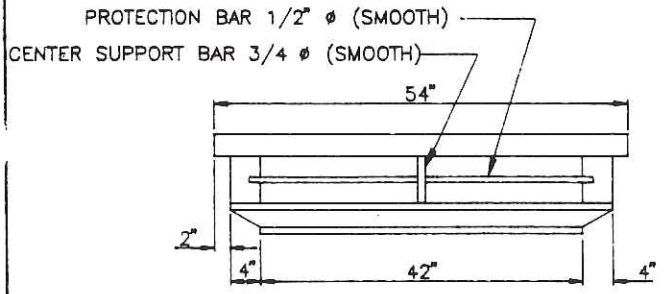
1. THE INLET MAY BE MODIFIED SLIGHTLY TO MATCH EXISTING CONDITIONS, AS DIRECTED BY THE ENGINEER.
2. STRUCTURE SHALL BE CLASS "A" CONCRETE. EXPOSED SURFACES SHALL BE FINISHED AS PER CURB SPECIFICATIONS.
3. COST OF FRAME AND GRATE AND THROAT FORM SHALL BE INCLUDED IN PRICE OF INLET OR OUTLET.
4. WHEN EMPLOYED AS OUTLET, PLACE GUTTER 6" BELOW TOP OF CURB GRADE AND ELIMINATE 1/2" IRON ROD FROM THROAT FORMS.
5. CURB & GUTTER SHALL BE CONSTRUCTED OR RECONSTRUCTED ON EACH SIDE OF BOX AS INDICATED ON THE PLANS AND COST THEREOF SHALL BE INCLUDED IN PRICE OF INLET OR OUTLET.
6. FLOOR OF INLET SHALL SLOPE FROM ALL WALLS TO THE LATERAL LINE AND SHALL BE GIVEN A STEEL-TROWELED FINISH.
7. AT THE CONTACT POINT BETWEEN THE LATERAL LINE AND THE INLET WALL A SMOOTH 3" RADIUS SHALL BE CONSTRUCTED.
8. IF INLET IS CONSTRUCTED IN A TWO STAGE POUR, PROVIDE A ROUGHENED CONSTRUCTION JOINT AND PLACE ONE No. 4 BAR 12" LONG IN EACH OF THE FOUR WALLS AS SHOWN.

CATCH BASIN INLET & OUTLET

REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER _____ DATE _____	D-5



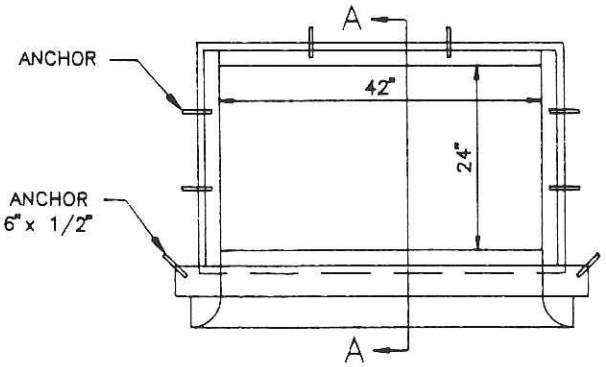
SECTION "AA"



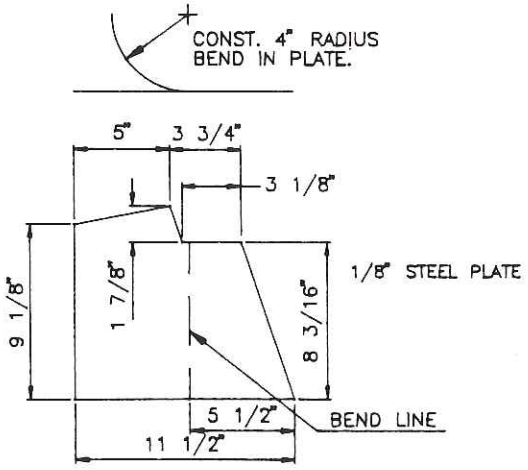
FRONT VIEW

NOTES:

1. ALL DIMENSIONS ARE FINISHED DIMENSIONS.
2. ALL PARTS SHALL BE STRUCTURAL GRADE STEEL.
3. ALL EXPOSED METAL PARTS SHALL BE PAINTED OR DIPPED WITH AN ASPHALTUM PAINT.



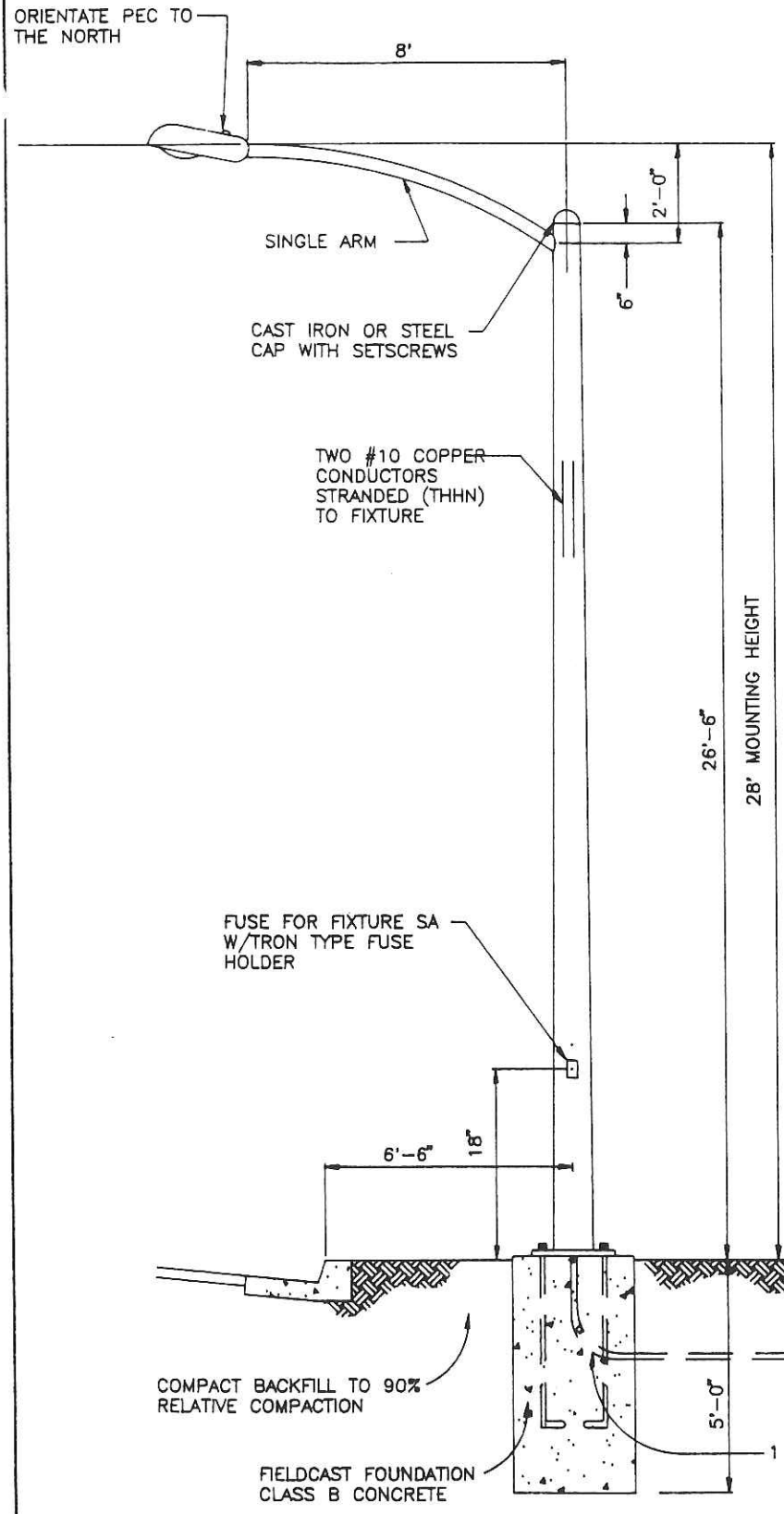
PLAN VIEW



THROAT SIDEPLATE

THROAT FORM & FRAME

THROAT FORM & FRAME	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. D-6



LIGHTING STANDARD
P.G.&E. 35-7274

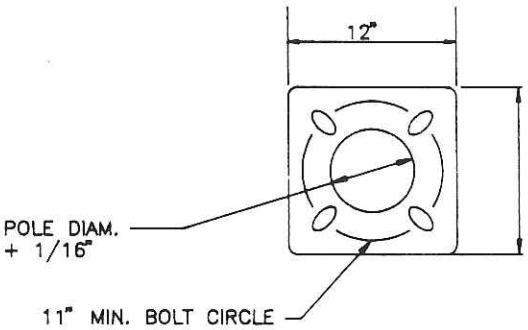
GENERAL NOTES

ALL WORK SHALL CONFORM TO THE APPLICABLE SECTIONS OF THE SPECIFICATIONS ENTITLED "STANDARD SPECIFICATIONS, STATE OF CALIFORNIA, BUSINESS AND TRANSPORTATION AGENCY, DEPARTMENT OF TRANSPORTATION", AND IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, AND THESE SPECIAL PROVISIONS.

LUMINAIRE SHALL BE COBRA HEAD TYPE, 120V HIGH PRESSURE SODIUM-VAPOR WITH TYPE IV QUICK ACTING PHOTOELECTRIC CELL AND HAVE A HIGH PRESSURE FACTOR REACTOR BALLAST. LENS SHALL BE POLYCARBONATE PLASTIC. BULB SHALL BE 70 WATTS OR 150 WATTS.

ALL STREET LIGHTS SHALL BE NUMBERED. NUMERICAL SEQUENCE TO BE OBTAINED FROM P.G.&E. NUMBERS TO BE 1 1/2" HIGH AND INSTALLED NINE FEET ABOVE FINISHED GRADE.

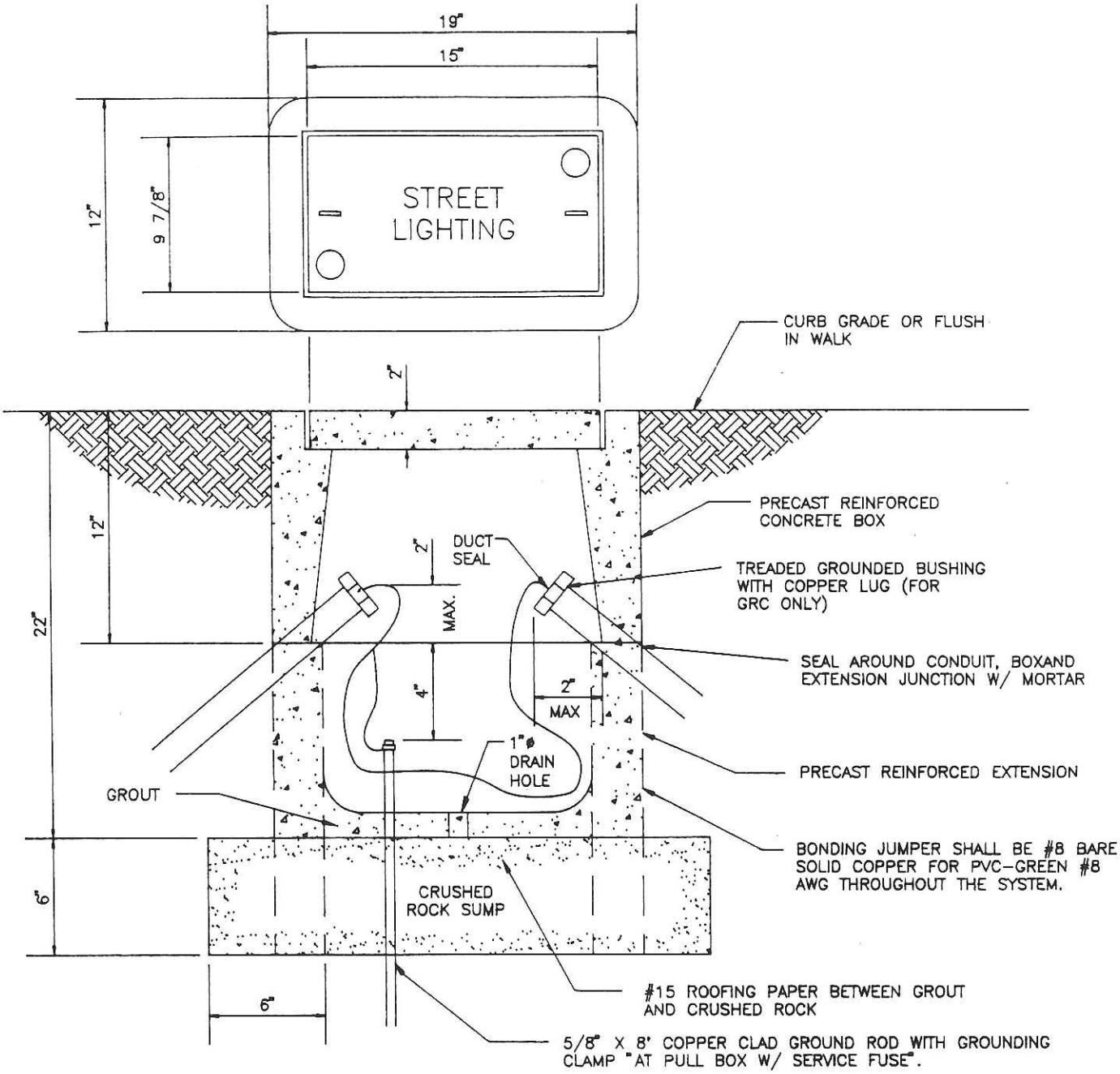
A PULL BOX WILL BE REQUIRED WHEREVER CONDUIT CHANGES DIRECTION AND WHERE MULTIPLE LIGHTS ARE INSTALLED ON A SINGLE SERVICE. PULLBOX SPACING SHALL NOT EXCEED 200'. (SEE P.W. STD. E-2)



BASE PLATE DETAIL

STREETLIGHT-LOCAL STREET WITH BASE, PULL BOX & PVC CONDUIT

REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER _____ DATE _____	E-1



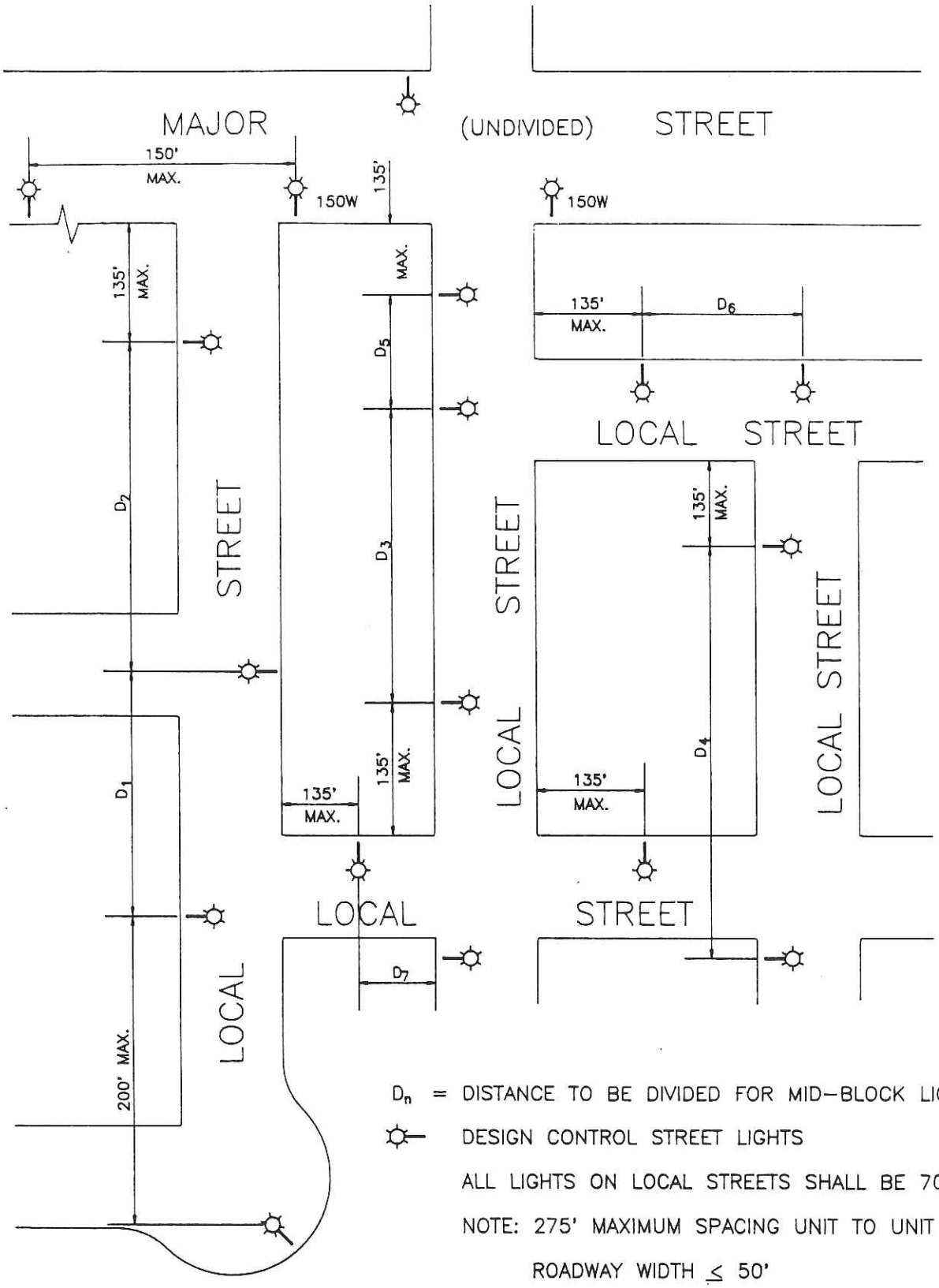
GENERAL NOTES:

1. PULL BOXES SHALL BE #3 1/2 AS PER CAL TRANS STANDARD SPECIFICATION OR CHRISTY N-9 OR APPROVED EQUAL.
2. PULL BOXES SHALL BE GROUTED PRIOR TO INSTALLATION OF CONDUCTORS, SLOPED TOWARD THE DRAIN HOLE. PLACE A LAYER OF ROOFING PAPER BETWEEN THE CRUSHING ROCK AND THE GROUT.
3. PULL LIDS BEFORE POURING CONCRETE AROUND PULL BOXES.
4. WRAP PULL BOX WITH ROOFING PAPER BEFORE BACKFILLING.
5. FUSE AT POINT OF SERVICE SHALL BE 60A IF #6 CONDUCTOR AND 40A IF #8 CONDUCTOR AND SHALL HAVE A TRON TYPE FUSE HOLDER. (SINGLE POLE)
6. INSTALL A ONE-FOOT RING OF CONCRETE, FOUR INCHES DEEP, AROUND THE WRAPPED PULL BOXES INSTALLED IN DIRT AREAS. SLOPED TO DRAIN AWAY FROM THE PULL BOX.

STREETLIGHTS

CONCRETE PULL BOXES

REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER _____ DATE _____	E-2



D_n = DISTANCE TO BE DIVIDED FOR MID-BLOCK LIGHTING

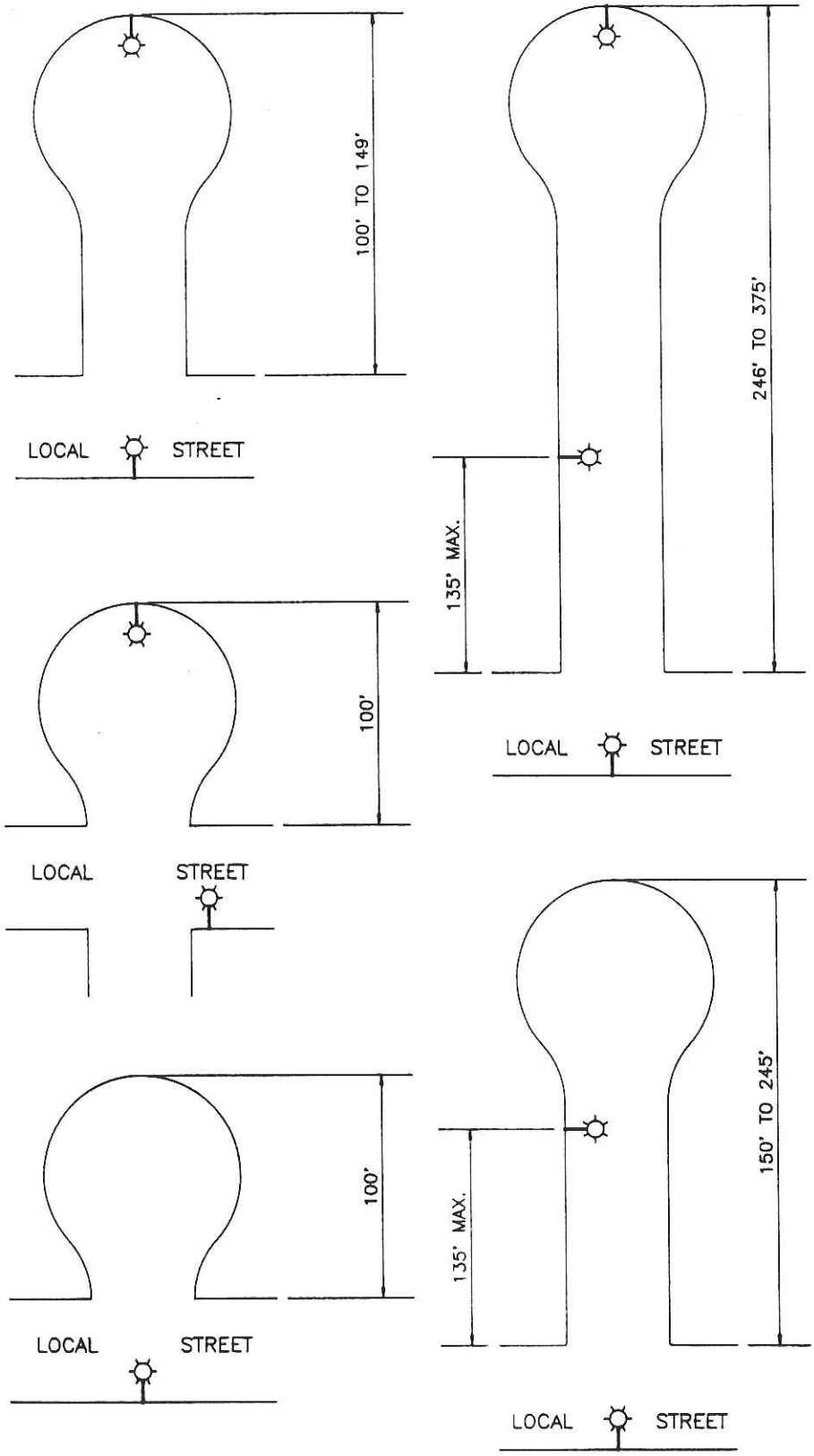
DESIGN CONTROL STREET LIGHTS

ALL LIGHTS ON LOCAL STREETS SHALL BE 70W

NOTE: 275' MAXIMUM SPACING UNIT TO UNIT

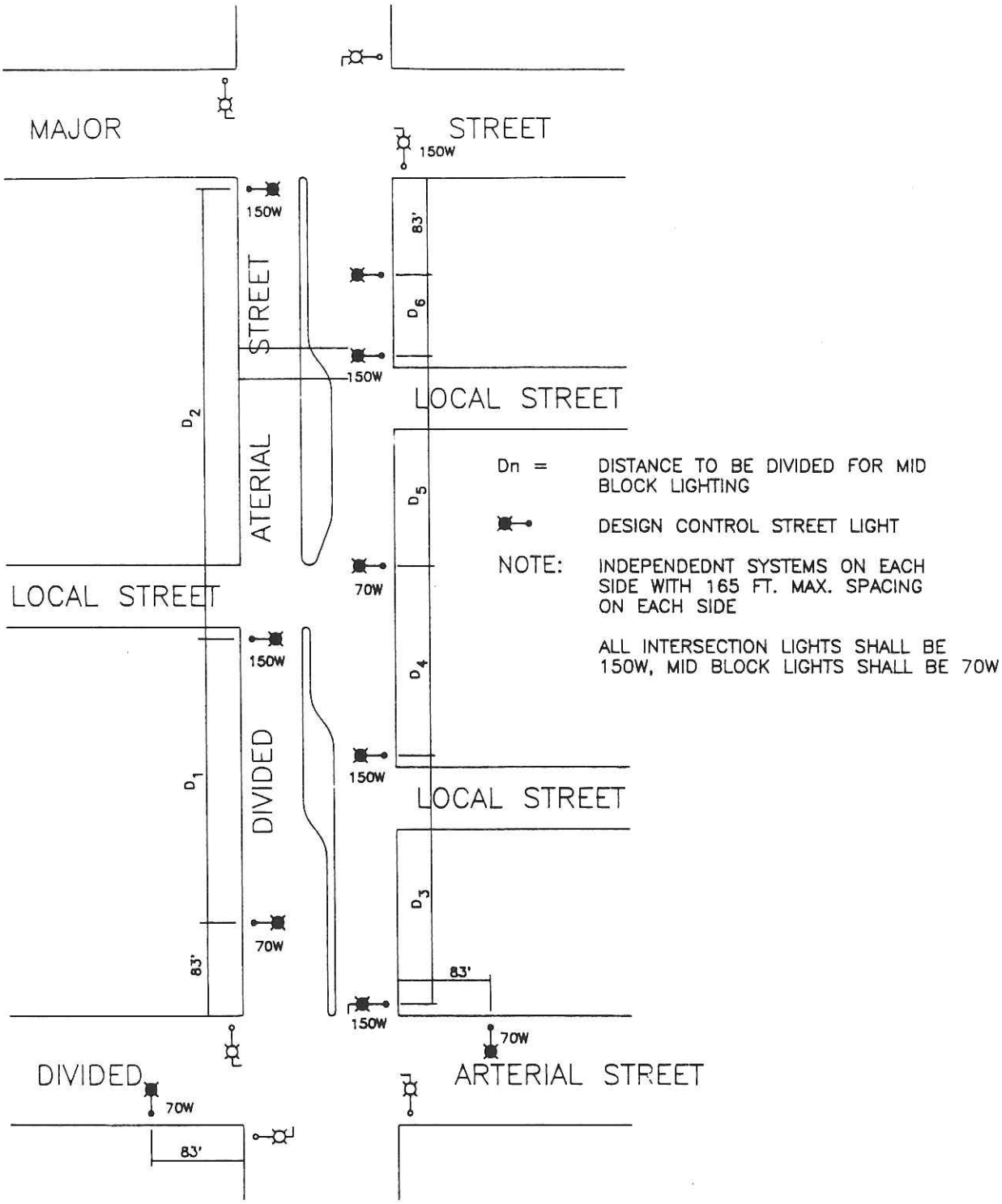
ROADWAY WIDTH $\leq$ 50'

STREETLIGHTS–PLACEMENT LOCAL STREETS	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. E–3



STREETLIGHT–PLACEMENT CUL–DE–SAC STREETS

REVISIONS	CITY OF AVENAL	STD. NO. E–4
	CITY ENGINEER _____ DATE _____	



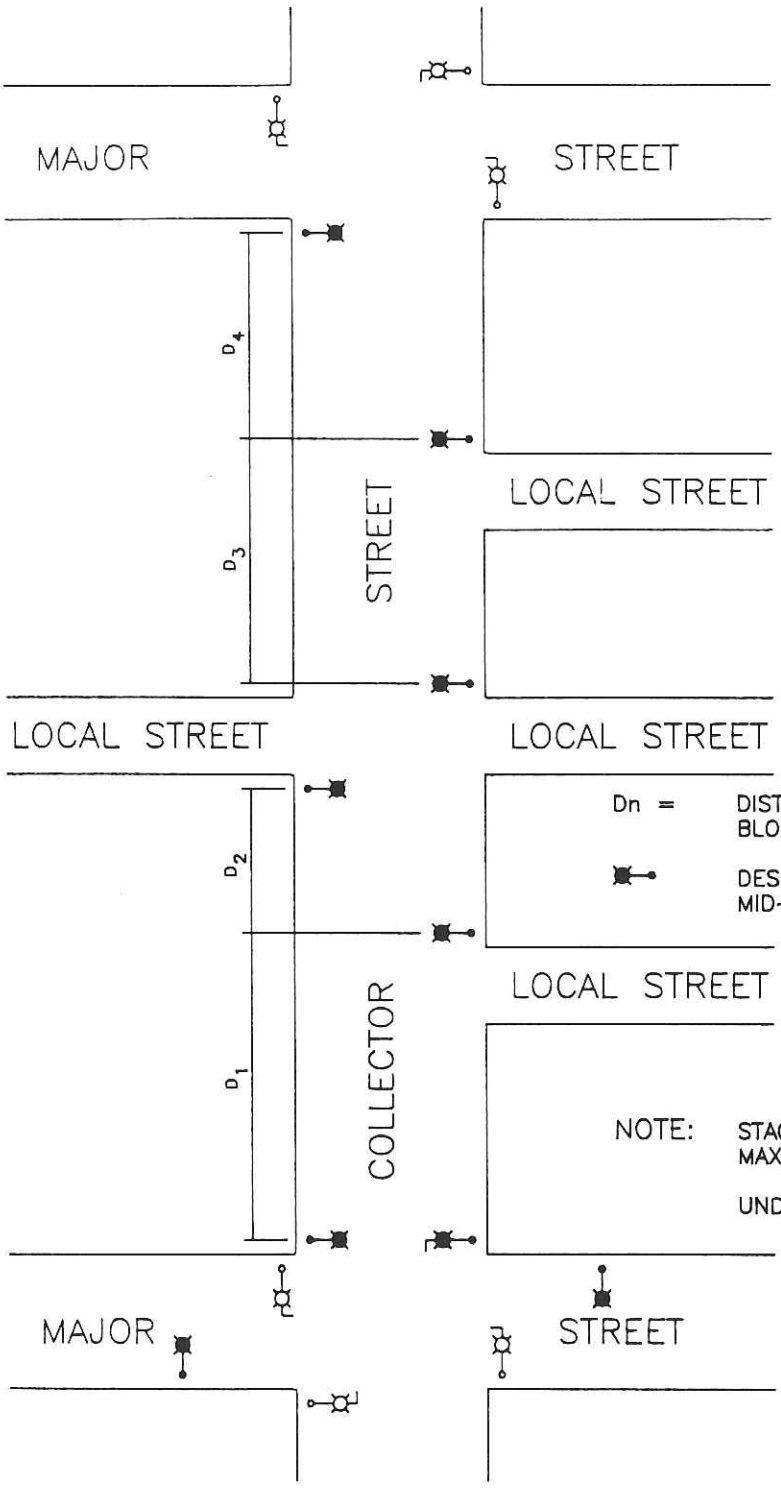
Dn = DISTANCE TO BE DIVIDED FOR MID BLOCK LIGHTING

DESIGN CONTROL STREET LIGHT

NOTE: INDEPENDEDNT SYSTEMS ON EACH SIDE WITH 165 FT. MAX. SPACING ON EACH SIDE

ALL INTERSECTION LIGHTS SHALL BE 150W, MID BLOCK LIGHTS SHALL BE 70W

STREETLIGHT–PLACEMENT DIVIDED ARTERIAL STREETS	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. E–5



Dn = DISTANCE TO BE DIVIDED FOR MID BLOCK LIGHTING

DESIGN CONTROL STREET LIGHT –150W
MID–BLOCK LIGHTS SHALL BE 70W

NOTE: STAGGER OR ALL ON ONE SIDE
MAX, SPACING UNIT TO UNIT 150'

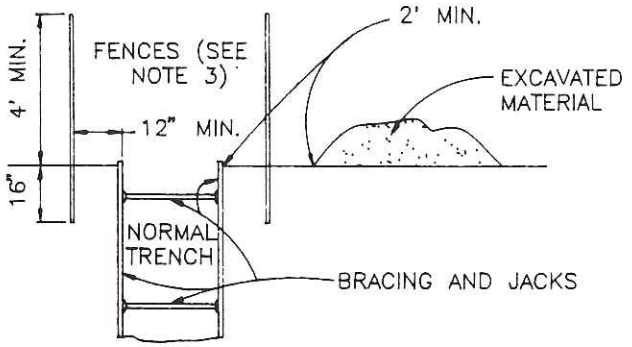
UNDIVIDED ROADWAY 50–90'

STREETLIGHT–PLACEMENT COLLECTOR STREET

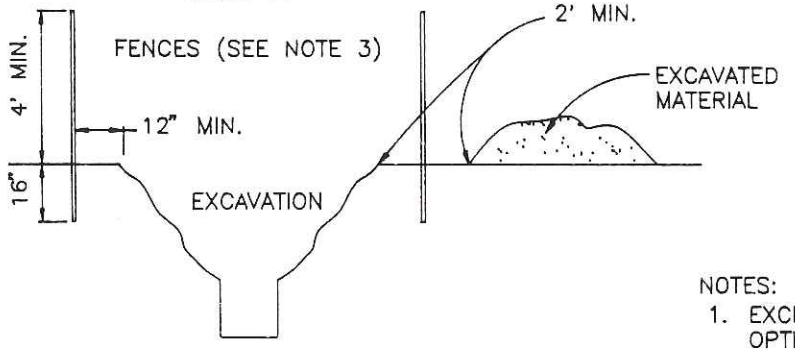
REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER _____ DATE _____	E–6

PRIOR TO THE END OF EACH WORK DAY THE CONTRACTOR SHALL EITHER BACKFILL THE TRENCH OR ERECT AND MAINTAIN FENCES OR COVERS THE FOLLOWING ARE MINIMUM ACCEPTABLE MEASURES ONLY AND COMPLIANCE WITH THIS STANDARD DOES NOT RELIEVE THE CONTRACTOR OF HIS OBLIGATION TO PROTECT THE PUBLIC BY ALL NECESSARY MEANS.

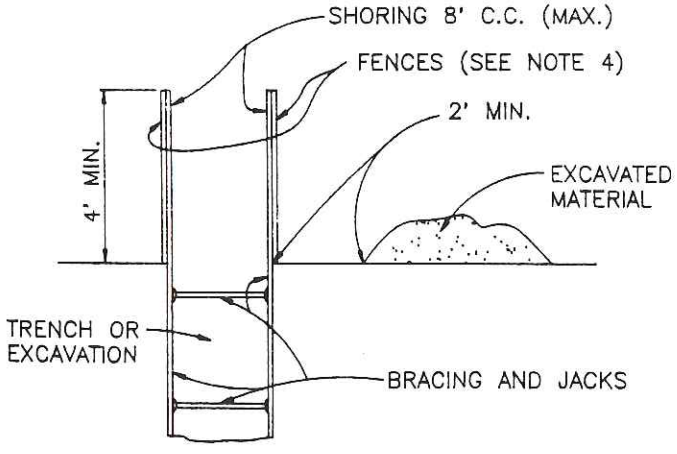
I. FENCES



CASE A

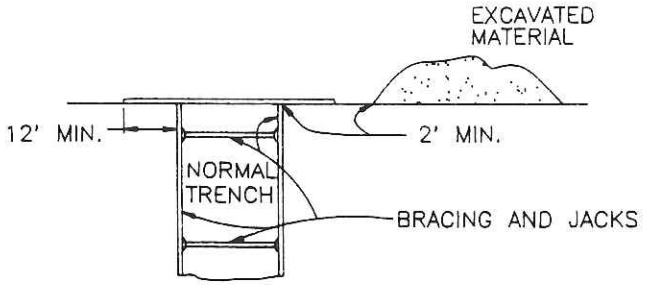


CASE B



CASE B

II. COVERS

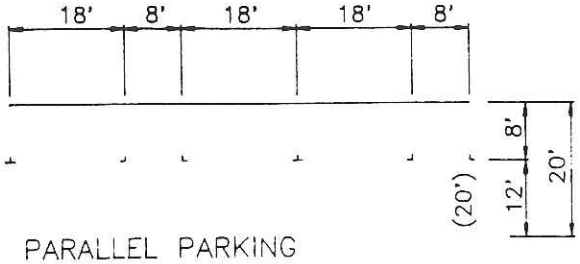


NOTES:

1. EXCEPTION: FENCES OR COVERS WILL BE OPTIONAL WITH THE CONTRACTOR IF THE EXCAVATION IS EITHER:
   a–LESS THAN 3 FEET DEEP
   b–LESS THAN 5 FEET DEEP WITH SUFFI–CIENT WARNING DEVICES
   c–FOR CASE B LESS THAN 3 FEET DEEP IN THE VERTICAL PORTION WITH UPPER SIDE SLOPE OF 1:1
2. COVERS MAY BE:
   a–1/4" STEEL PLATES
   b–2" PLANKS NON–VEHICULAR
   c–3/4" PLYWOOD TRAFFIC
3. FOR CASES "A" AND "B" FENCES MAY BE:
   a–WOOD PICKETS TIED WITH WIRE MESH POSTS 8' C.C.
   b–2"x4" POSTS 8' C.C. AND WIRE MESH
   c–2"x4" POSTS 8' C.C. WITH TOP AND BOTTOM RAIL AND CHICKEN WIRE
   d–SAME AS NOTE 4 ITEM – c
4. FOR CASE "C" FENCES MAY BE:
   a–WOOD PICKETS TIED WITH WIRE AND BOTTOM RAIL
   b–TOP AND BOTTOM RAIL WITH CHICKEN WIRE
   c–THREE RAILS EQUALLY SPACED WITH BOTTOM RAIL 6" ABOVE GROUND

MIN. PUBLIC SAFTEY REQUIREMENTS

REVISIONS	CITY OF AVENAL	STD. NO. M–1
	CITY ENGINEER _____ DATE _____	

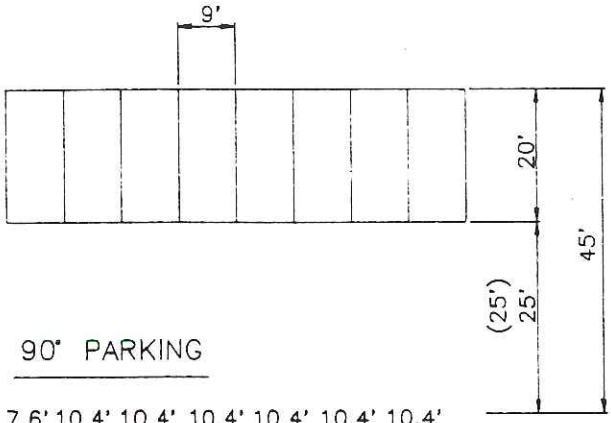


PARALLEL PARKING

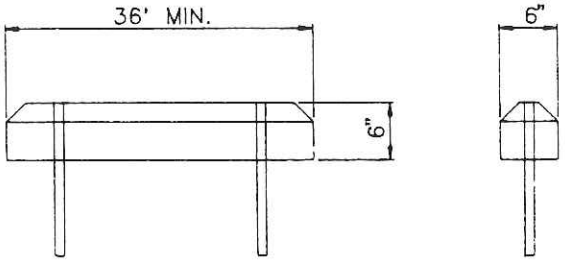


PARKING STALL FOR THE HANDICAPPED SHALL BE 12' WIDE AND INCLUDE A SIGN FOR THE INTENDED USE.

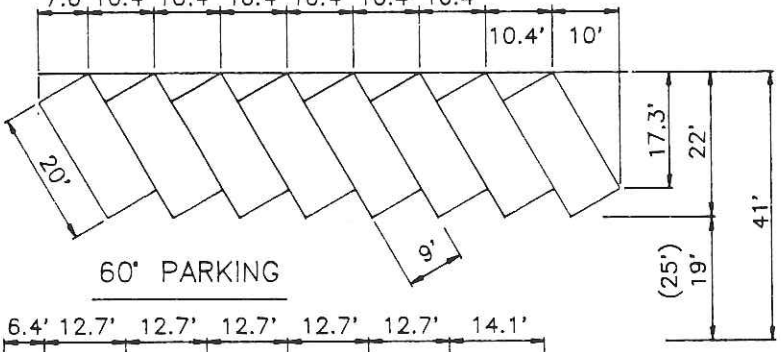
PARKING FOR HANDICAPPED



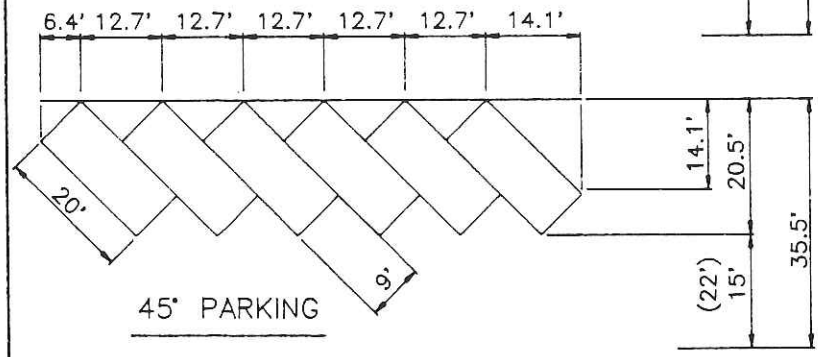
90° PARKING



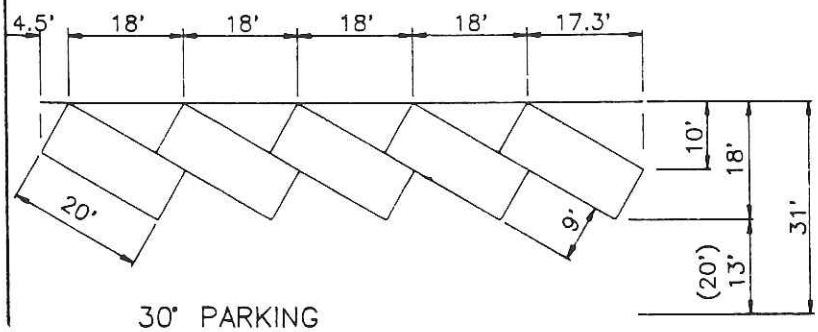
CONCRETE WHEEL STOP



60° PARKING



45° PARKING



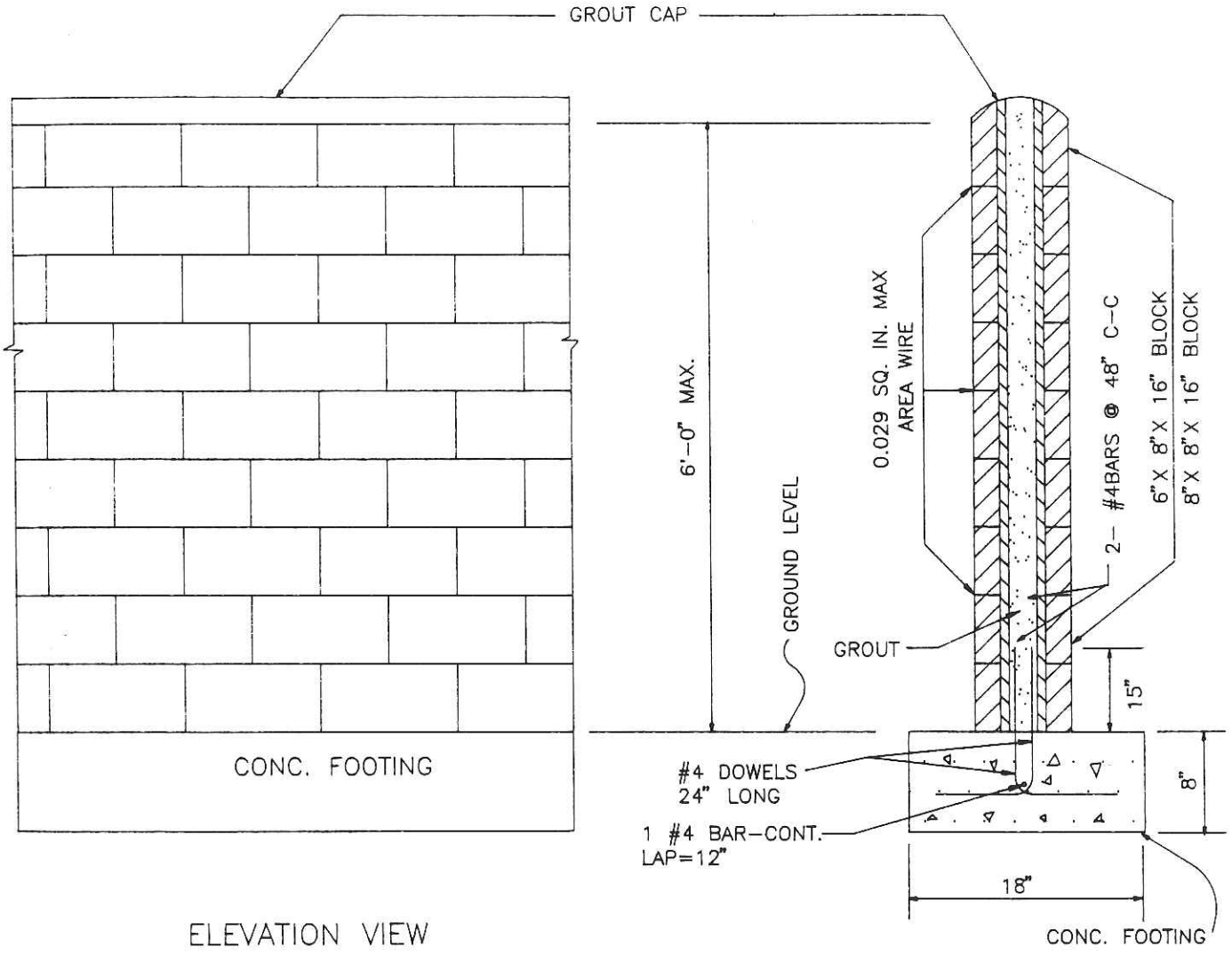
30° PARKING

NOTES;

1. DIMENSIONS IN PARENTHESES INDICATE THE MINIMUM AISLE REQUIRED FOR TWO WAY TRAFFIC.
2. THE PERCENT OF AREA TO BE LAND-SCAPED SHALL BE DETERMINED AT THE TIME OF SITE PLAN REVIEW.
3. PROVIDE THE REQUIRED NUMBER OF PARKING STALLS SPECIFIED BY THE CITY PLANNING DEPARTMENT, BASED ON ZONING ANG LAND USE.
4. INSTALL WHEEL STOPS TO PREVENT PARKED CARS FROM ENCROACHING OVER SIDEWALKS, ADJOINING PROPERTY OR CITY RIGHT-OF-WAY. REFER TO STD. DWG. FOR OVERHANG CLEARANCE AND WHEEL STOP REQUIREMENTS.
5. REFER TO STD. DWGS. FOR PARKING LOT DRAINAGE AND STRUCTURAL SECTION REQUIREMENTS.
6. PARKING LOTS SHALL HAVE 2% OF THE SPACE DESIGNATED FOR THE PHYSICALLY HANDICAPPED. PARKING LOTS WITH 50 SPACES OR LESS SHALL HAVE A MINIMUM OF ONE HANDICAPPED PARKING SPACE.

PARKING LOT REQUIREMENTS

REVISIONS	CITY OF AVENAL	STD. NO. M-2
	CITY ENGINEER _____ DATE _____	



ELEVATION VIEW

WALL SECTION

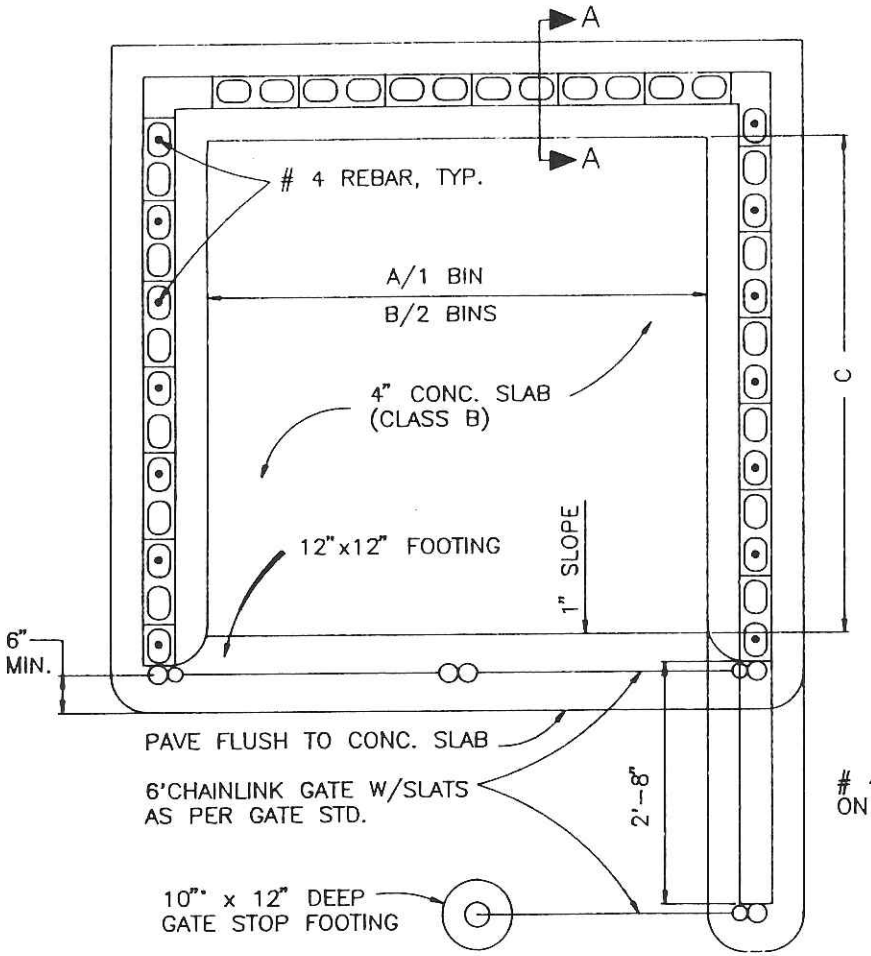
GENERAL NOTES

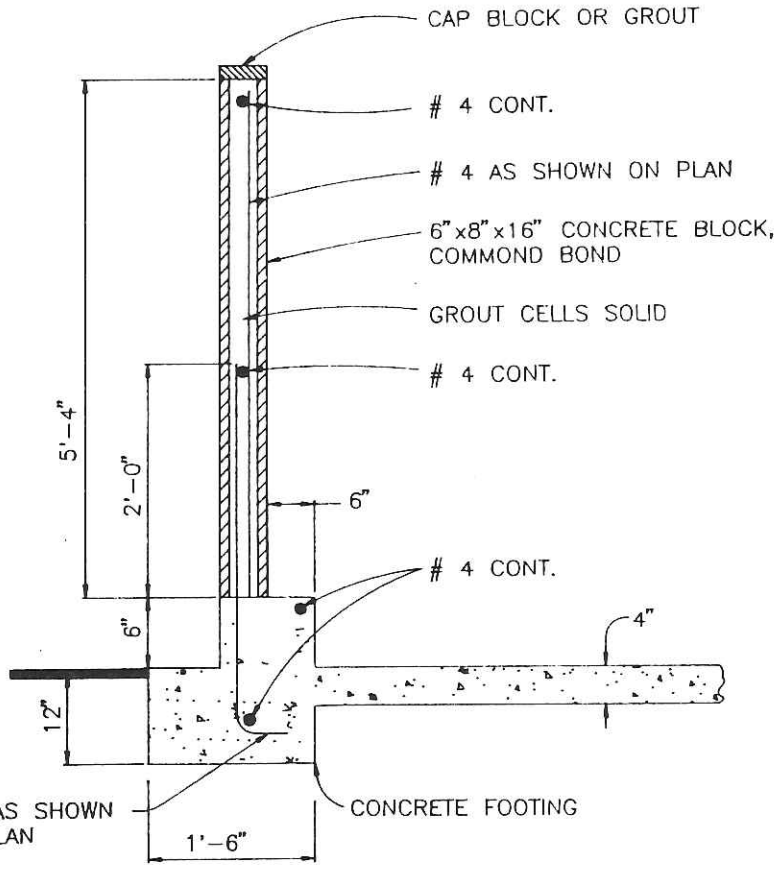
1. CHAPTER 24 OF 1991 EDITION OF U.B.C. SHALL BE COMPLIED WITH.
2. WALL THICKNESS SHALL BE EITHER 6" OR 8".
3. ALL MASONRY UNIT CELLS SHALL BE POURED SOLID WITH GROUT.
4. MORTAR SHALL CONSIST OF PORTLAND CEMENT AND SAND, MEETING TYPE "S" REQUIRMENTS.

CONCRETE BLOCK FENCE DETAIL

REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER DATE	M-3

TRASH ENCLOSURE





1. PUBLIC WORKS RECOMMENDED ENCLOSURE.
2. CUT CORNER BLOCK ENDS AND CENTER WEB TO FORM A CONT. BOND BEAM,
3. GROUND TO BE SLOPED AWAY FROM WALL.
4. LOCATION OF BIN ENCLOSURE TO BE APPROVED BY THE PUBLIC WORKS DIRECTOR.
5. A BUILDING PERMIT SHALL BE OBTAINED FROM THE CITY BLD. DEPT.

MIN. INSIDE ENCLOSURE DIMENSIONS

	1 YD.	2 YD.	3 YD.
A	10'	10'	10'
B	—	20'	20'
C	10'	10'	10'

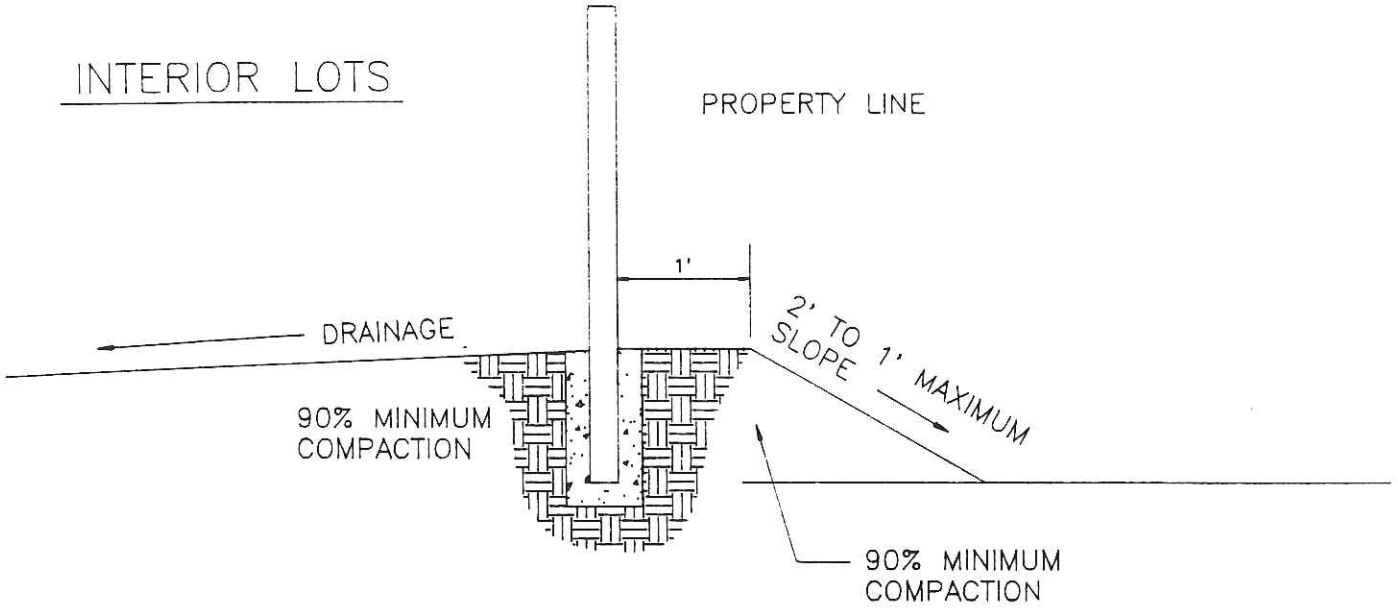
REVISIONS

CITY OF AVENAL

CITY ENGINEER _____ DATE _____

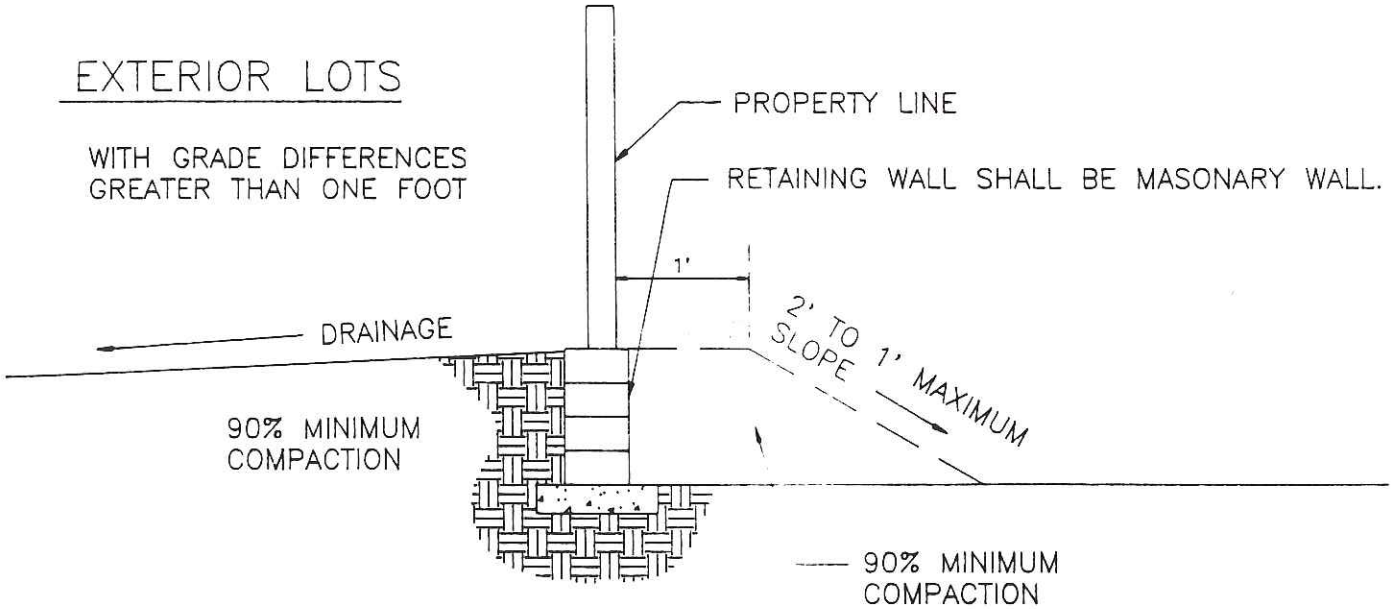
STD. NO. M-4

INTERIOR LOTS



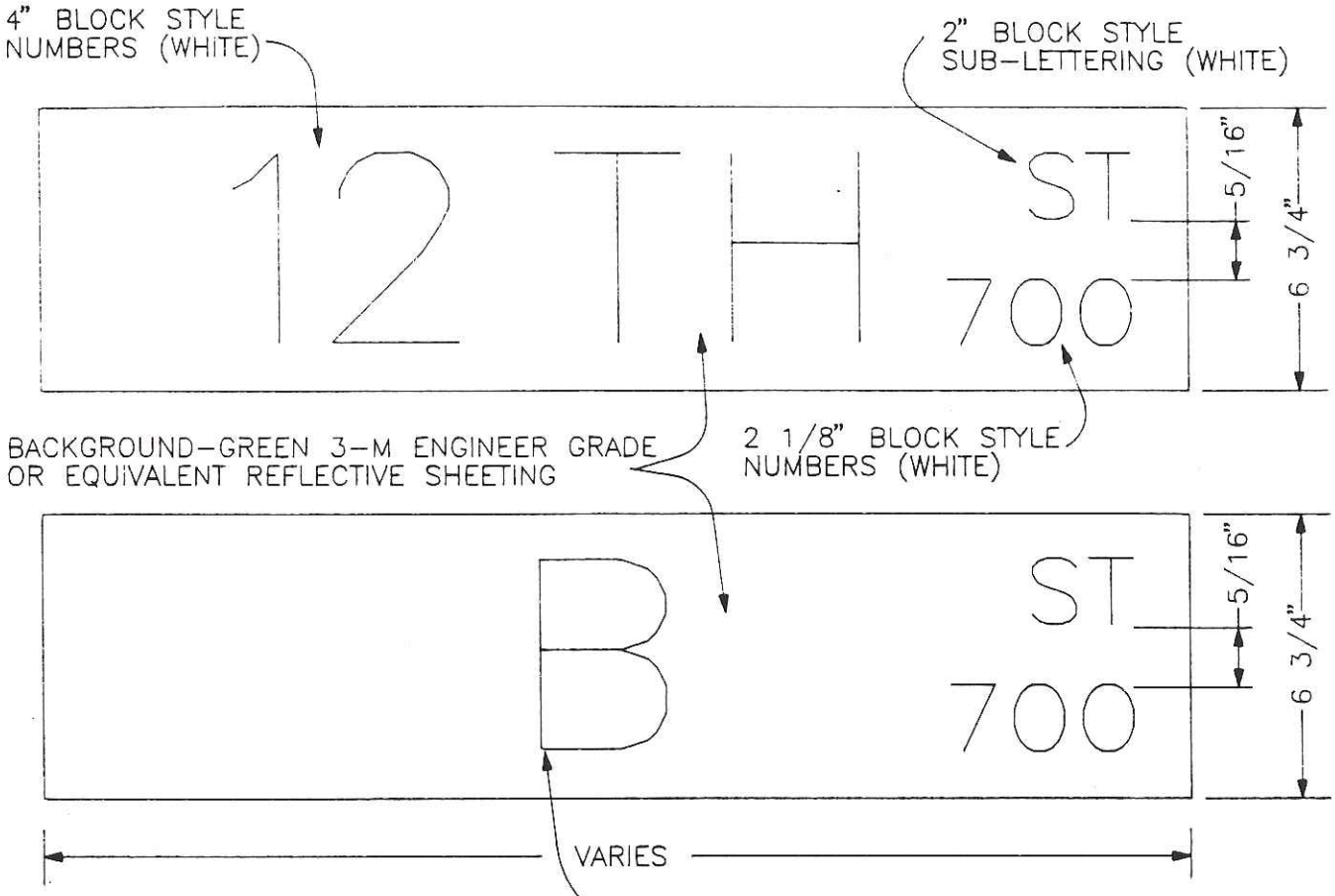
EXTERIOR LOTS

WITH GRADE DIFFERENCES GREATER THAN ONE FOOT



LOT LINE GRADING STANDARD

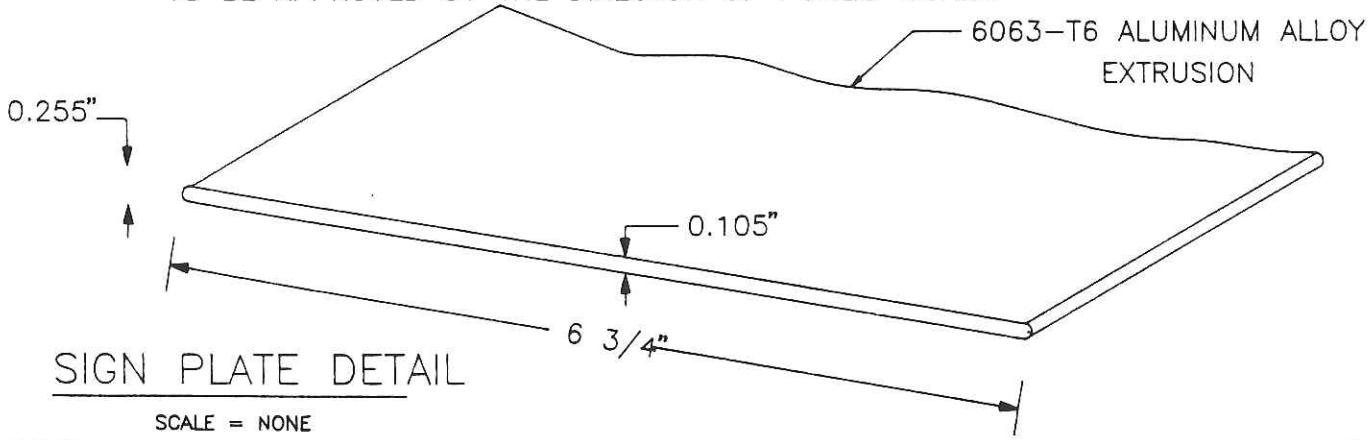
REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER _____ DATE _____	M-5



SIGN FACE DETAIL

SCALE = NONE

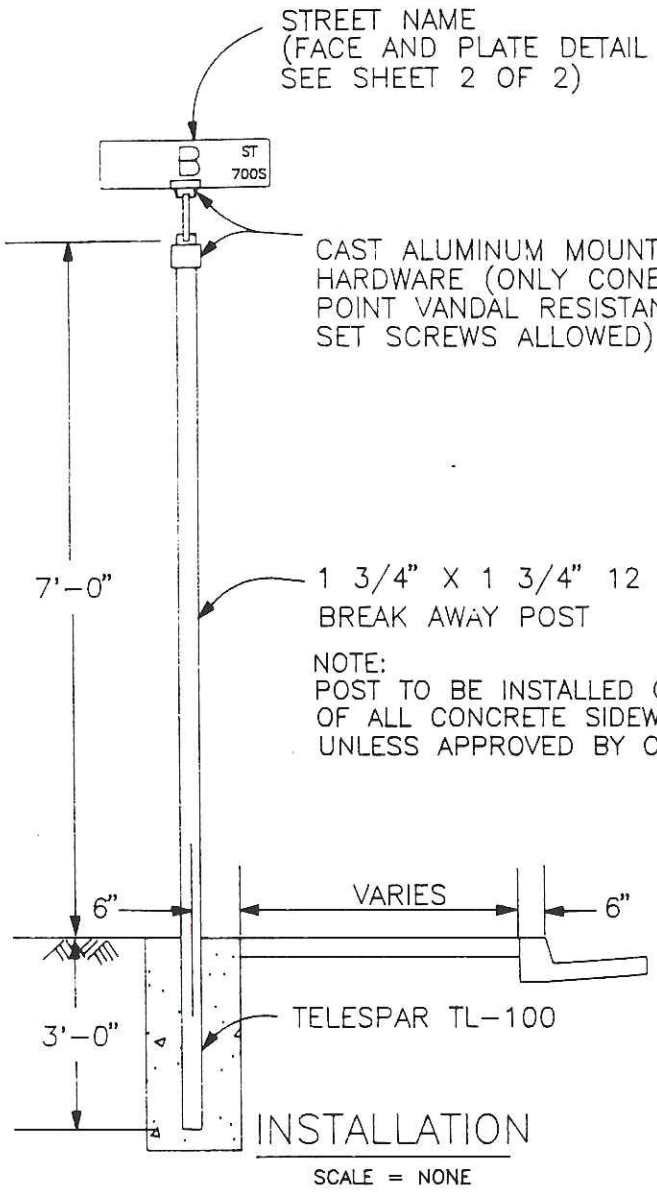
NOTE: ALL LETTERS, NUMBERS AND LOGO SHALL BE HEAT APPLIED, DIE CUT OR REVERSED SCREEN 3M ENGINEER GRADE REFLECTIVE OR EQUIVALENT; TO BE APPROVED BY THE DIRECTOR OF PUBLIC WORKS



SIGN PLATE DETAIL

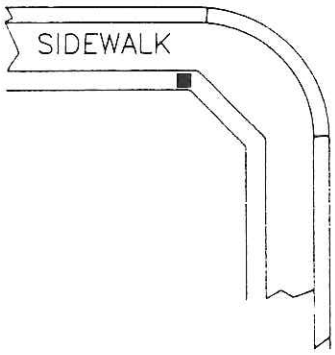
SCALE = NONE

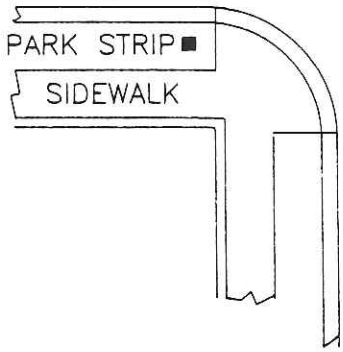
STREET NAME SIGN (FACE AND PLATE DETAILS)	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. M-6

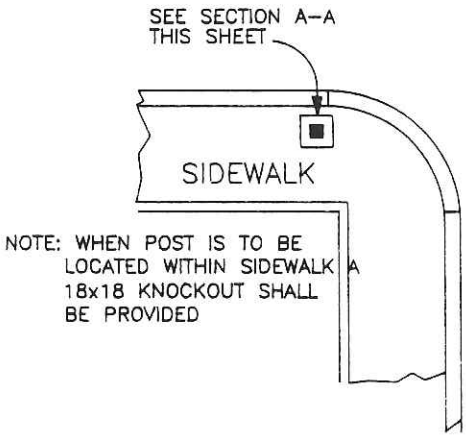


INSTALLATION

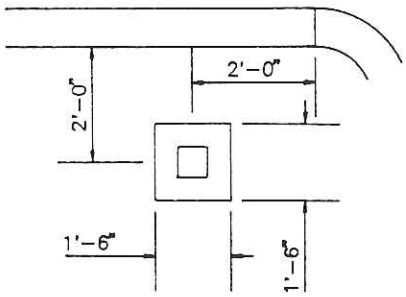
SCALE = NONE







NOTE: WHEN POST IS TO BE LOCATED WITHIN SIDEWALK A 18x18 KNOCKOUT SHALL BE PROVIDED

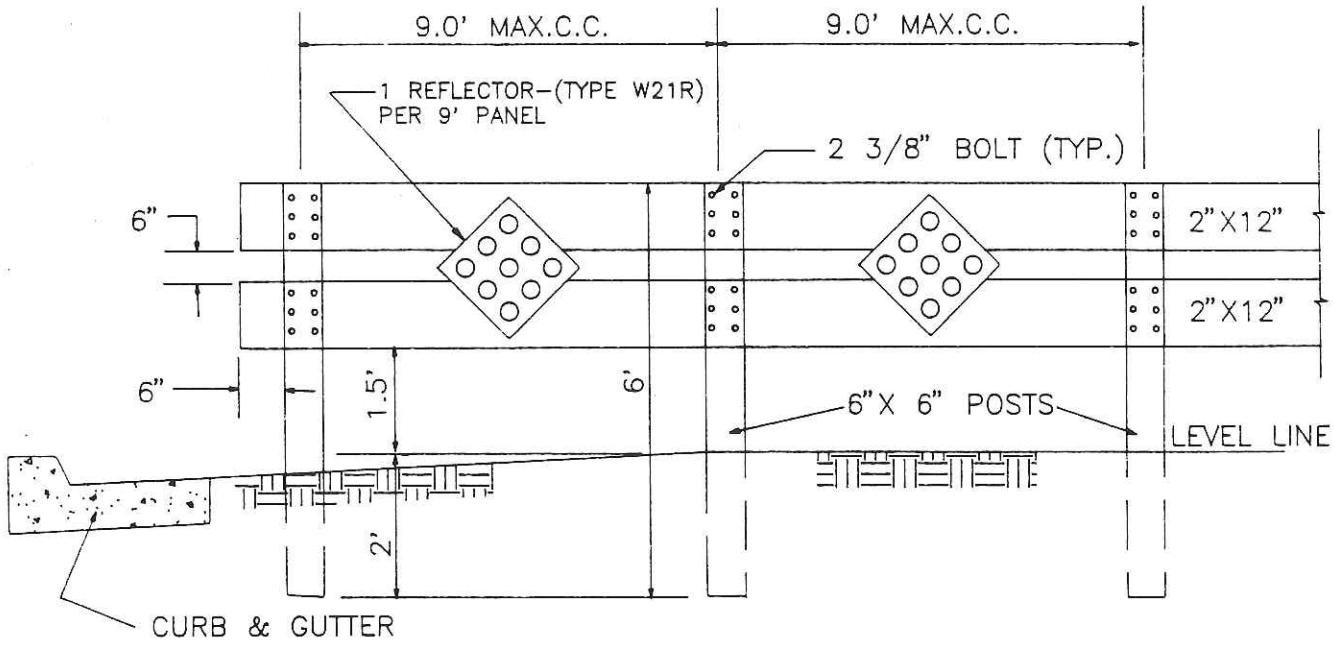


SECTION A-A

TYPICAL LOCATIONS

STREET SIGNS SHALL BE LOCATED AT N.E. OR S.W. INTERSECTION CORNERS.

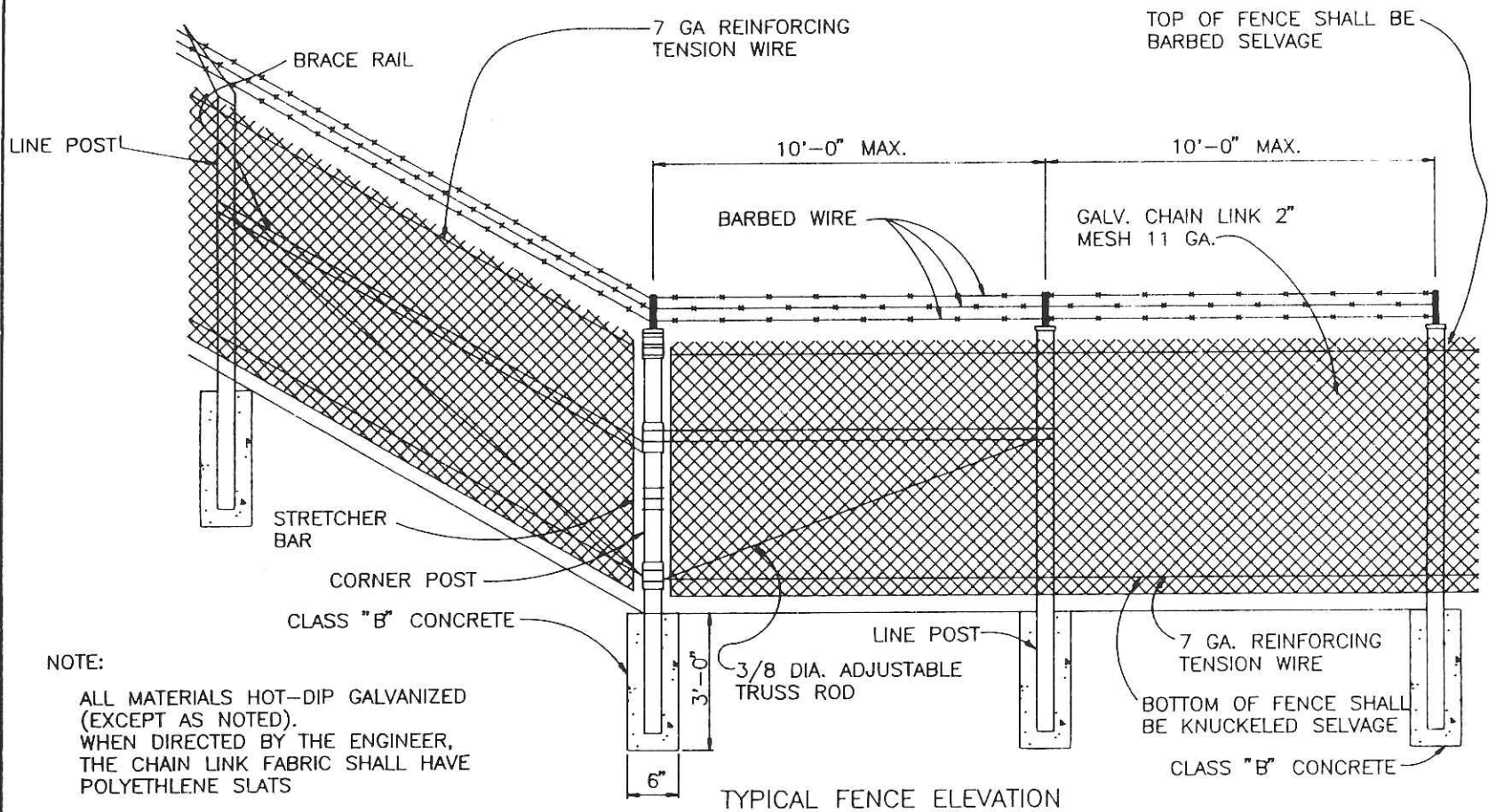
STREET NAME SIGN	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. M-7



NOTE:
1. BARRICADES MUST BE FULL WIDTH OF PAVEMENT OR TRAVELED WAY.
2. APPLY TWO COATS OF EXTERIOR FLAT WHITE PAINT TO ALL EXPOSED WOOD MEMBERS.
3. ANY DEVIATION FROM THE ABOVE FOR TEMPORARY INSTALLATIONS, SHALL BE SUBJECT TO APPROVAL OF THE CITY ENGINEER.

TEMPORARY TIMBER BARRICADE	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. M-8

CHAIN LINK FENCE



TYPICAL FENCE ELEVATION

NOTE:

ALL MATERIALS HOT-DIP GALVANIZED (EXCEPT AS NOTED).
WHEN DIRECTED BY THE ENGINEER, THE CHAIN LINK FABRIC SHALL HAVE POLYETHLENE SLATS

TABLE A			
DESCRIPTION	SIZE	DESCRIPTION	SIZE
END POSTS	3-3/8" OD SCH. 40	STRETCHER BAR BANDS	1/8"x1"
CORNER POSTS	3-3/8" OD SCH. 40	STRETCHER BAR	1/4"x3/4"
LINE POSTS	2-3/8" OD SCH. 40	TRUSS ROD	3/8" DIA. ADJUSTABLE
TENSION WIRE	7 GA. REINFORCING	TENSION WIRE TIES	11 GA. @ 24" O.C.
BRACE RAILS	1-5/8" OD SCH. 40	LINE POST TIES	6 GA. @ 14" O.C.
GALVANIZED AFTER WEAVING, CHAIN LINK FABRIC	2x11x6'- 9 GA.	BARBED WIRE GATE POSTS	12 1/2 GA. 4 PT 4 1/2 OD SCH. 40

REVISIONS

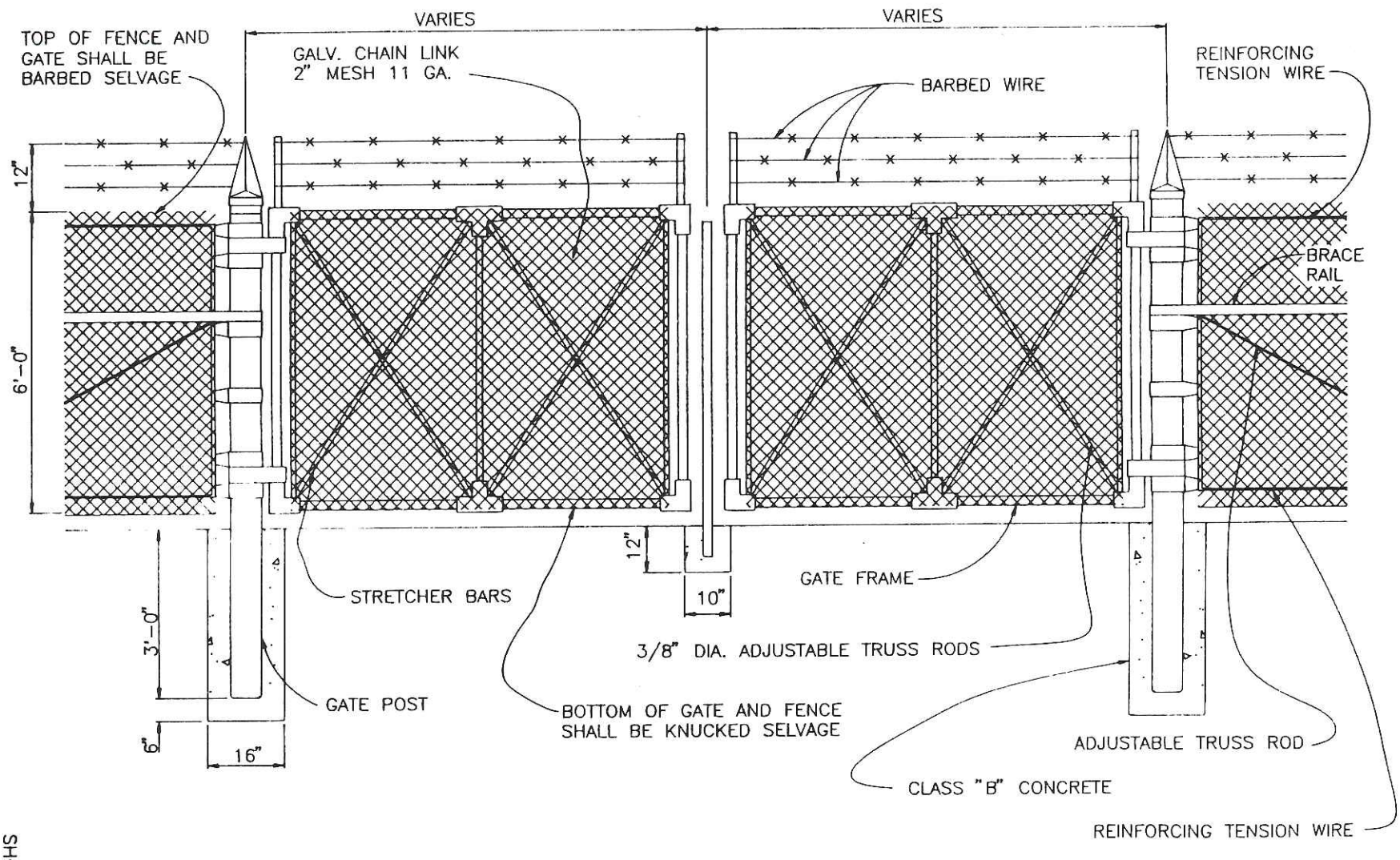
CITY OF AVENAL

CITY ENGINEER _____ DATE _____

STD. NO. M-9

SHEET 1 OF 2

CHAIN LINK GATE



NOTE:

FOR MATERIAL TYPES AND SIZE SEE TABLE ON A ON SHEET 1

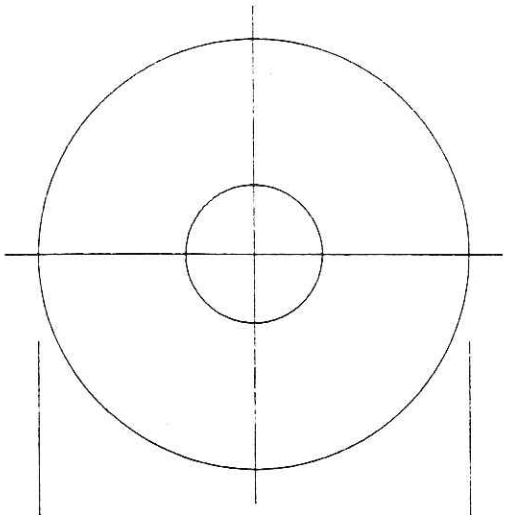
REVISIONS

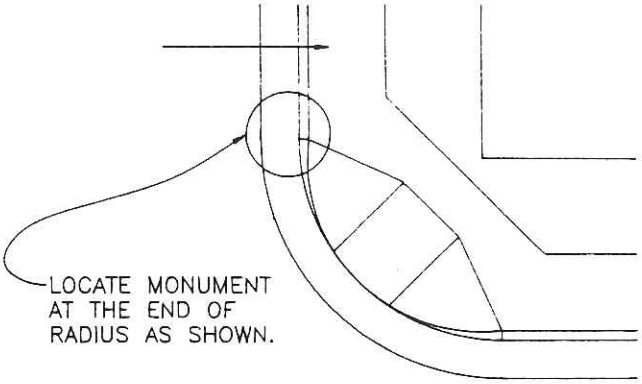
CITY OF AVENAL

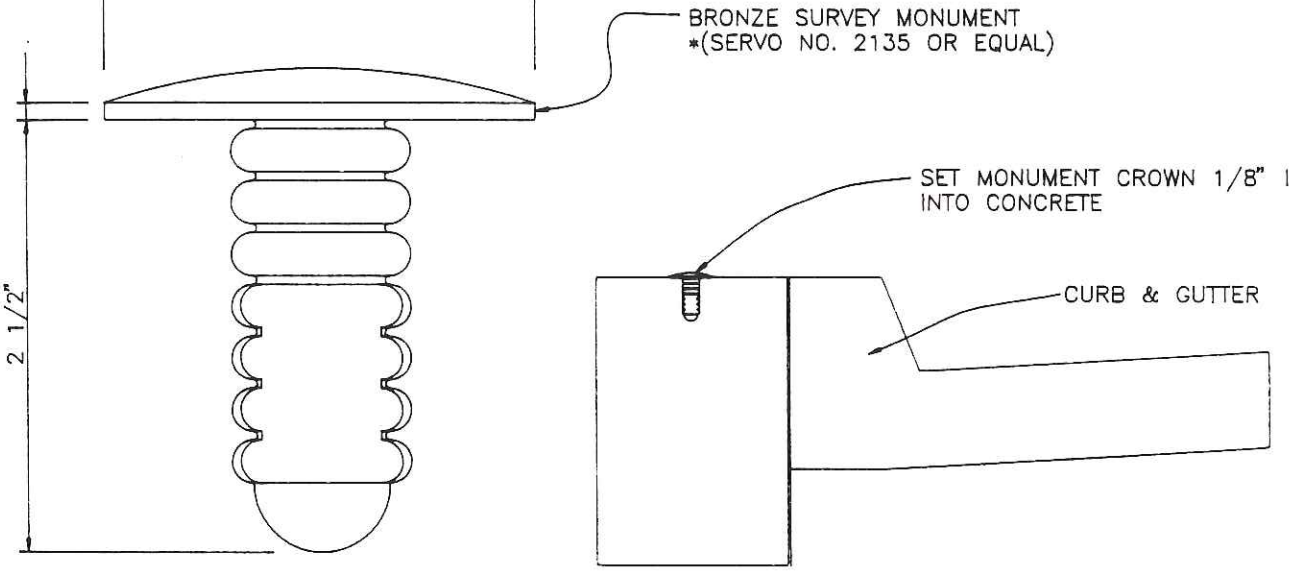
CITY ENGINEER _____ DATE _____

STD. NO. M-9

SHEET 2 OF 2







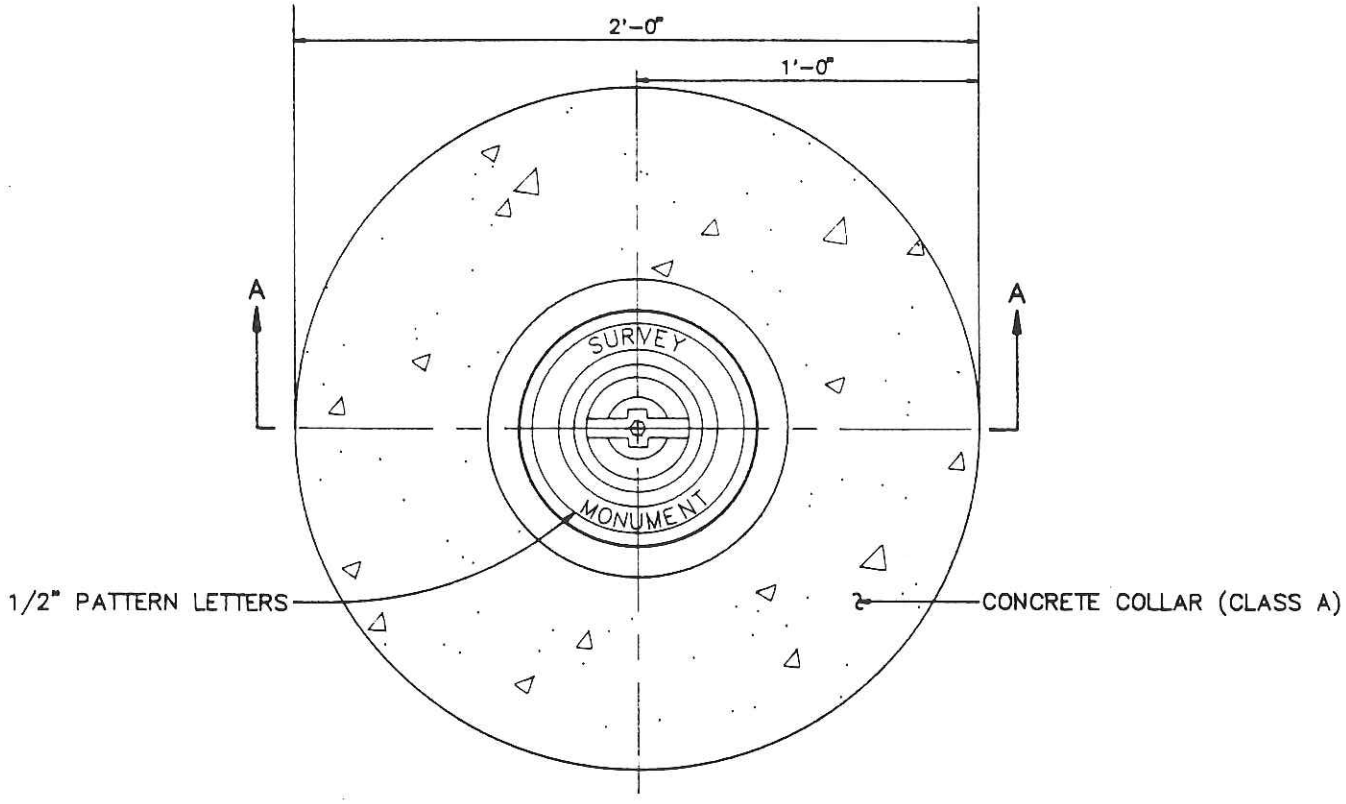
FULL SIZE

NOTES:

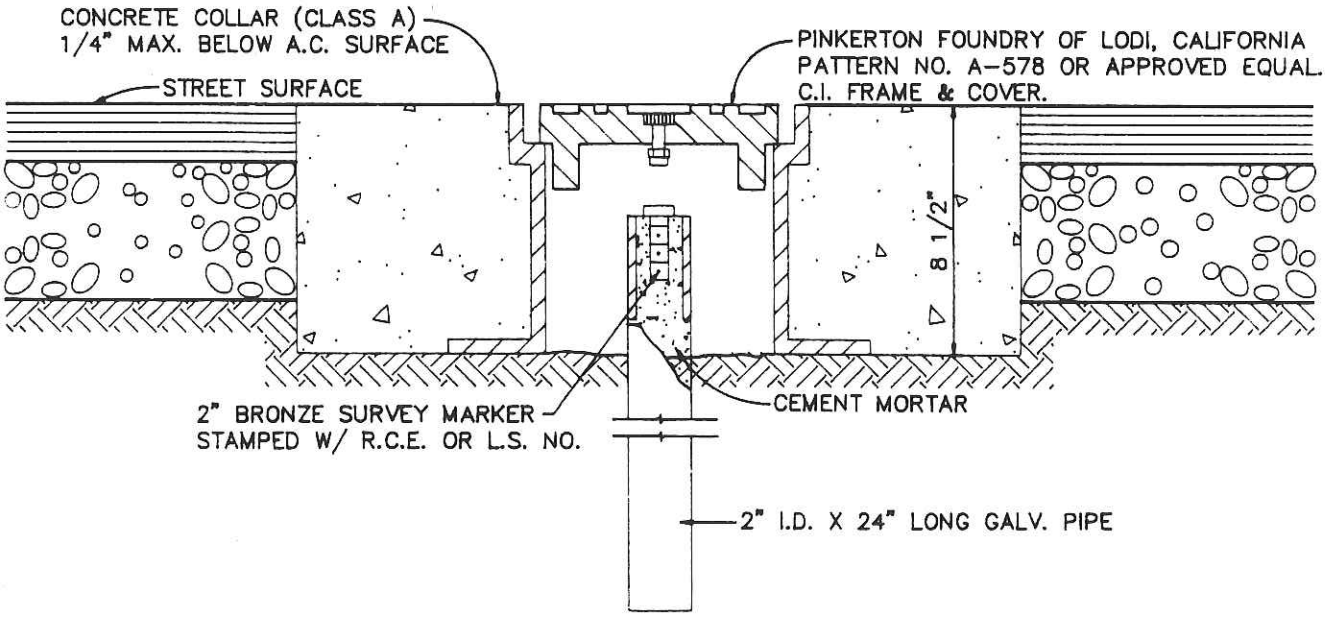
1. LOCATE BENCH MARKS AT THE NORTHEAST CORNER OF INTERSECTIONS APPROVED BY THE CITY ENGINEER.
2. COMPLETE NOTES SHOWING LOCATIONS, ELEVATIONS, AND CLOSURES SHALL BE FILED WITH THE CITY ENGINEER.
3. ELEVATIONS SHALL BE BASED ON U.S.G.S. DATUM.

* AVAILABLE AT: SERVCO, 2942 CENTURY PLACE, COSTA MESA, CA 92626

BENCH MARK	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. M-10



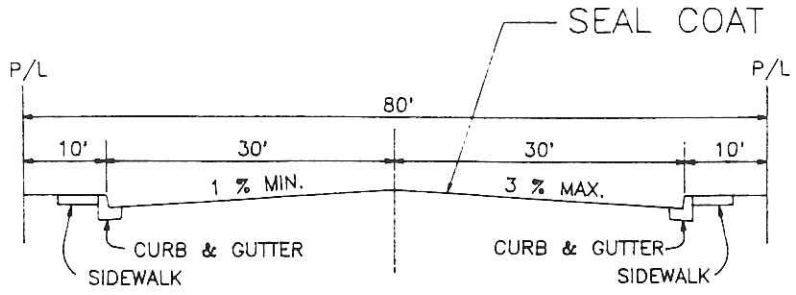
PLAN



SECTION A-A

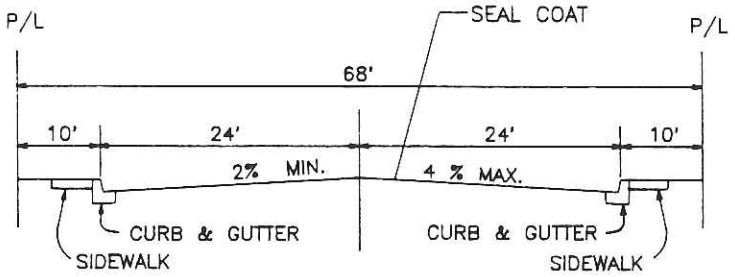
NOTE:
LOCATE SURVEY MONUMENTS AT ALL STREET INTERSECTIONS

STREET INTERSECTION SURVEY MONUMENT	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. M-11



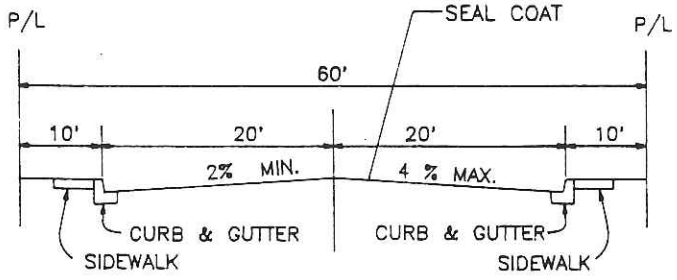
80–FOOT STREET

ARTERIAL TI = 7.0



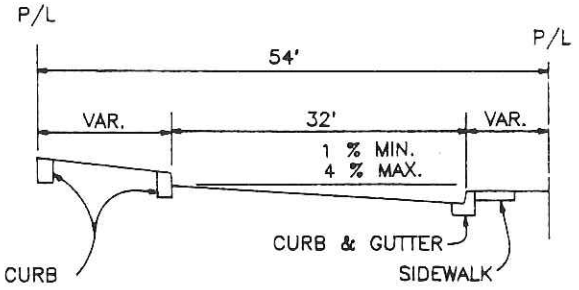
68–FOOT STREET

TI = 6.0'



60–FOOT STREET

RESIDENTIAL TI = 5.0

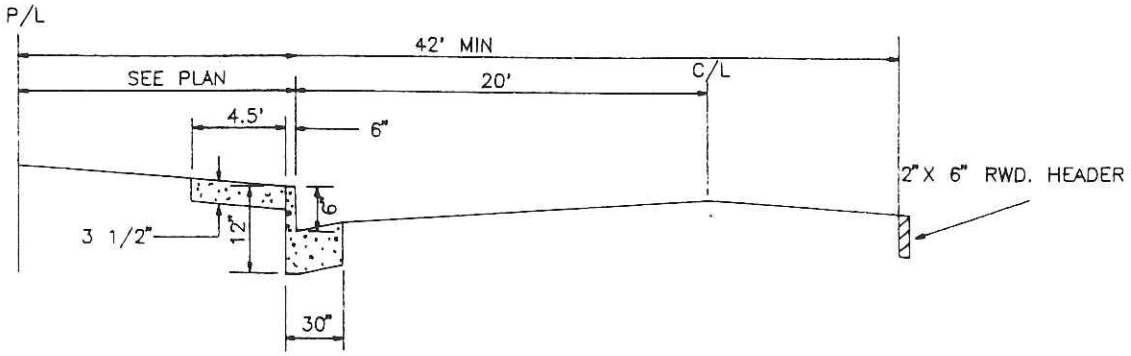


FRONTAGE ROAD

TI = 5.0

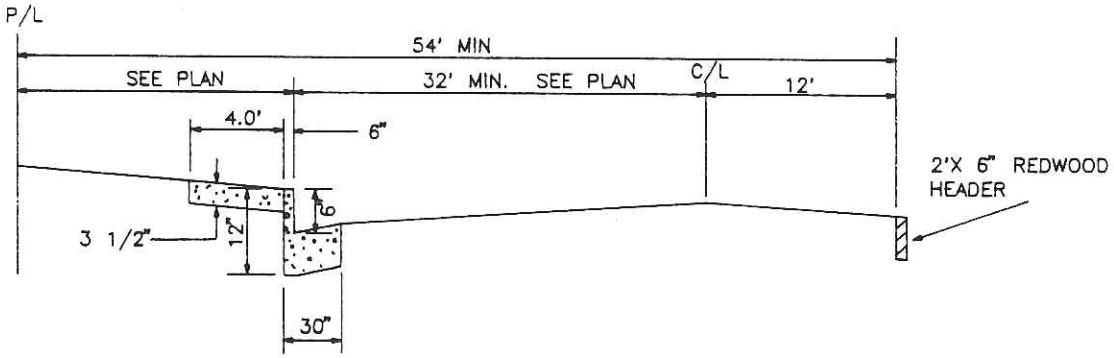
ALL PAVEMENT STRUCTURAL SECTIONS TO BE DESIGNED BASED N SOIL TESTS AND SUBMITTED TO THE CITY ENGINEER FOR APPROVAL.

TYPICAL STREET SECTIONS	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P–1



MINIMUM SECTION OF 60' STREET

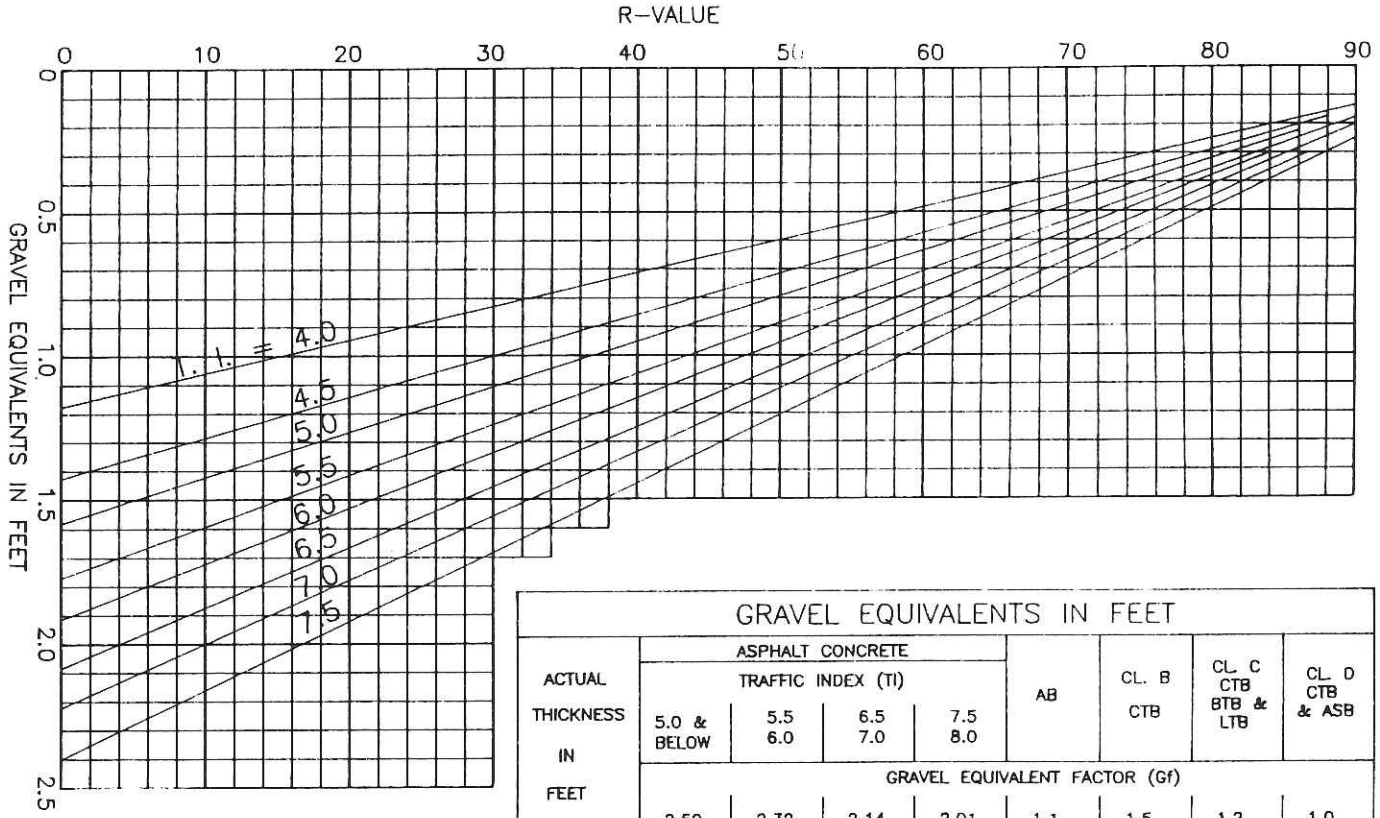
NOTE:
SLOPE 4:1 FROM RWD. HEADER TO EXISTING SURFACING OR NATURAL GROUND UP TO 2' DIFFERENCE IN ELEV. USE 2:1 SLOPE



MINIMUM SECTION OF 80' STREET

TYPICAL STREET SECTIONS	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P-2

STRUCTURAL DESIGN CHART FOR FLEXIBLE PAVEMENTS



GRAVEL EQUIVALENTS IN FEET

ACTUAL THICKNESS IN FEET	ASPHALT CONCRETE TRAFFIC INDEX (TI) 5.0 & BELOW	5.5 6.0	6.5 7.0	7.5 8.0	AB	CL. B CTB	CL. C CTB BTB & LTB	CL. D CTB & ASB
	GRAVEL EQUIVALENT FACTOR (Gf)							
	2.50	2.32	2.14	2.01	1.1	1.5	1.2	1.0
0.17 0.20	0.43 0.50	0.39 0.46	0.43					
0.25 0.30	0.63 0.75	0.58 0.70	0.54 0.64	0.50 0.60				
0.35 0.40	0.88 1.00	0.81 0.93	0.75 0.86	0.70 0.80	0.39 0.44		0.42 0.48	.035 0.40
0.45 0.50		1.04 1.16	0.96 1.07	0.90 1.01	0.50 0.55	.068 0.75	0.54 0.60	0.45 0.50
0.55 0.60			1.18	1.11 1.21	0.71 0.66	0.83 0.90	0.66 0.72	0.55 0.60
0.65 0.70				1.30	0.72 0.77	0.98 1.105	0.78 0.84	0.65 0.70
0.75 0.80					0.83 0.88	1.13 1.20	0.90 0.96	0.75 0.80

GENERAL NOTES:

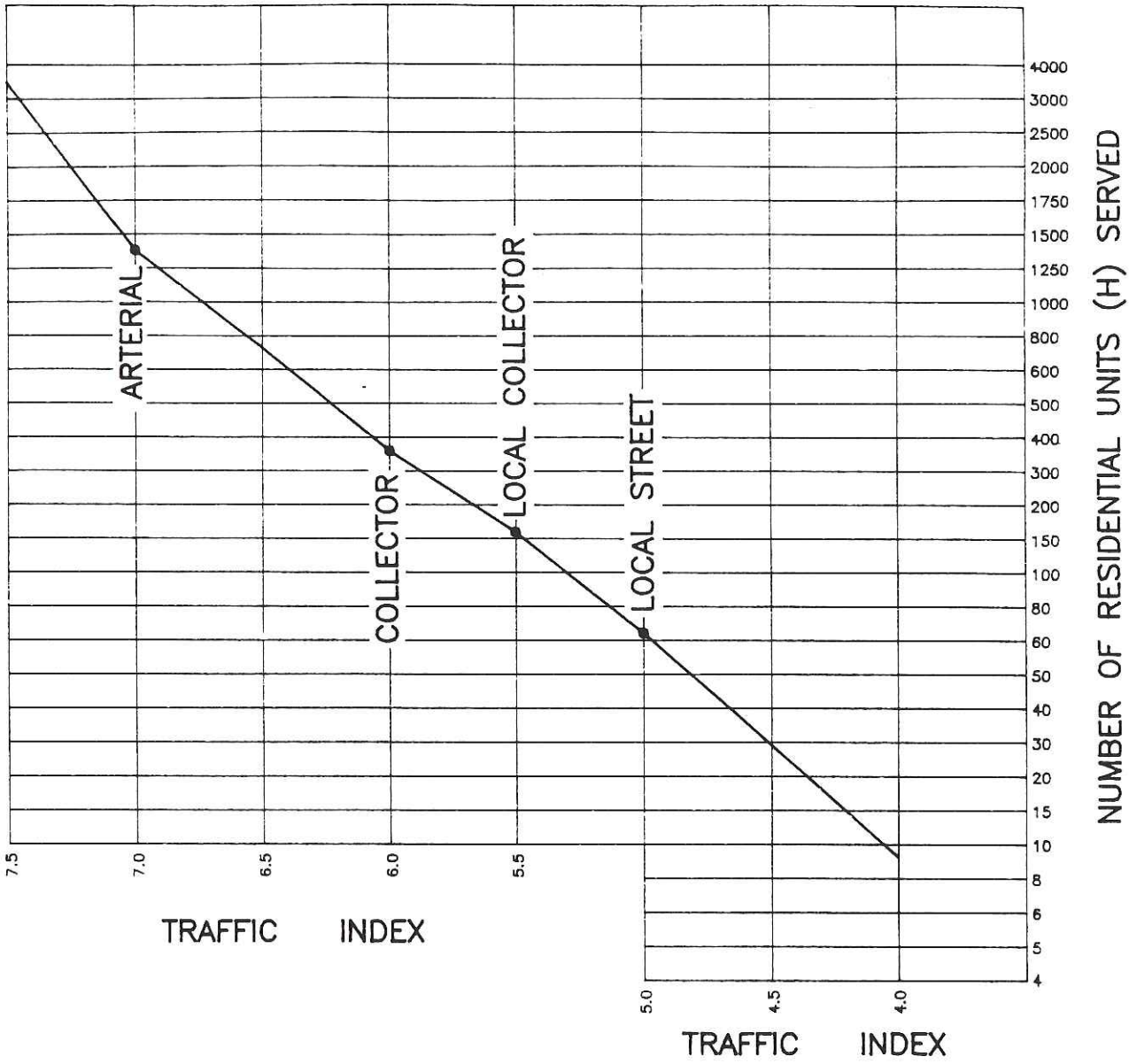
A. ALL PAVEMENTS SHALL BE DESIGNED ACCORDING TO TEST METHOD NO. CALIF. 301-G All PART VII, PLANNING MANUAL OF INSTRUCTIONS, STATE OF CALIFORNIA WITH THE EXCEPTION THAT T.I.'S WILL BE DETERMINED FROM THE TRAFFIC INDEX CHART WHERE APPLICABLE.
B. SOLID LINE INDICATES MINIMUM THICKNESS ALLOWED.
C. WHERE EXPANSIVE SOILS ARE ENCOUNTERED AS DESCRIBED IN THE STANDARD SPECIFICATIONS DESIGN OF THE STRUCTURAL SECTION TO BE BASED UPON LABORATORY TEST AND SUBMITTED TO CITY ENGINEER FOR APPROVAL.

REVISIONS

CITY OF AVENAL

CITY ENGINEER _____ DATE _____

STD. NO. P-3

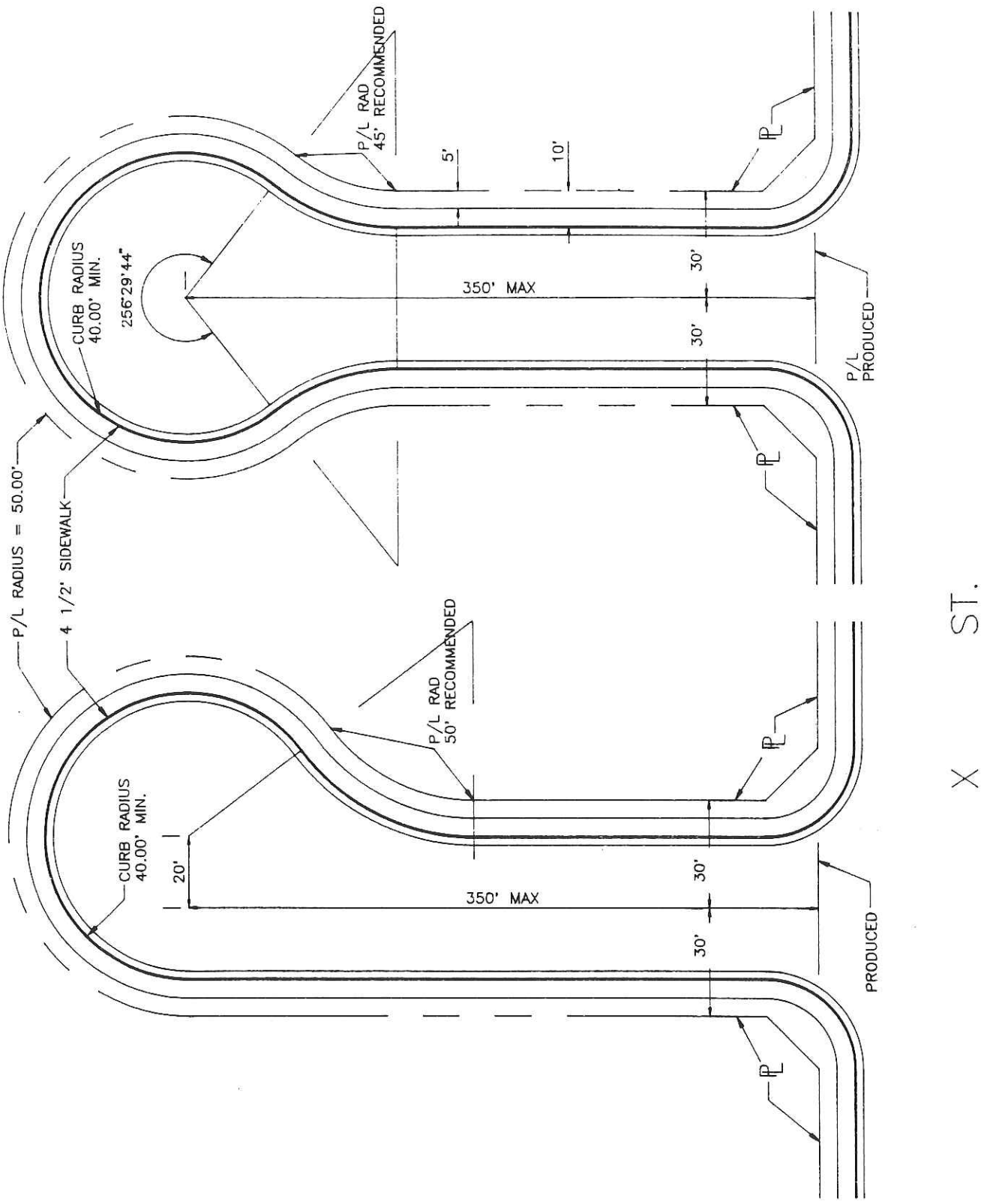


T.I. = 3.16(H)

WHERE THE NUMBER OF UNITS TO BE SERVED OR TRAFFIC COUNTS CAN NOT BE DETERMINED, USE THE TRAFFIC INDEX SHOWN.

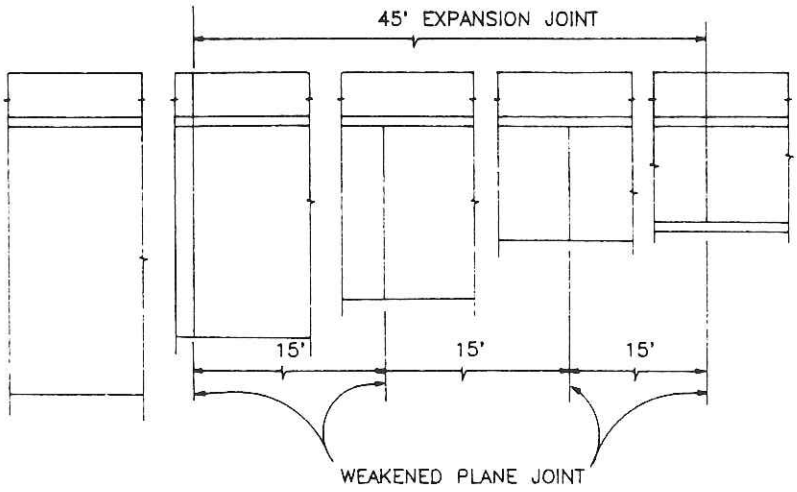
AREAS CONSIDERED AS SHOULDER MAY HAVE T.I.'S EQUAL TO 0.6 OF THE TRAFFIC LANES. 4.0 IS MINIMUM T.I. FOR DESIGN OF TRAVELWAY AND SHOULDERS.

TRAFFIC INDEX CHART	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P-4

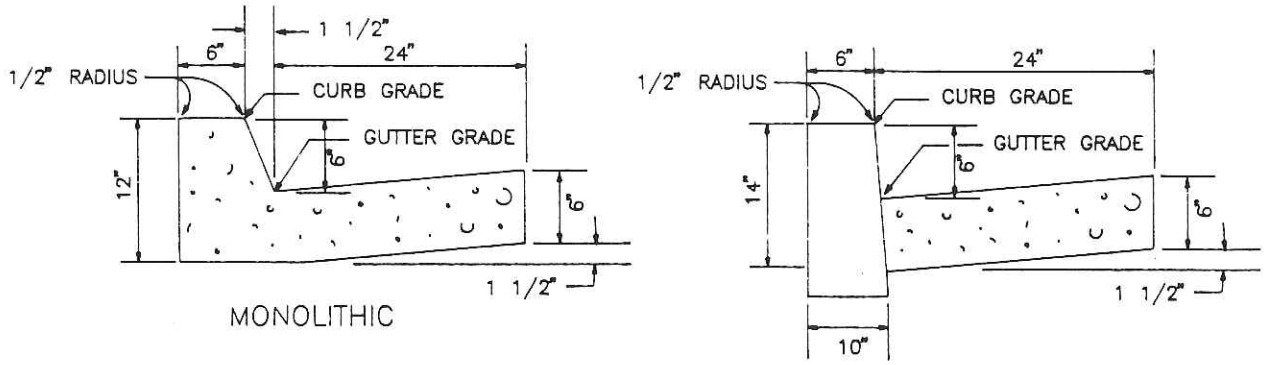


STANDARD CUL-DE-SAC ON 60 FOOT STREET

REVISIONS	CITY OF AVENAL	STD. NO. P-5
	CITY ENGINEER _____ DATE _____	

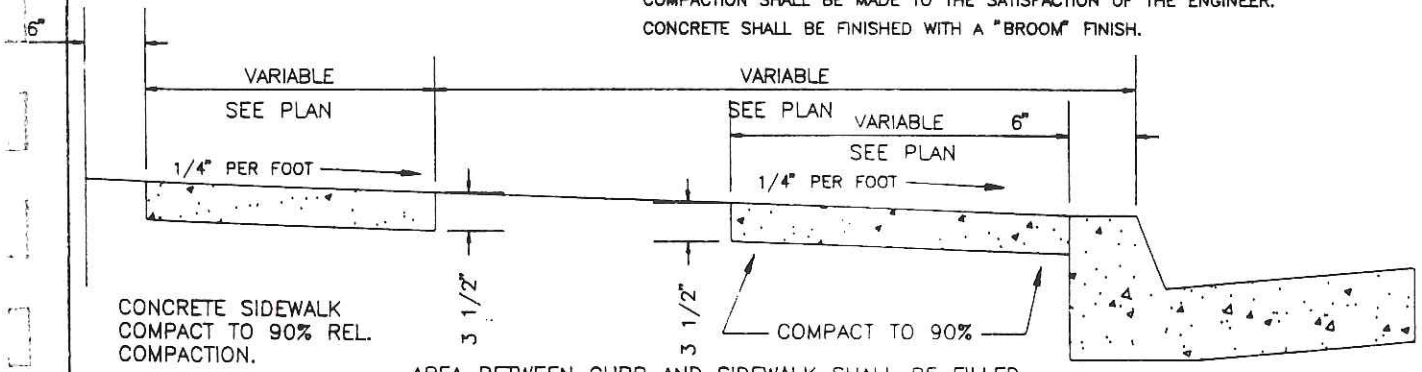


PLANS OF SIDEWALK, CURB & GUTTER, SCRIBE LINE DETAILS



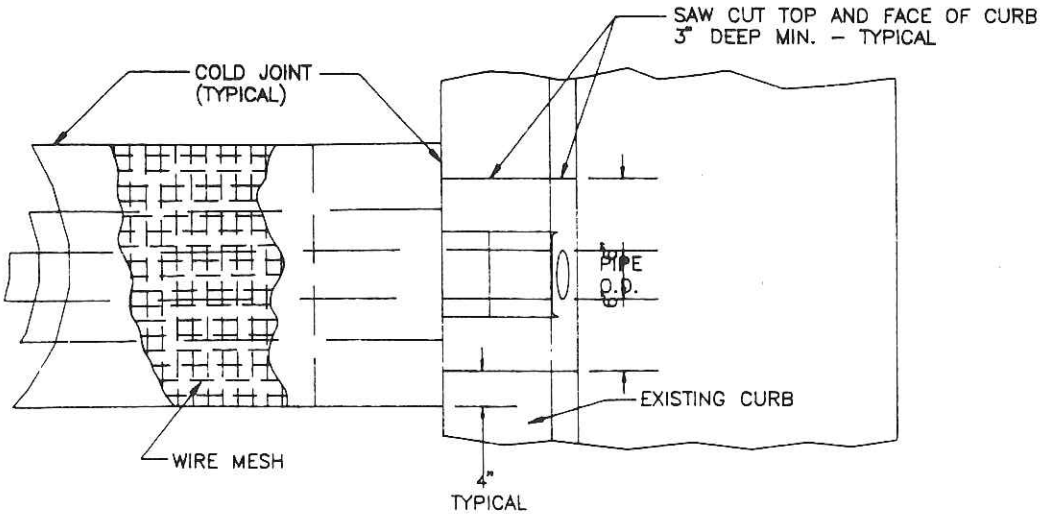
SECTIONS OF CURB & GUTTER

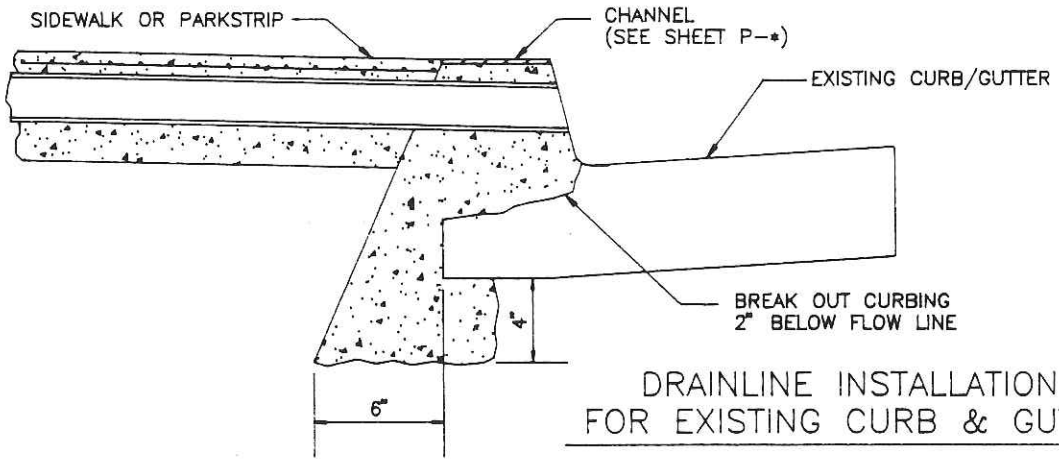
NOTE:
CONTRACTOR SHALL FILL AREA BETWEEN NEW GUTTER AND EXISTING STREET SURFACE WITH MIN 2" A.C. AND 4" A.B. OR AS REQUIRED BY CITY ENGINEER TO MEET EXISTING STREET SURFACE.
COMPACTION SHALL BE MADE TO THE SATISFACTION OF THE ENGINEER.
CONCRETE SHALL BE FINISHED WITH A "BROOM" FINISH.



SECTION OF SIDEWALK & CURB

CONCRETE SIDEWALK, CURB & GUTTER	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P-6

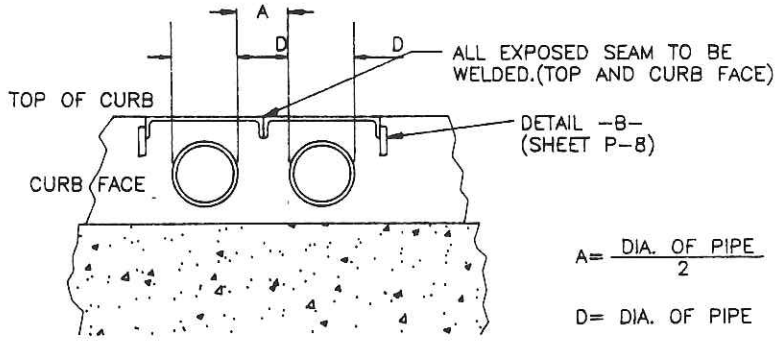




DRAINLINE INSTALLATION FOR EXISTING CURB & GUTTER

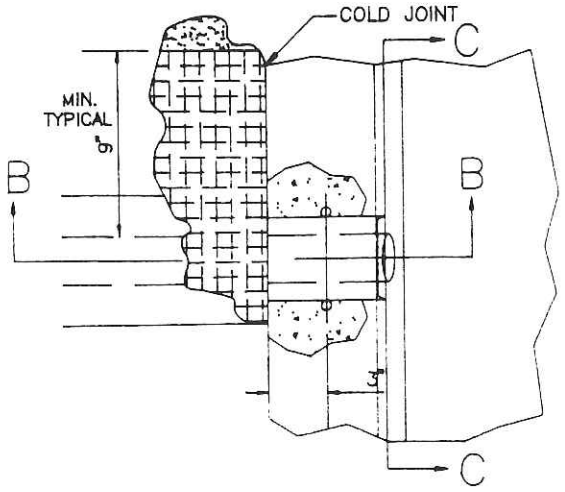
NOTES:

1. PIPE SHALL BE ONE CONTINUOUS LENGTH FROM PROPERTY LINE TO CURB LINE.
2. MULTIPLE PIPES TO BE SET A MINIMUM DISTANCE OF D/2 APART. (SEE DETAIL BELOW)
3. CONCRETE SHALL BE 6 SACK, CLASS A.
4. PIPE SHALL BE CIRCULAR ASBESTOS CEMENT, CAST IRON OR RIGID PLASTIC.
5. WIRE MESH TO BE INSTALLED IN CONCRETE ABOVE DRAIN LINE.

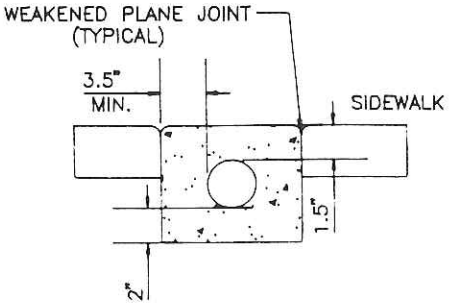


DUAL PIPE INSTALLATION

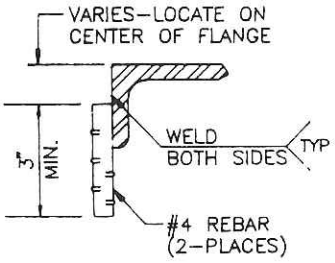
SIDEWALK UNDERDRAIN PIPE (EXISTING CURB & GUTTER)	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P–7



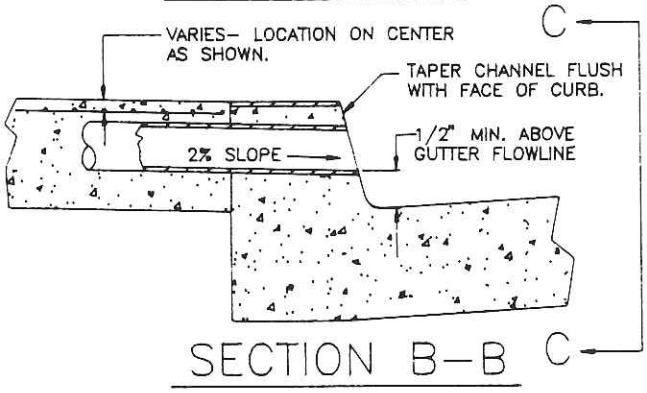
DETAIL –A–



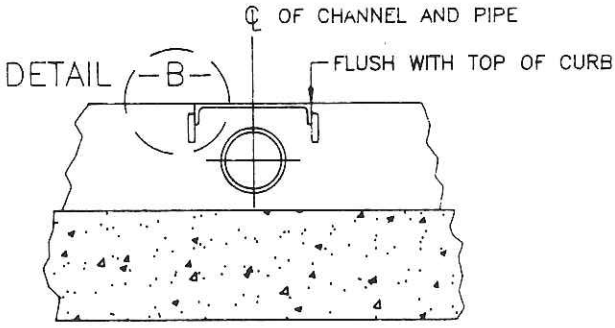
SECTION A–A



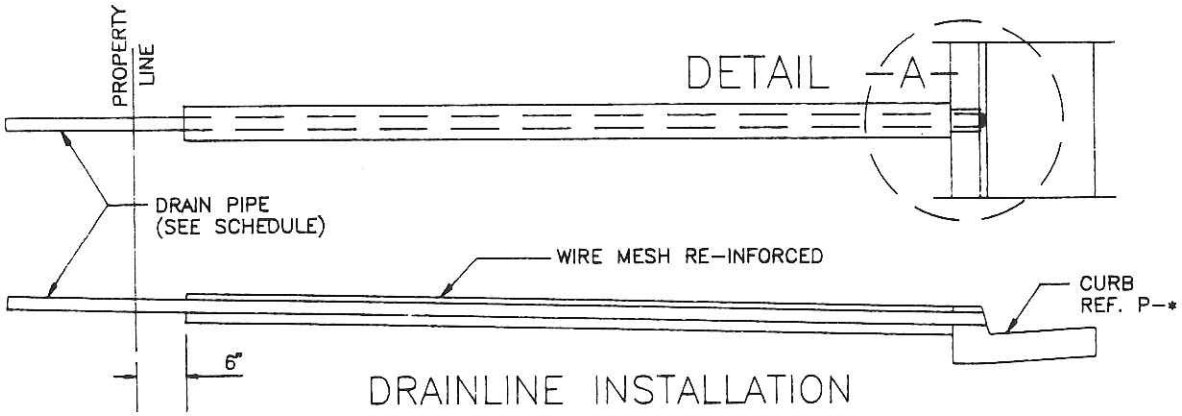
DETAIL –B–



SECTION B–B

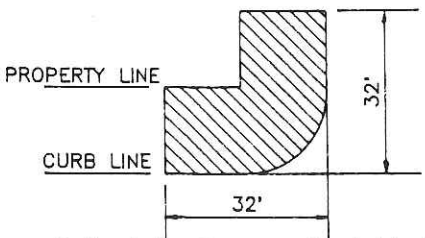


SECTION C–C



DRAINLINE INSTALLATION FOR NEW CONSTRUCTION

FOR INSTALLATION ON EXISTING CURB AND GUTTER SEE SHEET P–7



Drain shall not occupy the hatched area.

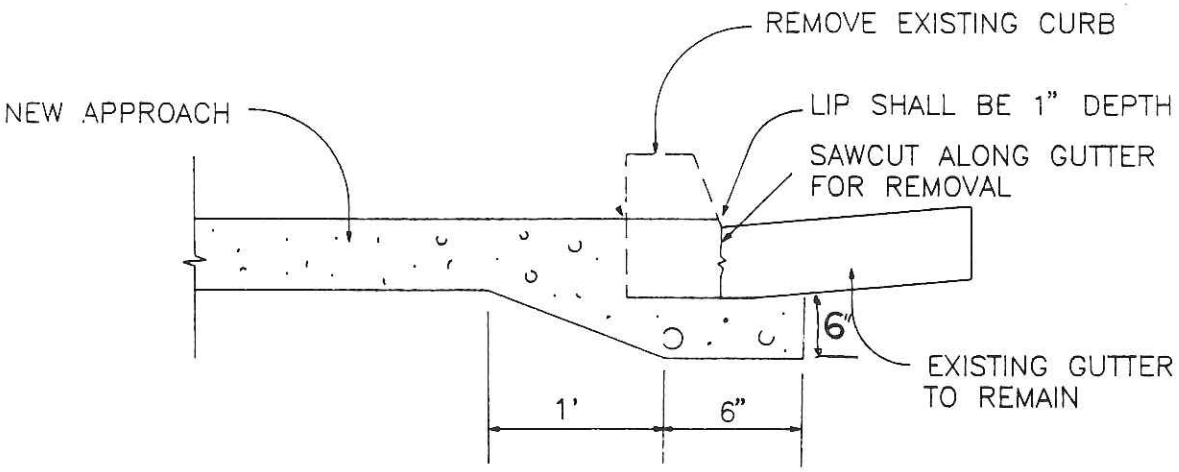
BLOCK CORNER

SCHEDULE		
PIPE DIA.	CURB FACE	CHANNEL
3"	6" TO 8"	6"
4"	6" TO 8"	6"
6"	8" TO 10"	8"

CHANNEL MATERIAL TO BE STD. GALV. EQUIV., UNLESS OTHERWISE APPROVED BY CITY ENGINEER.

SIDEWALK UNDERDRAIN PIPE (NEW CONSTRUCTION)

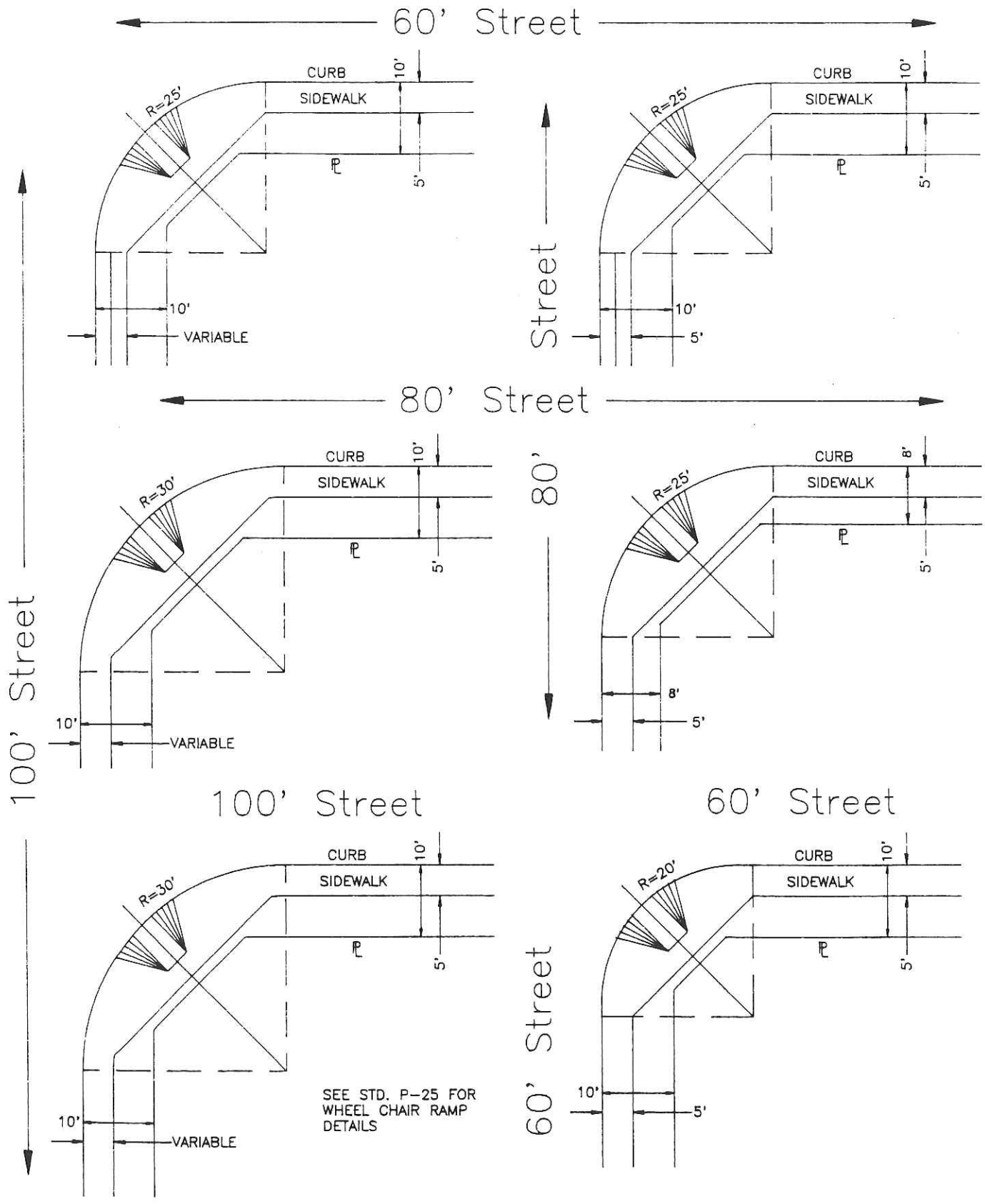
REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER _____ DATE _____	P–8



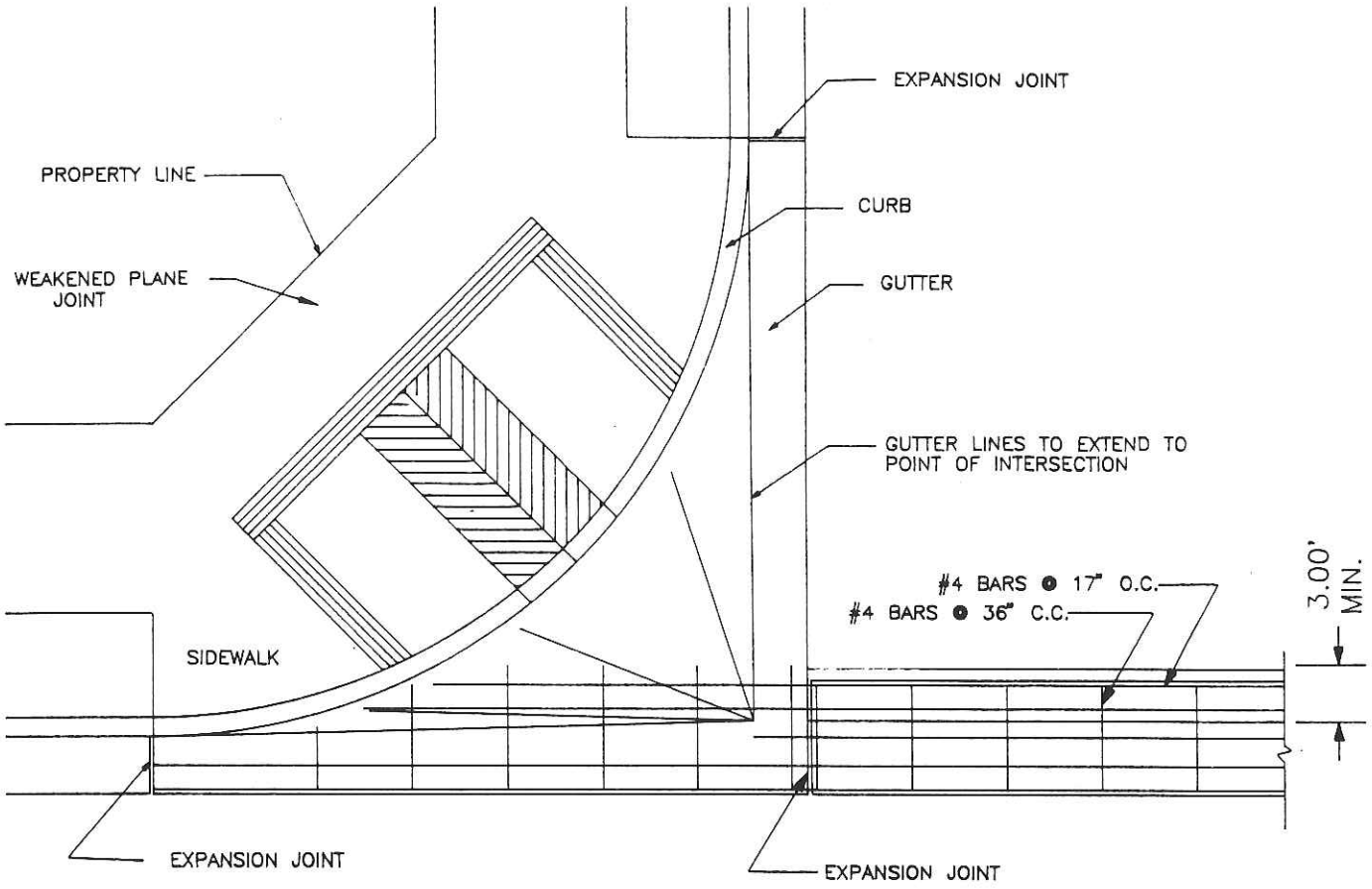
PLACE 6"x6" OF CONCRETE UNDER REMAINING GUTTER

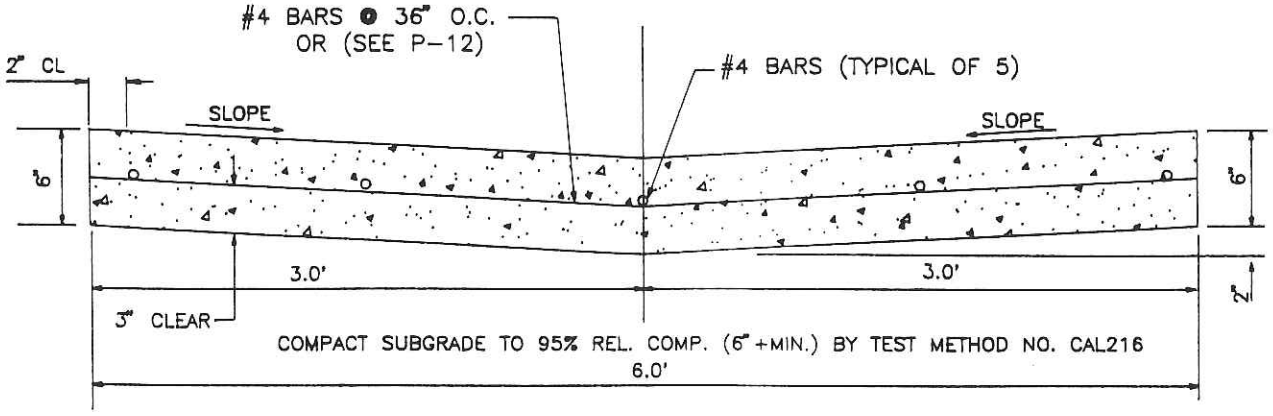
CURB REMOVAL FOR NEW APPROACHES

REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER _____ DATE _____	P-9



CURB RETURNS WHEELCHAIR RAMPS FOR INTERSECTING STREETS	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P-10

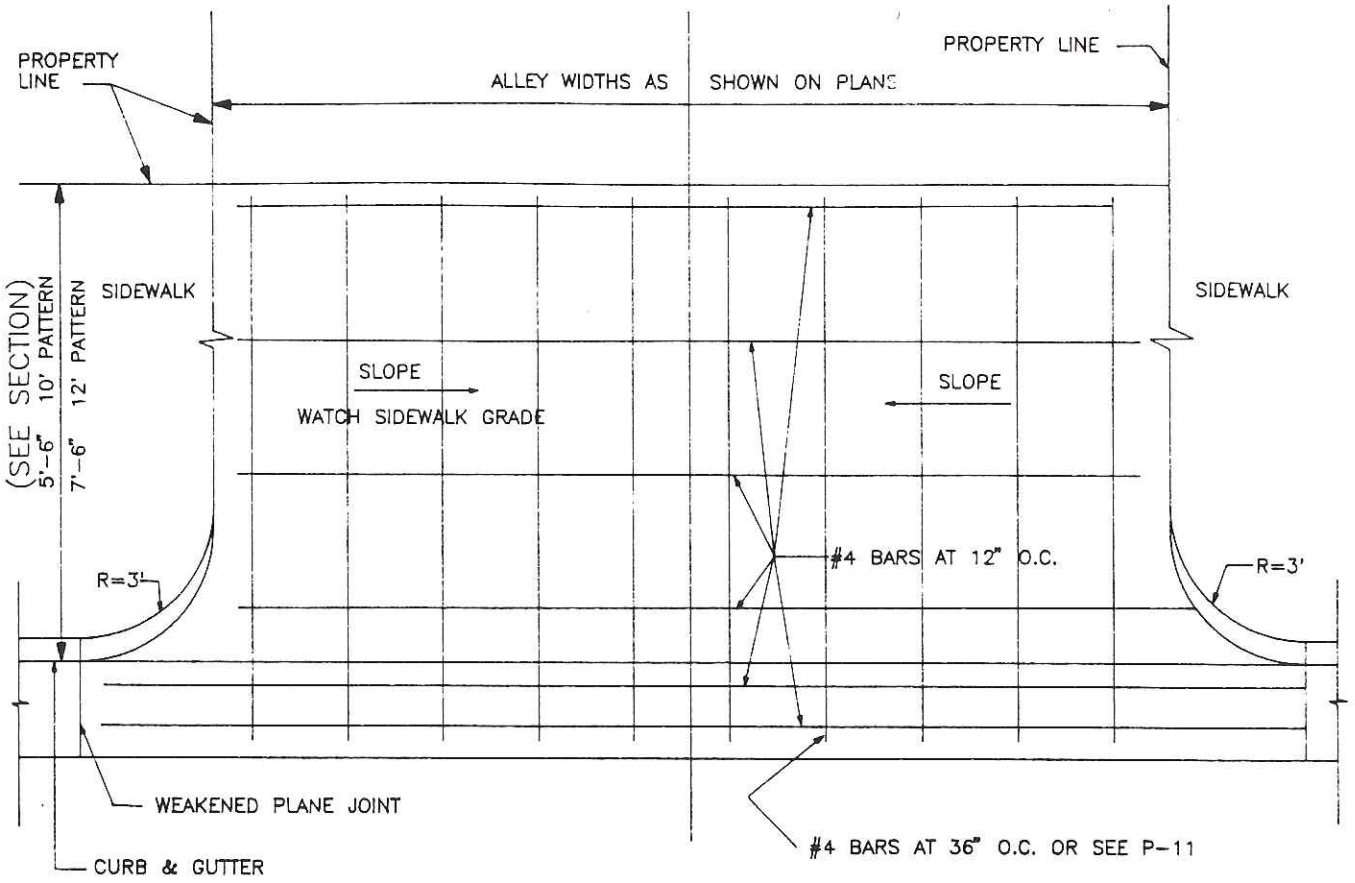




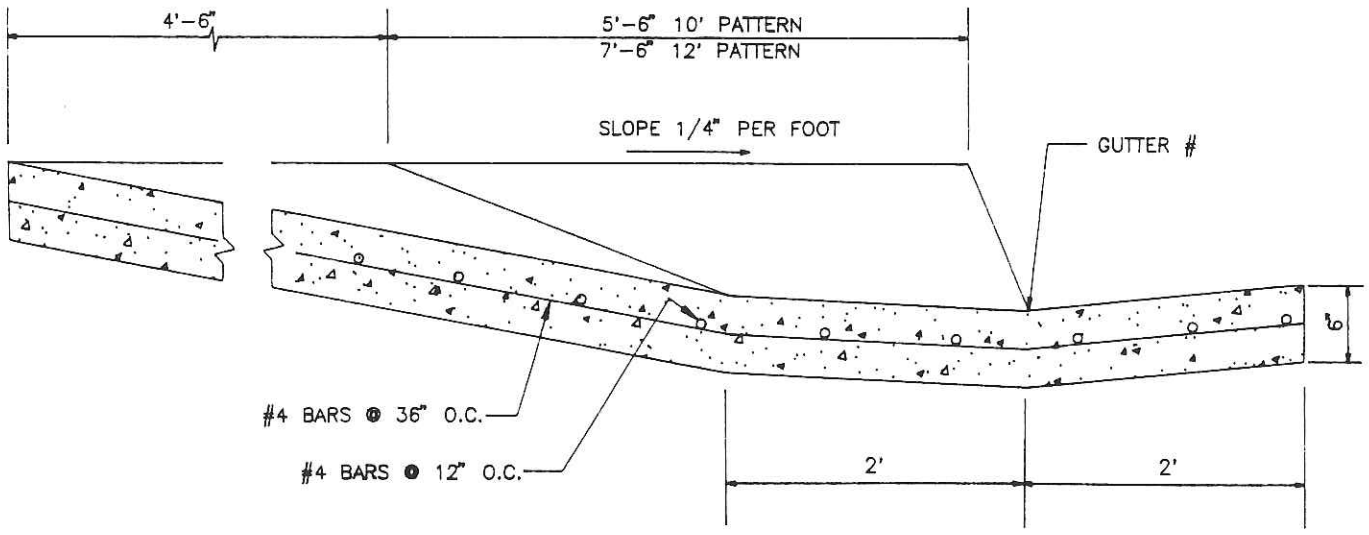
SECTION

CLASS A CONCRETE

CONCRETE VALLEY GUTTER STREET INTERSECTION	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P-11

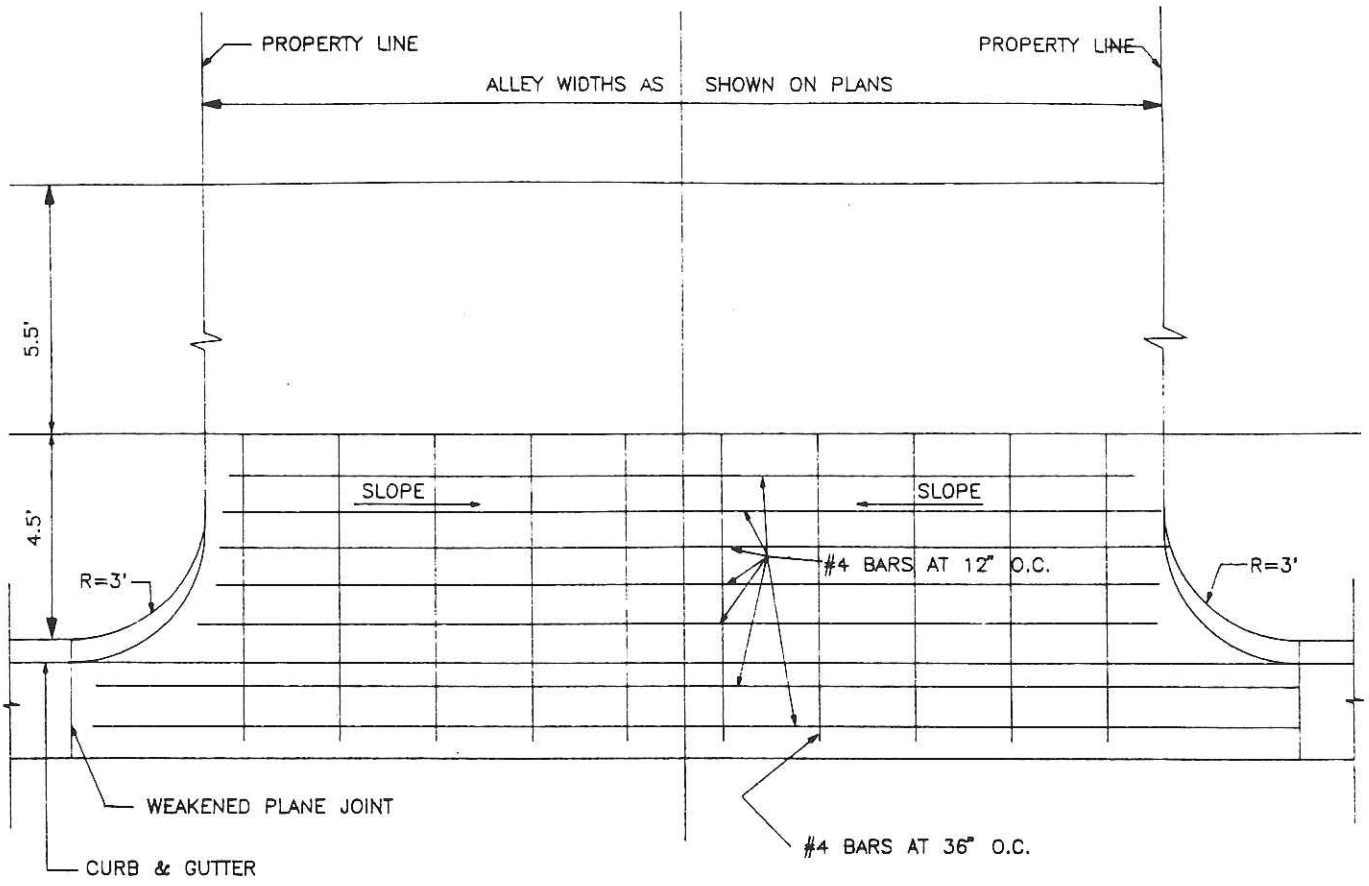


PLAN

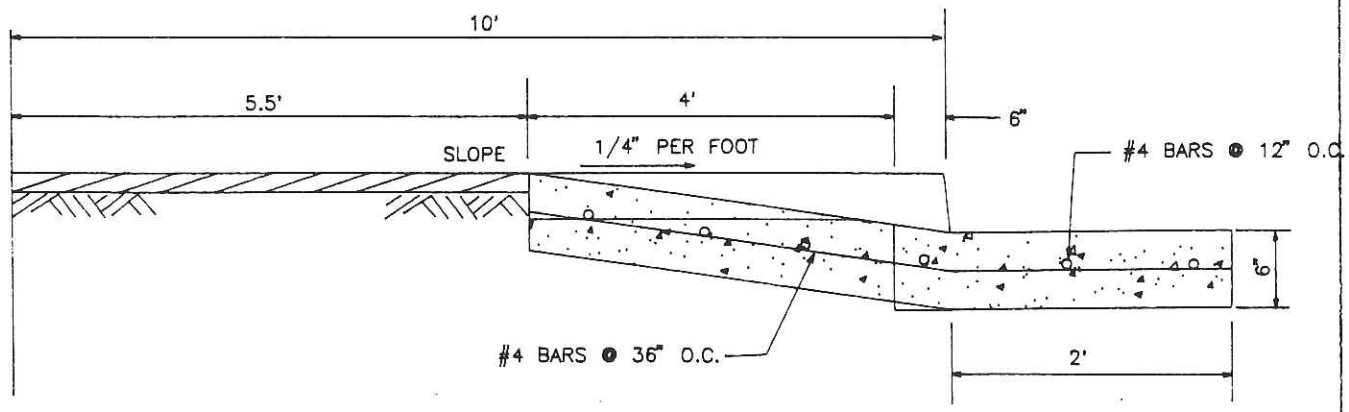


SECTION

COMMERCIAL ALLEY APPROACH	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P-12



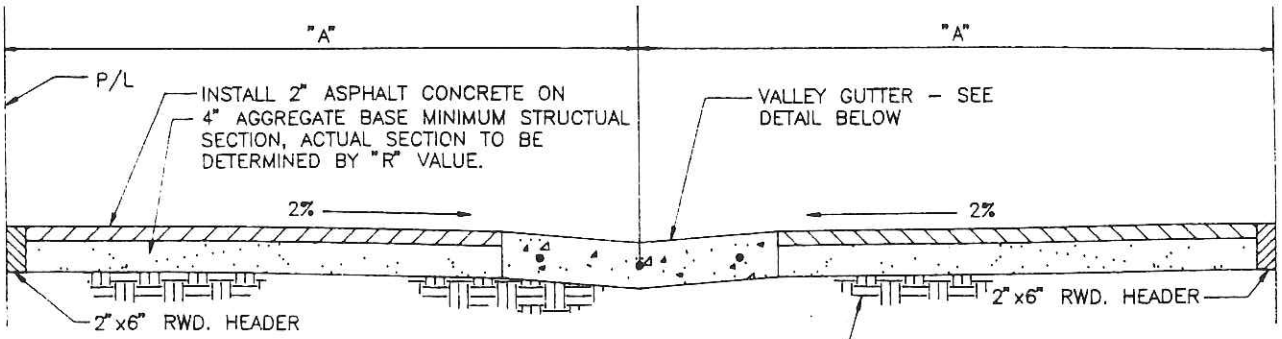
PLAN



SECTION

RESIDENTIAL ALLEY APPROACH

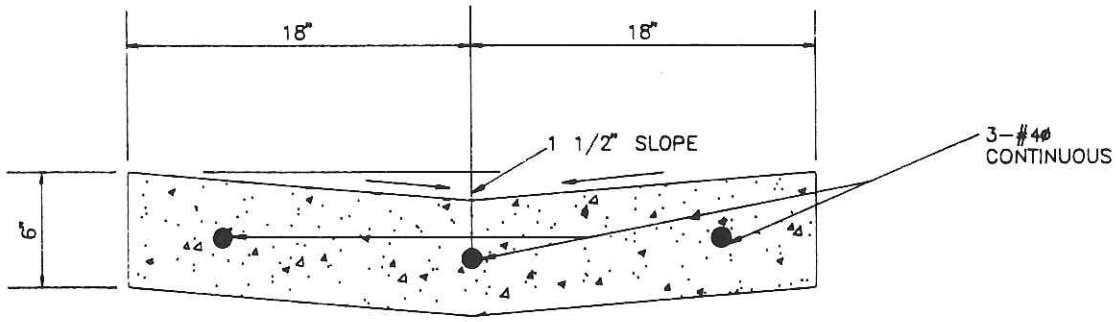
REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER DATE	P-13



ELEVATION

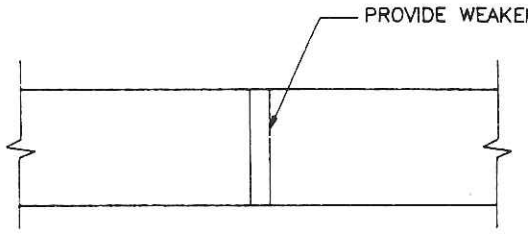
6" SCARIFIED NATIVE SOIL COMPACTED TO 95% RELATIVE COMPACTION.

'A'	LAND USE
10'	RESIDENTAL
13'	MULTIPLE UNITS
15'	COMMERCIAL



CLASS "B" CONCRETE

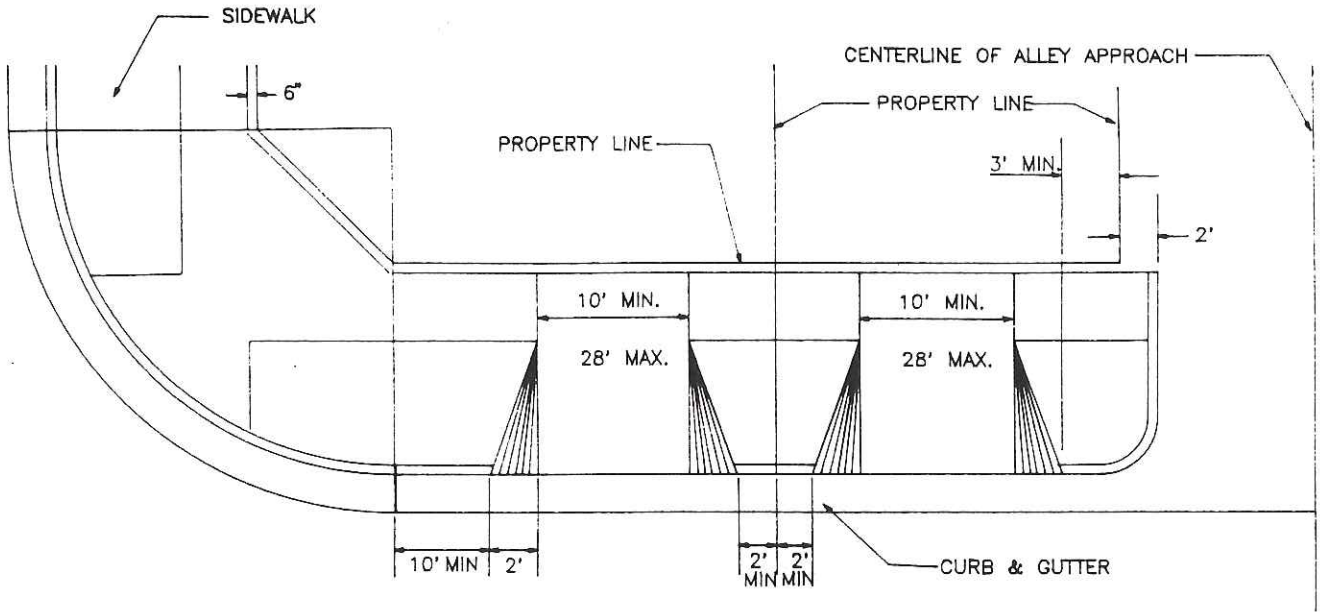
DETAIL



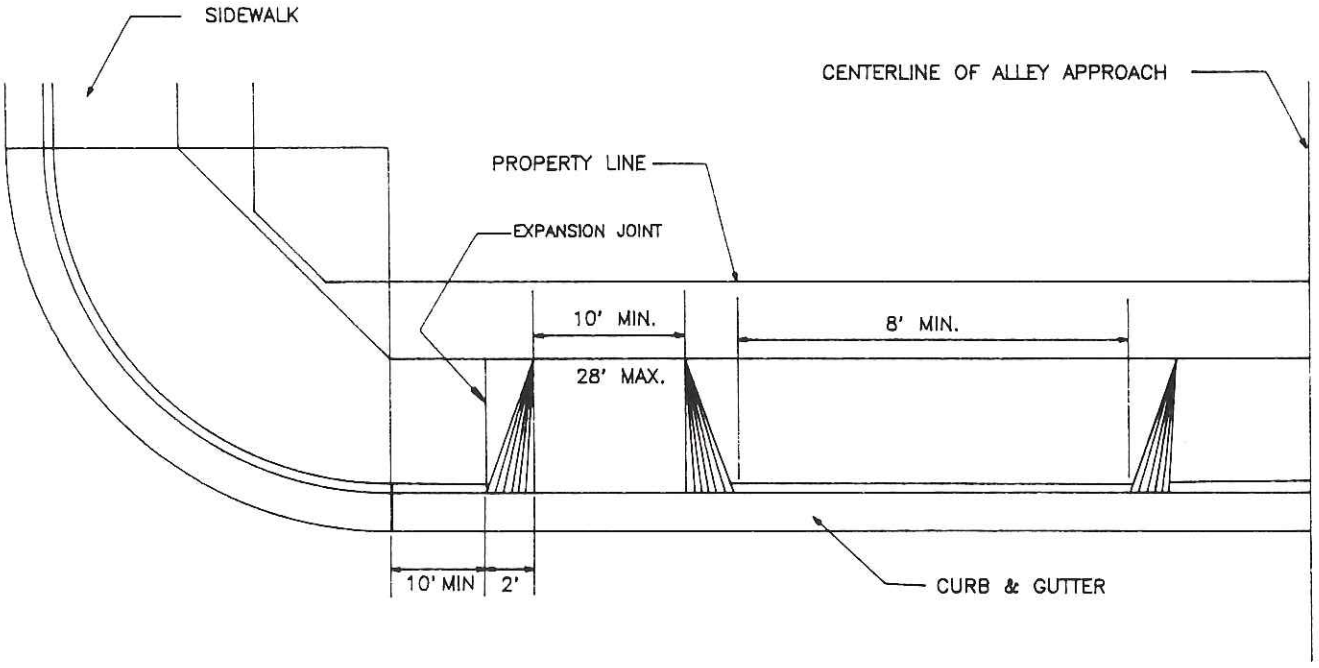
JOINT

ALLEY GUTTER DETAIL

REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER DATE	P-14

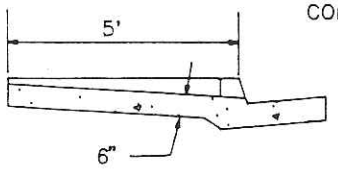


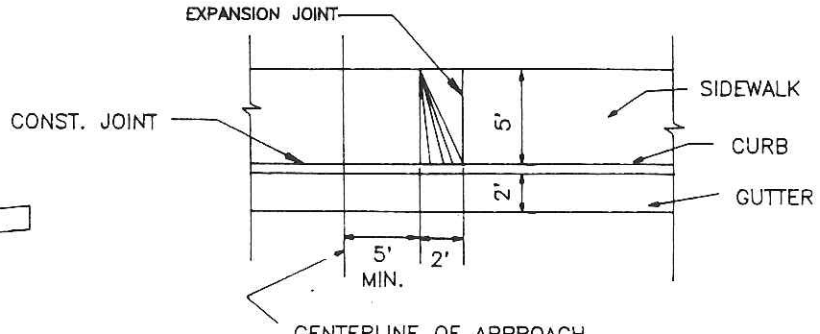
STANDARD CURB, GUTTER & NON-ADJACENT SIDEWALK



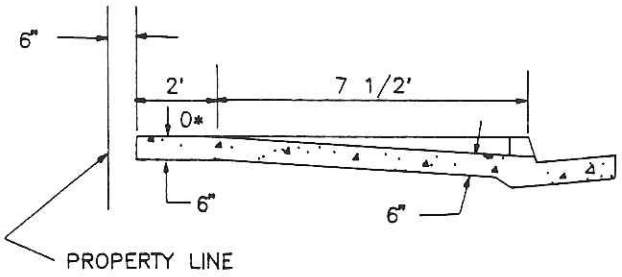
STANDARD CURB, GUTTER WITH ADJACENT SIDEWALK

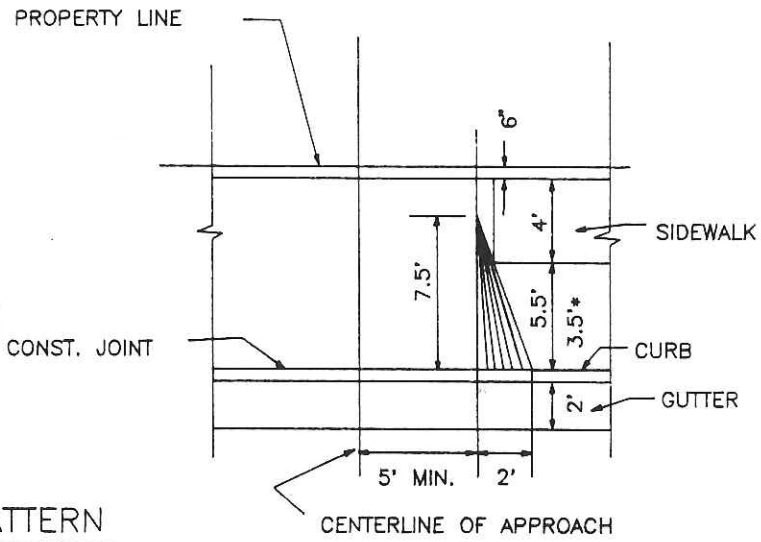
STANDARD RESIDENTIAL DRIVE APPROACH	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P-15





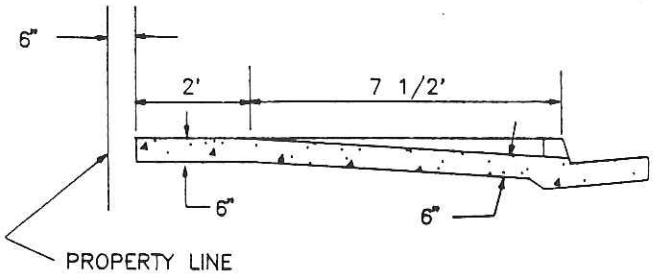
5' COMBINATION

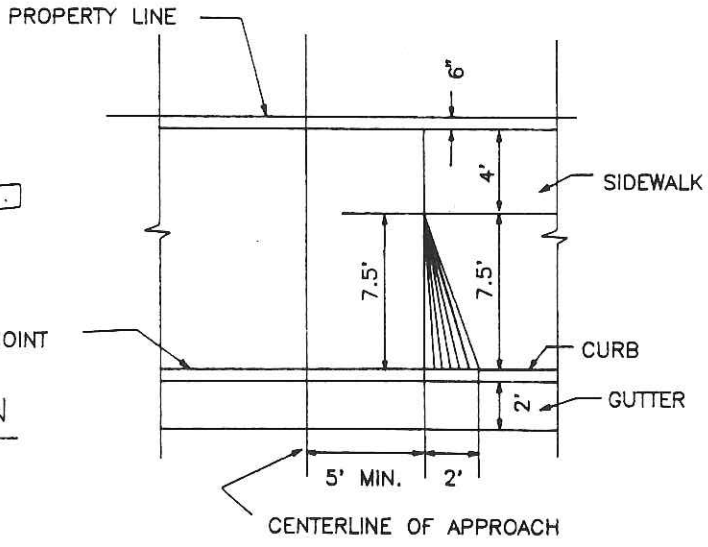




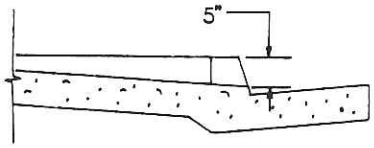
10' PATTERN

* 8' PATTERN



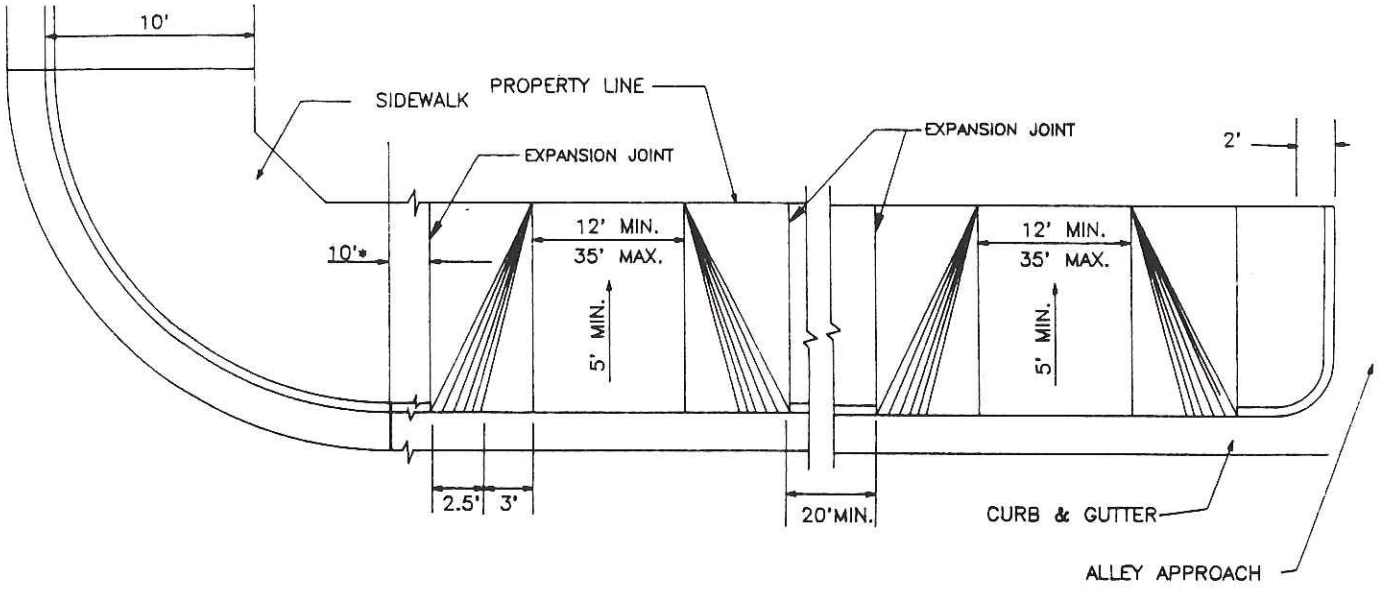


12' PATTERN



CONST.. JOINT

RESIDENTIAL DRIVEWAY APPROACHES FOR 8'–10'–12' PATTERN & 5' COMBINATION	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P–16



STANDARD COMMERCIAL CURB, GUTTER AND SIDEWALK

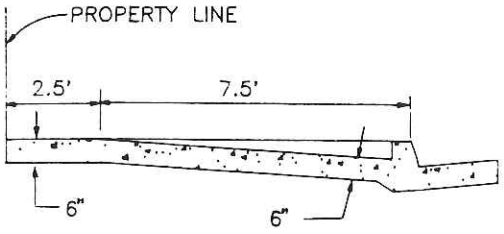
NOTE:

SEE DRIVE APPROACH STANDARDS

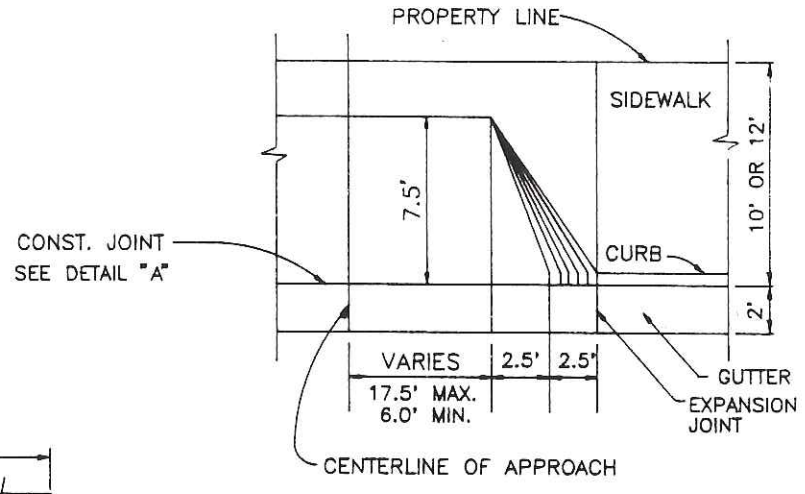
NOT MORE THAN 60% OF THE CURB FACE MAY BE USED FOR DRIVEWAY OPENING.

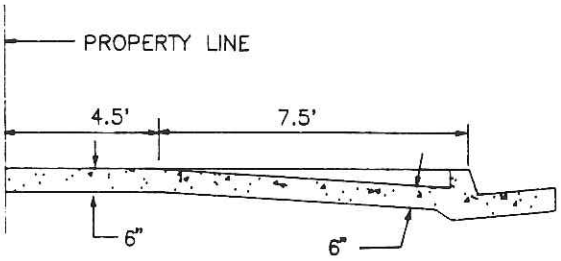
* MINIMUM SPACING BETWEEN CURB RETURN AND EDGE OF DRIVE APPROACH–10'

STANDARD COMMERCIAL DRIVE APPROACH	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P–17

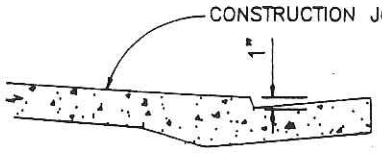


10' PATTERN





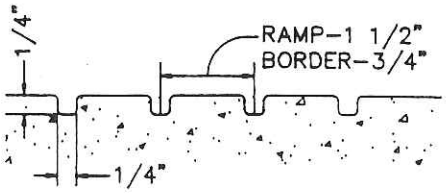
12' PATTERN



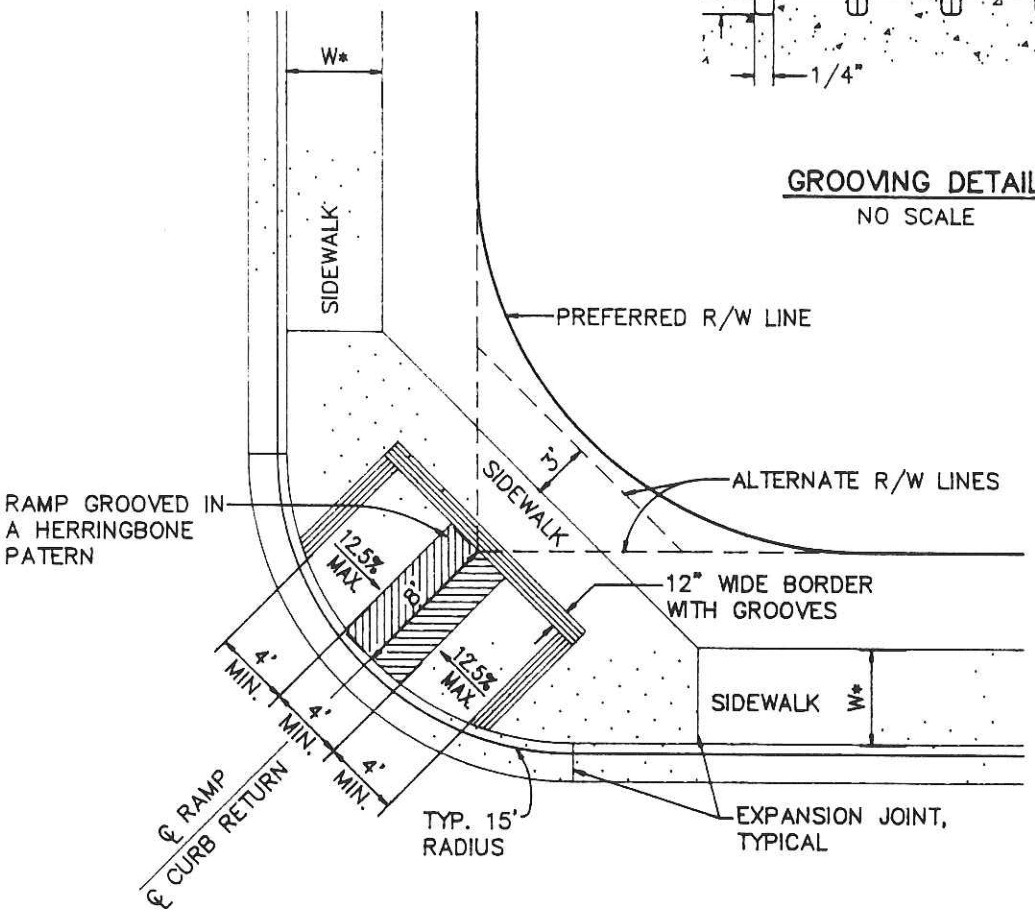
DETAIL A

CLASS "B" CONCRETE

COMMERCIAL DRIVEWAY APPROACHES FOR 10'–12' CURB PATTERN	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P–18



GROOVING DETAIL
NO SCALE



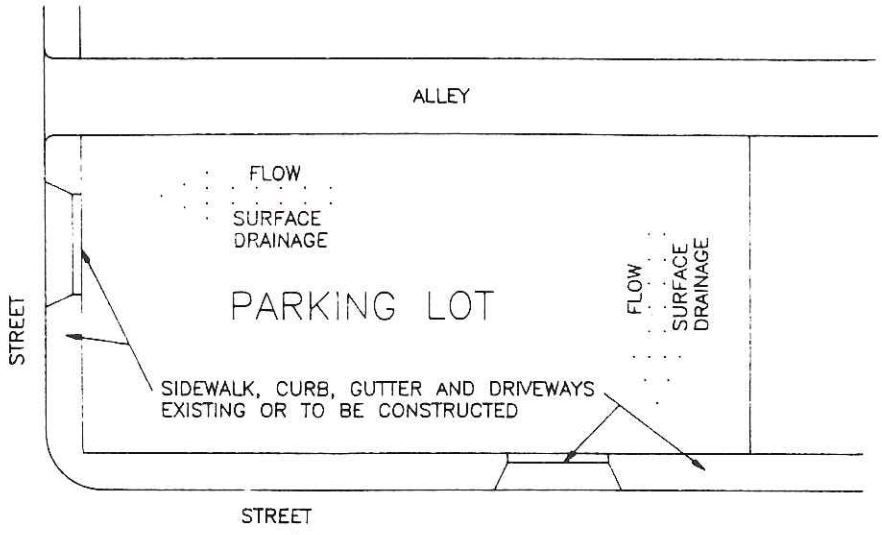
RADIUS DETAIL
NO SCALE

* = APPROVED SIDEWALK LANDING WIDTH – 54" MIN.

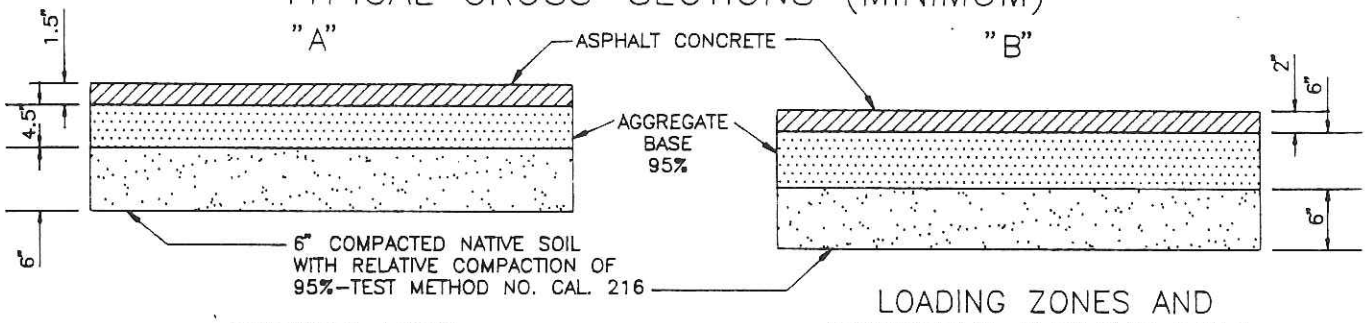
NOTES:

1. RAMPS SHALL HAVE NO ABRUPT CHANGES IN ELEVATION OR ANGLE OF SLOPE.
2. THE BOTTOM OF THE RAMP SHALL HAVE A LIP OF 1/2" WITH 45° BEVEL.
3. SIDEWALK AND RAMP THICKNESS SHALL BE 4". COMPACT SUBGRADE TO 90% (MIN.).
4. RAMP SLOPE SHALL BE 1:12 (8.33%) MAX.
5. RAMP SIDE SLOPE SHALL BE 1:8 (12.5%) MAX. WITH A TRAVERSE HEAVY BROOM FINISH.
6. THERE SHALL BE NO SIDEWALK OBSTRUCTIONS. ALL POWER POLES, STREET LIGHTS, FIRE HYDRANTS AND MAIL BOXES SHALL BE SET BACK BEHIND THE SIDEWALK UNLESS APPROVED BY THE CITY ENGINEER.
7. IF A LNDING ISN'T PROVIDED, THE FANNED OR FLARED SIDE SLOPE SHOULD BE 1:12 (8.33%) MAX.
8. FORMS TO REMAIN FOR A MIN. OF 24 HOURS.
9. THERE SHALL BE 0.20' MIN. SLOPE AROUND A 15' RADIUS.

WHEELCHAIR RAMP	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P-19

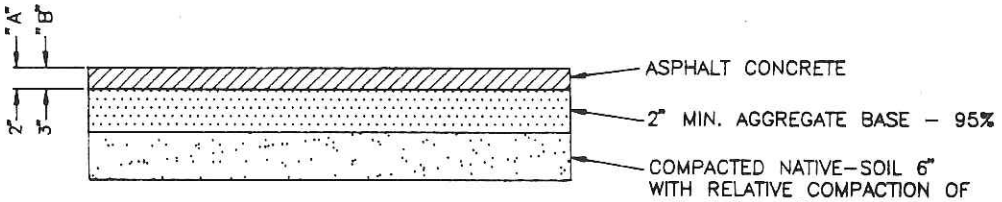


TYPICAL CROSS-SECTIONS (MINIMUM)

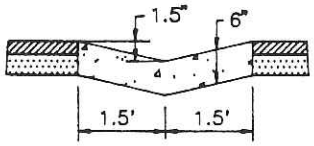


PARKING LOTS

LOADING ZONES AND
INDUSTRIAL PARKING LOTS



OPTIONAL-WITH APPROVED TEST

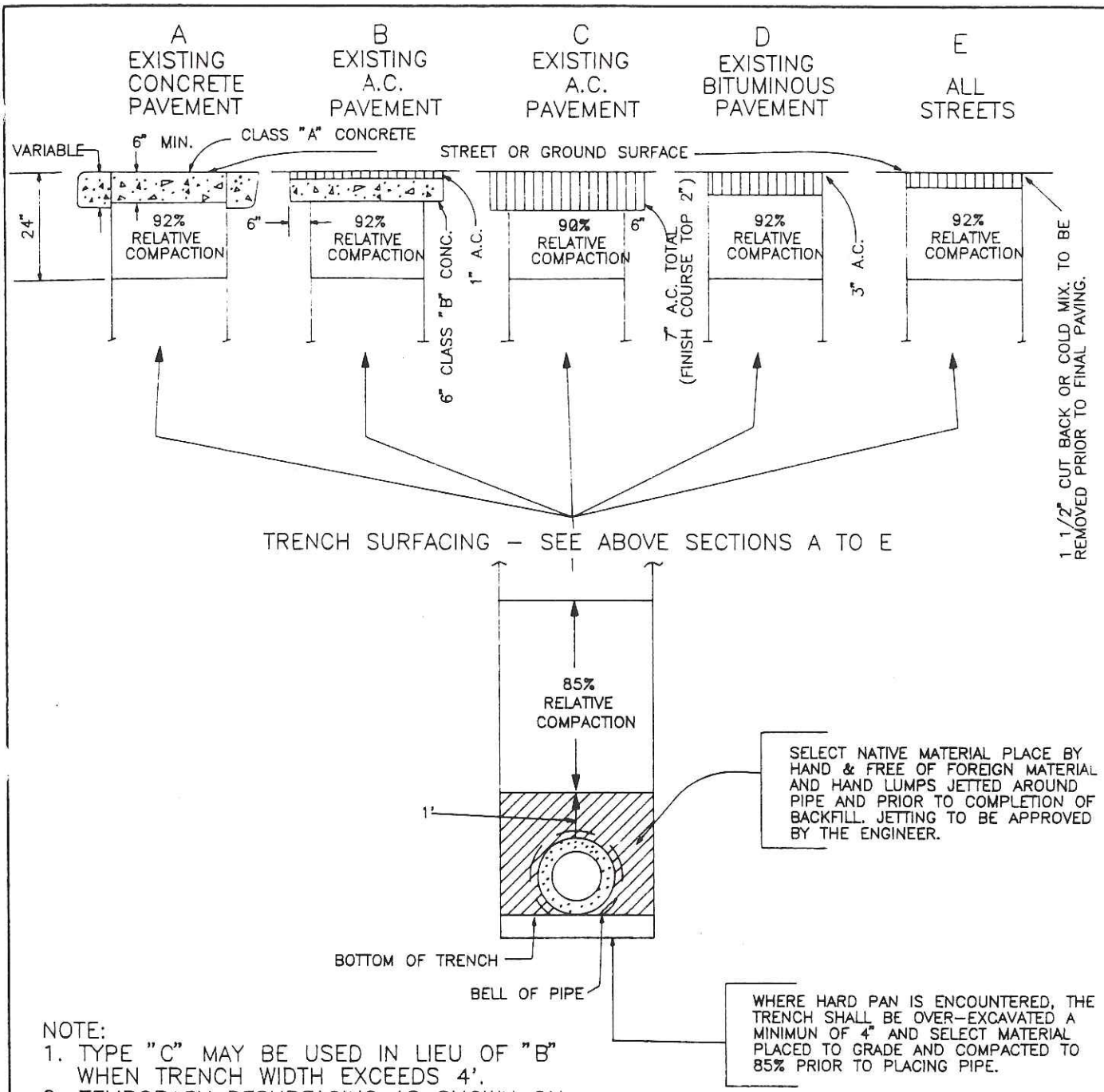


PARKING LOT V GUTTER

NOTE:
1. SURFACE DRAINAGE SHALL BE TO STREET OR INTO STORM DRAIN SYSTEM.
2. PARKING BUMPERS TO BE PLACED SO THAT PARKED CARS WILL NOT ENCROACH ON SIDEWALKS OR PARKWAYS.
3. THE OPTIONAL CROSS-SECTION MAY BE USED UPON SUBMISSION OF "R" VALUE TESTS TAKEN BY AN APPROVED LABORATORY SUBSTANTIATING THE USE OF EXISTING SOIL FOR THE BASE. A MINIMUM VALUE OF 65 WILL BE REQUIRED.
4. WHERE ASPHALT CONCRETE IS APPLIED TO THE NATIVE SOIL, WEED KILLER WILL BE REQUIRED BEFORE THE SURFACE MATERIAL IS PLACED. WEED KILLER TO BE APPLIED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.
5. SURFACE DRAINAGE TO ALLEY ONLY BY WRITTEN APPROVAL OF THE CITY ENGINEER.
6. TEMPORARY PARKING LOTS (USE NOT TO EXCEED 60 DAYS) SHALL BE GRADED AND ROLLED SMOOTH. THE TOP 6" OF NATIVE SOIL SHALL BE COMPACTED TO 85% RELATIVE COMPACTION USING TEST METHOD NO. CAL. 216. A DUST PALLIATIVE PER STATE STANDARD SPECIFICATIONS AT THE RATE OF 1 GAL./SQ.YD. TO OBTAIN A MIN. PENETRATION OF 1" THE MIXING RATIO SHALL BE 4:1 PER STATE STANDARD SPECIFICATIONS. THE DEVELOPER SHALL POST A BOND TO GUARANTEE REMOVAL OF ALL IMPROVEMENTS FOR A TEMPORARY PARKING LOT.

PARKING LOT DETAILS

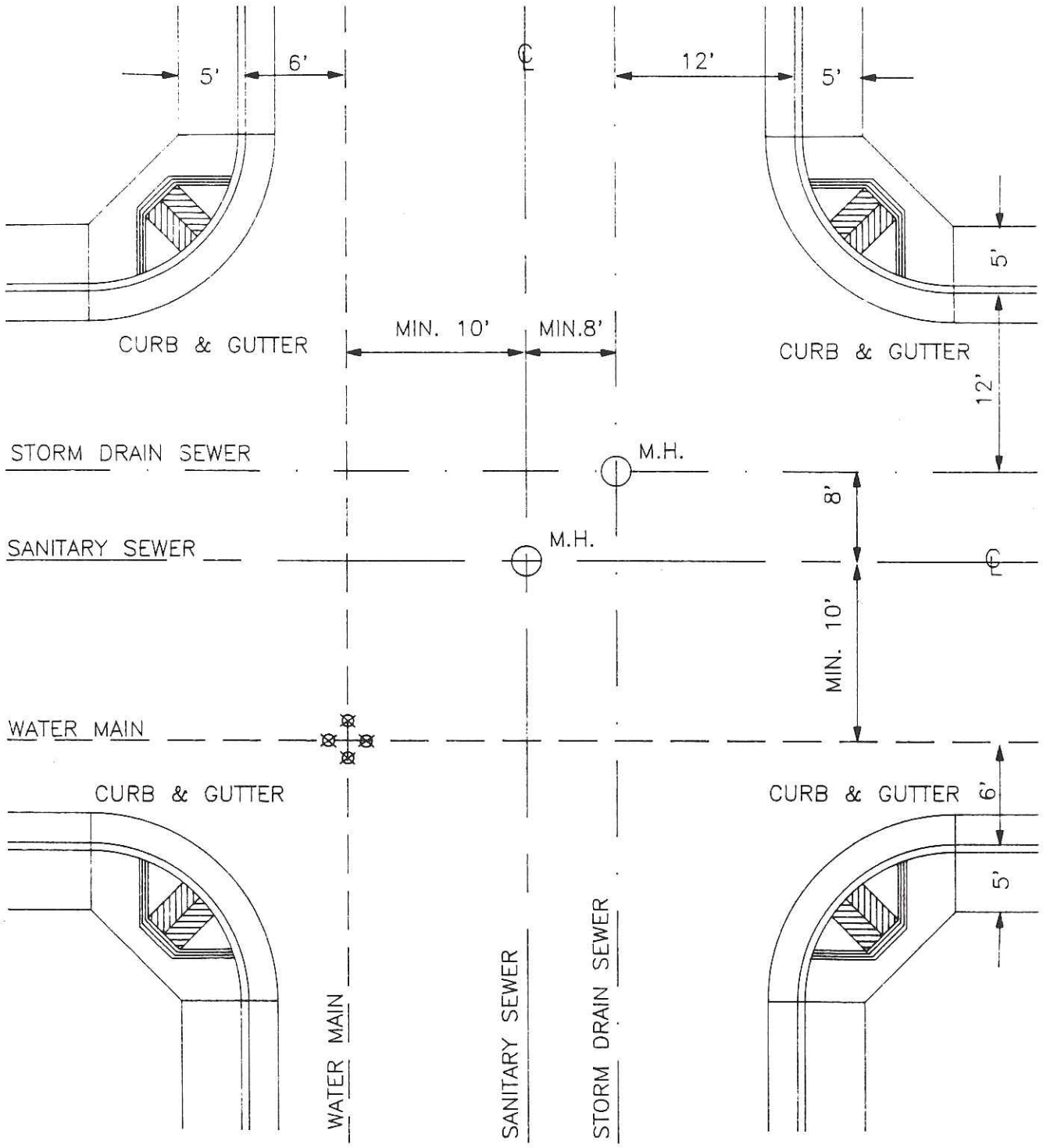
REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER _____ DATE _____	P-20



TRENCH SURFACING – SEE ABOVE SECTIONS A TO E

NOTE:
1. TYPE "C" MAY BE USED IN LIEU OF "B" WHEN TRENCH WIDTH EXCEEDS 4'.
2. TEMPORARY RESURFACING AS SHOWN ON SECTION "E", SHALL BE REQUIRED IN ALL STREET INTERSECTIONS, OR AS DIRECTED BY THE ENGINEER.
3. TEST 216 FOR ALL RELATIVE COMPACTION DETERMINATIONS, STATE OF CALIFORNIA.
4. A.C.= ASPHALT CONCRETE.
5. THE PAVEMENT SECTIONS SHOWN ABOVE ARE MINIMUM, AND IF THE EXISTING STRUCTURAL SECTION IS GREATER, IT SHALL BE MATCHED UNLESS OTHERWISE APPROVED BY THE ENGINEER.

TRENCH BACKFILL & SURFACE REPLACEMENT	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P-21



NOTE:
THIS "STANDARD" IS A GUIDE ONLY AND DEVIATIONS WILL BE ACCEPTABLE WHERE CONDITIONS DICTATE.
DIMENSIONS SHOWN ARE DESIRABLE BUT DO NOT GOVERN.
THE INTENTION IS TO SHOW THE RELATIVE POSITION OF ALL UTILITIES.
ANY CHANGES OR DEVIATION MUST BE APPROVED BY THE CITY ENGINEER.

LOCATIONS FOR UNDERGROUND CONDUITS & PIPES IN RESIDENTIAL AREA CITY STREETS	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. P-22

CASE 1 & 2 : NEW SEWER BEING INSTALLED

ZONE	SPECIAL CONSTRUCTION REQUIRED FOR SEWER
A.	Sewer lines will not be permitted in this zone without special permission from the Department of Public Works.
B.	Extra–strength vitrified clay pipe with compression joints; or concrete pipe with reinforced concrete collars around the joints, which joints shall have a minimum thickness of six inches on either side of the joint; or rubber gasket reinforced concrete pipe; or rubber gasketed asbestos–cement pipe; or rubber gasketed plastic pipe; or cast iron pipe with compression joints.
C. or D.	Class 150 or heavier cast–iron pipe with hot dip bituminous coated and approved mechanical joints; or any sewer pipe within a continuous steel casing, which casing shall have a thickness of not less than one–fourth inch and with all voids between sewer pipe and casing pressure grouted with sand–cement grout.

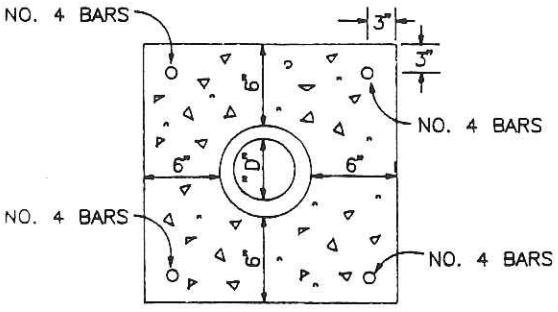
CASE 3: NEW WATER MAIN BEING INSTALL– EXISTING SEWER

If an existing sewer is located within Zone A, B, C, or D of a proposed water main, the following special requirments apply.

ZONE	
A.	No water mains shall be constructed without special permission from the Department of Public Works.
B.	If the sewer does not meet the Zone B. requirements given above the water main shall be of Class 200 pipe or equivalent.
C.	No water mains shall be constructed without special permission from the Department of Public Works. If permission is granted, the sewer shall be encased with reinforced concrete and the water main shall be of Class 200 pipe or equivalent.
D.	The sewer shall be encased with reinforced concrete.

DEFINITIONS

1. Comression joints are rubber ring or gasket joints
2. Mechanical joints are bolted joints.
3. Acceptable reinforced concrete encasement is as to the right:



Concrete shall be Class B (California Department of Transportation **Standard Specifications, Section 90, current issue) or equivalent.**

WATER LINE AND SEWER LINE SEPARATION 1 OF 2	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. S–1

WATER LINE AND SEWER LINE SEPARATION

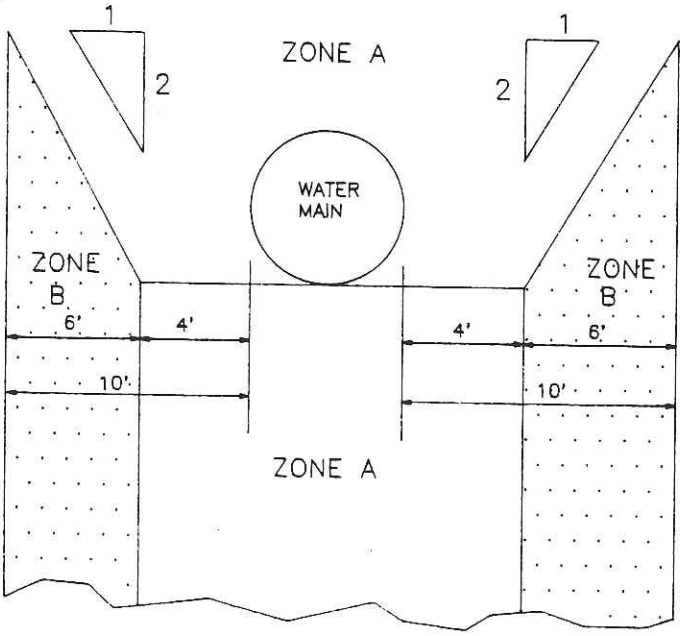
A. New Construction – When neither water mains nor sewer mains are existing, the following shall apply wherever possible.
   1. Parallel Mains – The horizontal separation between pressure water mains and sanitary sewers shall be at least 10 feet.
   2. Crossing Mains – Pressure water mains shall be at least three feet above sanitary sewer where these lines must cross.

B. Alternative Conditions – When either water mains or sewer mains are existing, or the conditions required in A above cannot be met, the following shall apply.
   1. New water main and existing sewer main. – Case 3.
   2. Existing water main – new sewer main. – Case 1 and 2.

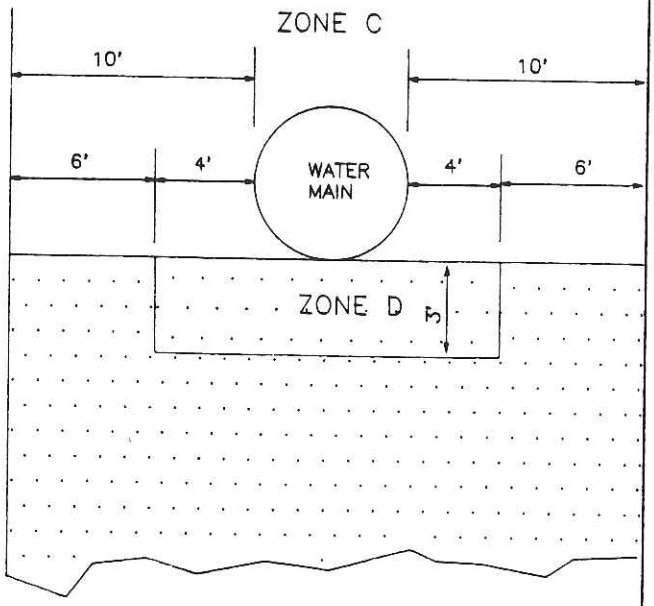
SPECIAL CONSTRUCTION REQUIREMENTS

WHERE REQUIRED SEPARATION CANNOT BE MAINTAINED

PARALLEL CONSTRUCTION

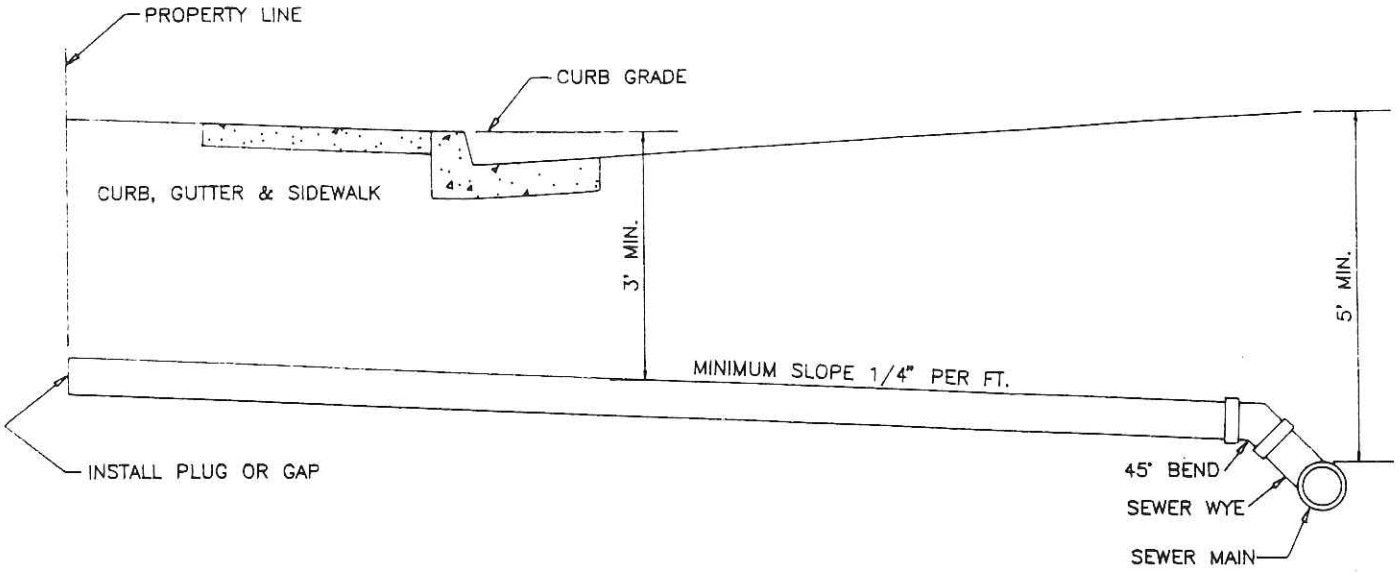


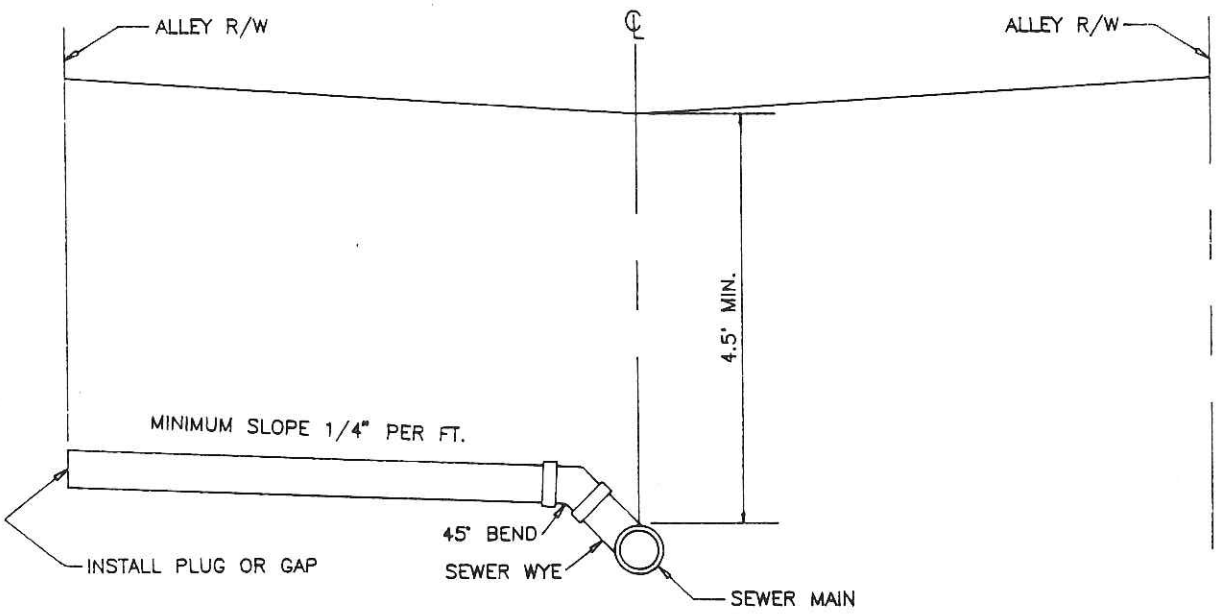
PERPENDICULAR CONSTRUCTION



NOTES: DIMENSIONS ARE FROM OUTSIDE OF WATER MAIN TO OUTSIDE OF SEWER. EXPLANATION OF COMPRESSION AND MECHANICAL JOINTS AND REQUIRED CONCRETE ENCASEMENT ON PAGE S–1 (1 of 2)

WATER LINE AND SEWER LINE SEPARATION 2 OF 2	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. S–1



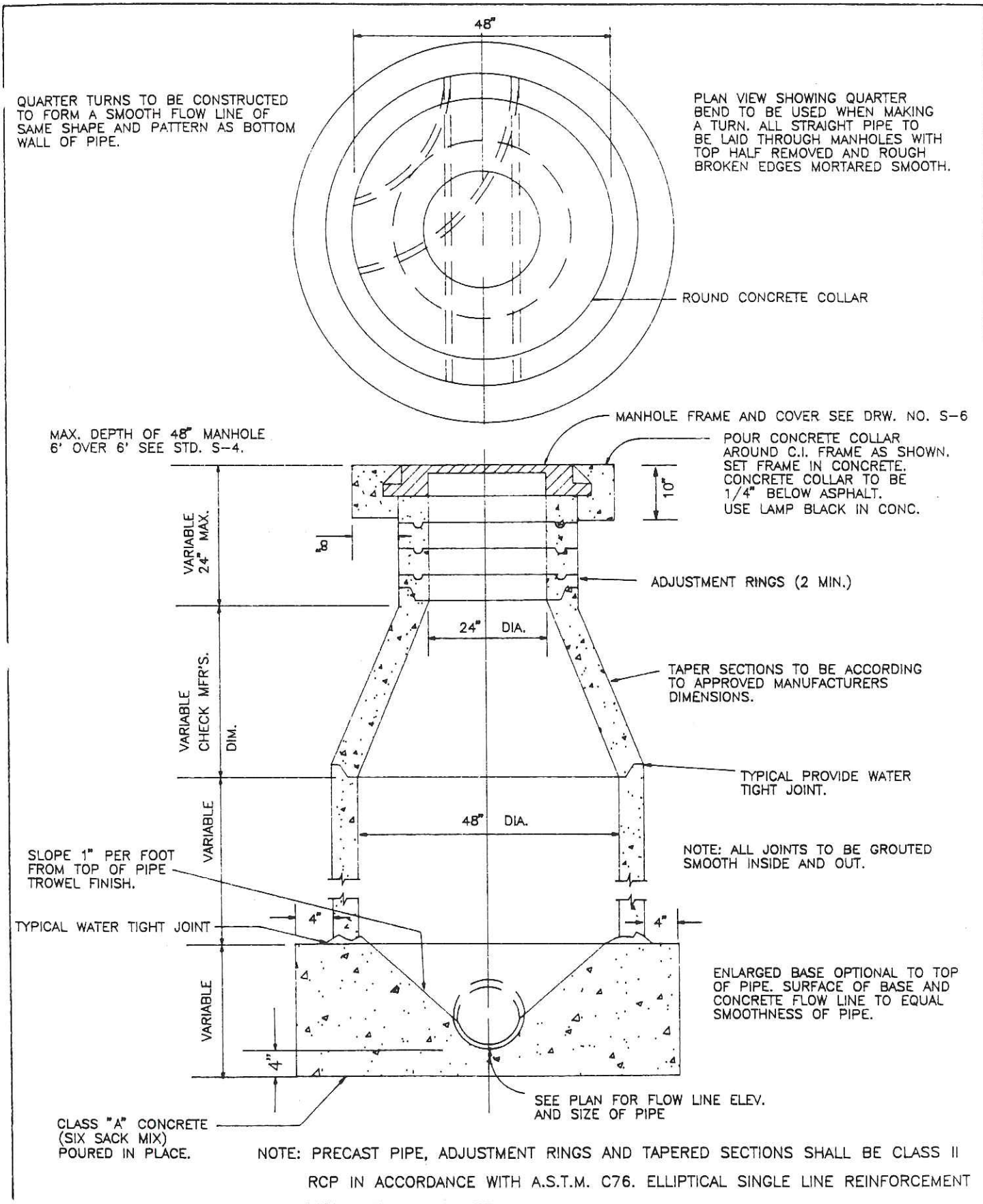


APPROVED TYPE OF PIPE SHALL MEET OR EXCEED THE FOLLOWING REQUIRMENTS:

1. P.V.C.– A.S.T.M. D3034–74 PSIG SDR–35(EXTRA STRENGTH)
2. V.C.P.– A.S.T.M. C–278, A.S.T.M. C–425

HOUSE BRANCH & UTILITIES LOCATIONS IN STREETS

REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER _____ DATE _____	S–2



NOTE: PRECAST PIPE, ADJUSTMENT RINGS AND TAPERED SECTIONS SHALL BE CLASS II RCP IN ACCORDANCE WITH A.S.T.M. C76. ELLIPTICAL SINGLE LINE REINFORCEMENT WILL NOT BE PERMITTED.

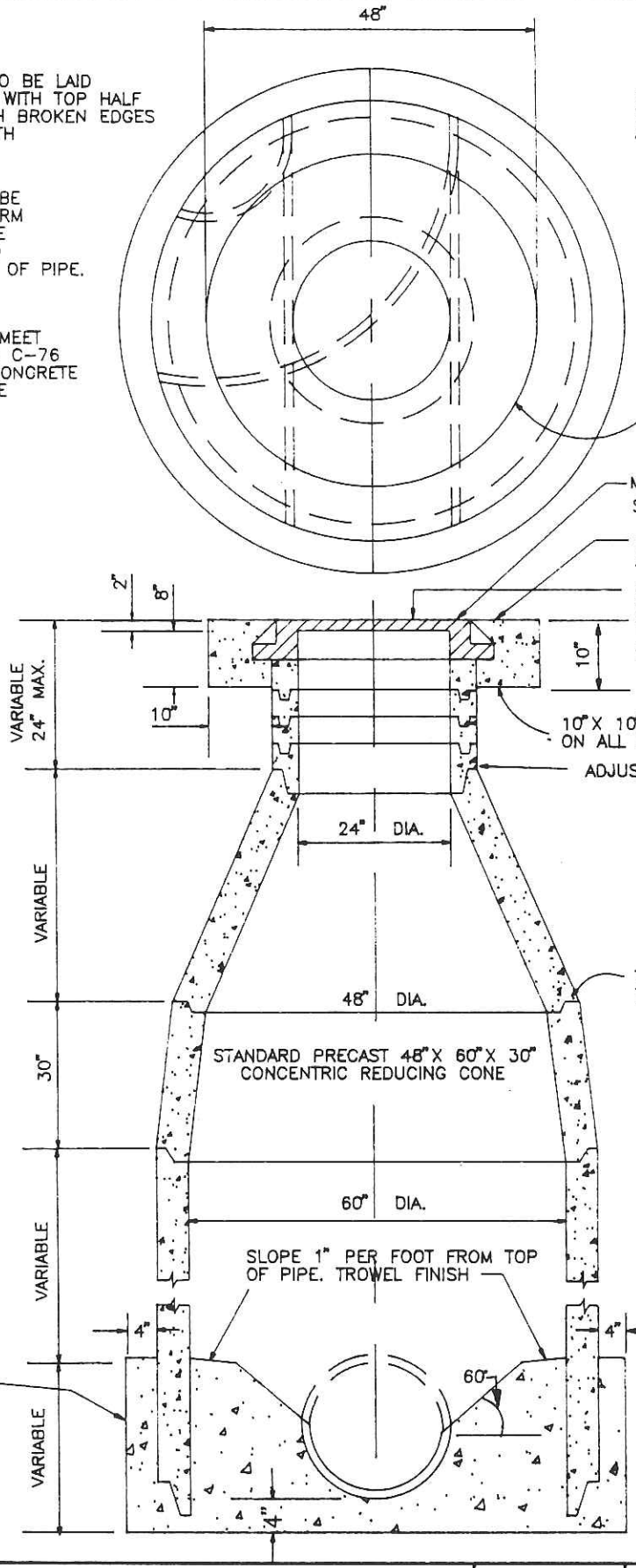
48" SEWER MANHOLE WITH PRECAST SECTIONS & CAST IRON FRAME & COVER

REVISIONS	CITY OF AVENAL	STD. NO. S-3
	CITY ENGINEER _____ DATE _____	

ALL STRAIGHT PIPE TO BE LAID THROUGH MANHOLES WITH TOP HALF REMOVED AND ROUGH BROKEN EDGES MORTARED UP SMOOTH

QUARTER TURNS TO BE CONSTRUCTED TO FORM A SMOOTH FLOW LINE OF SAME SHAPE AND PATTERN AS BOTTOM OF PIPE.

NOTE: SECTIONS TO MEET ASTM SPECIFICATIONS C-76 CLASS II RCP FOR CONCRETE PIPE FOR RESPECTIVE DAIMETERS.



PLAN VIEW SHOWING QUARTER BEND TO BE USED WHEN MAKING A TURN.

NOTE: WHEN PIPE IS CUT ALL EXPOSED REINFORCING STEEL TO BE COATED WITH 2" OF CONCRETE.

ROUND CONCRETE COLLAR

MANHOLE FRAME AND COVER SEE DRAWING S-6

POUR CONCRETE COLLAR AROUND C.I. FRAME AS SHOWN.

SET FRAME IN CONCRETE BED CONCRETE COLLAR TO BE 1/4" BELOW ASPHALT. USE LAMP BLACK IN CONC.

10"X 10" CONCRETE COLLAR ON ALL MANHOLES

ADJUSTMENT RINGS (2 MIN.)

TYPICAL PROVIDE WATER TIGHT JOINT.

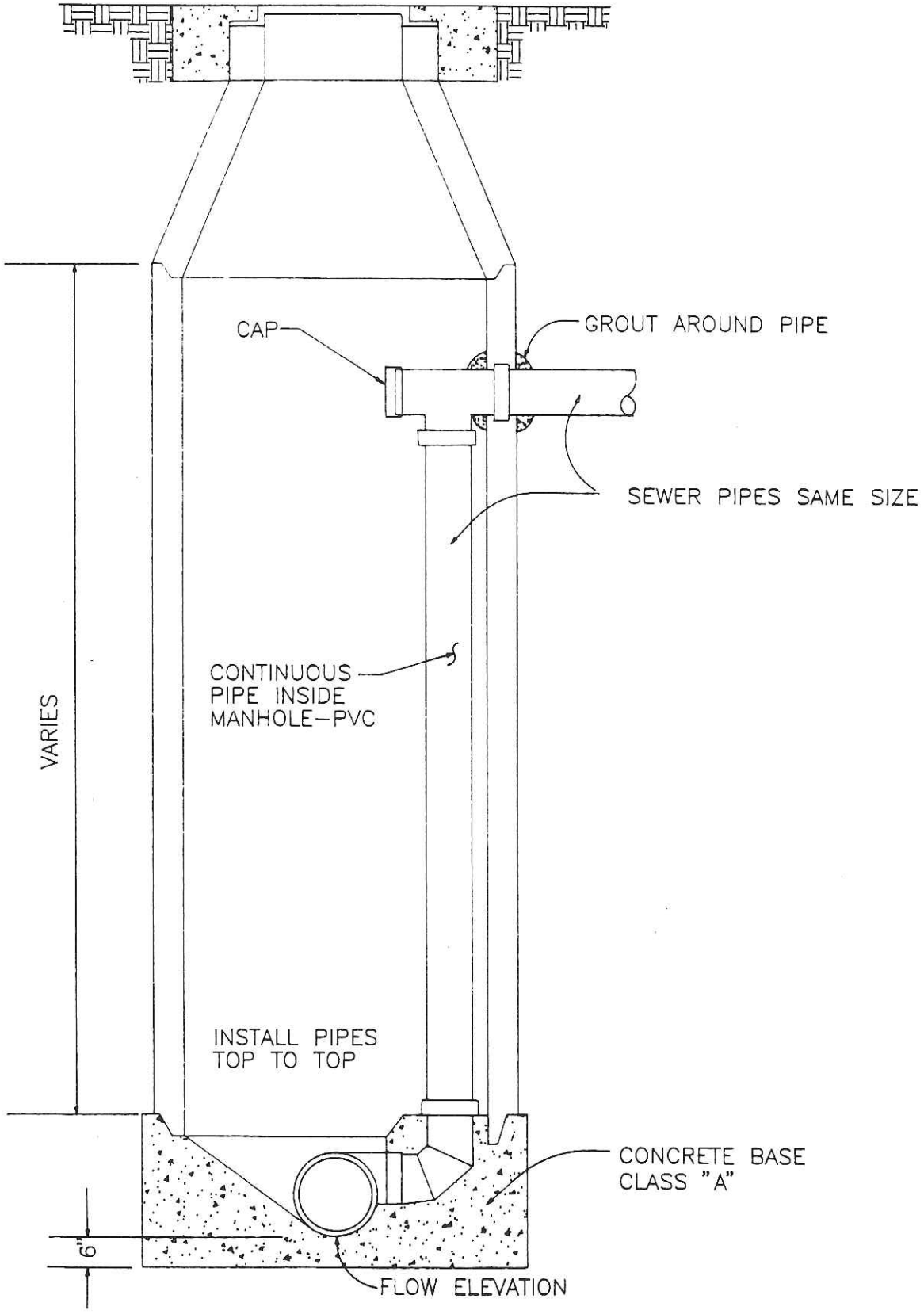
NOTE: ALL JOINTS TO BE GROUTED SMOOTH INSIDE AND OUT.

CLASS "A" CONCRETE (SIX SACK MIX) POURED IN PLACE.

ENLARGED BASE OPTIONAL TO TOP OF PIPE. SURFACE OF BASE AND CONCRETE FLOW LINE TO EQUAL SMOOTHNESS OF PIPE.

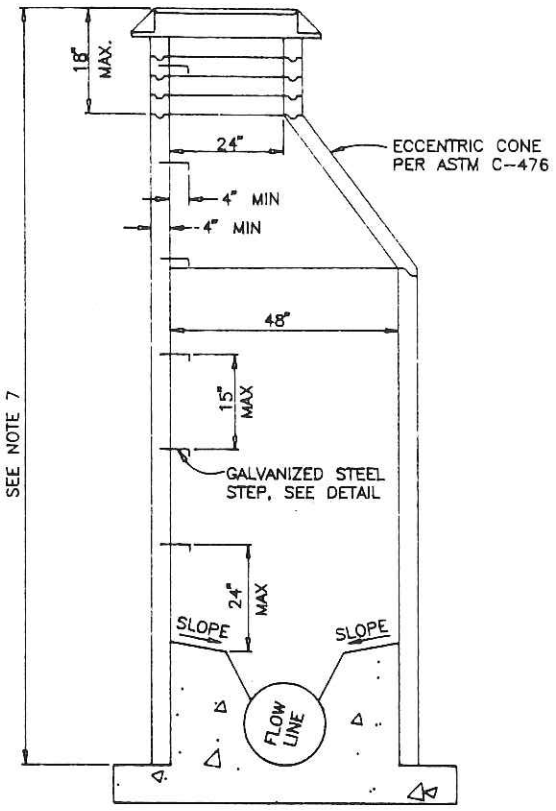
60" SEWER MANHOLE WITH PRECAST SECTIONS & CAST IRON FRAME & COVER

REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER _____ DATE _____	S-4



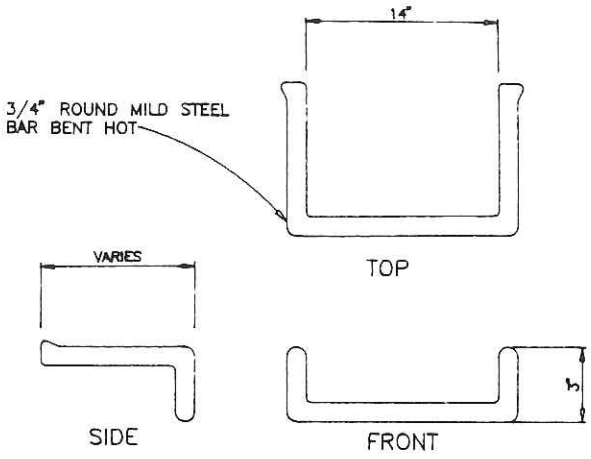
DROP MANHOLE

REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER _____ DATE _____	S–5



MANHOLE WITH STEPS

NO SCALE

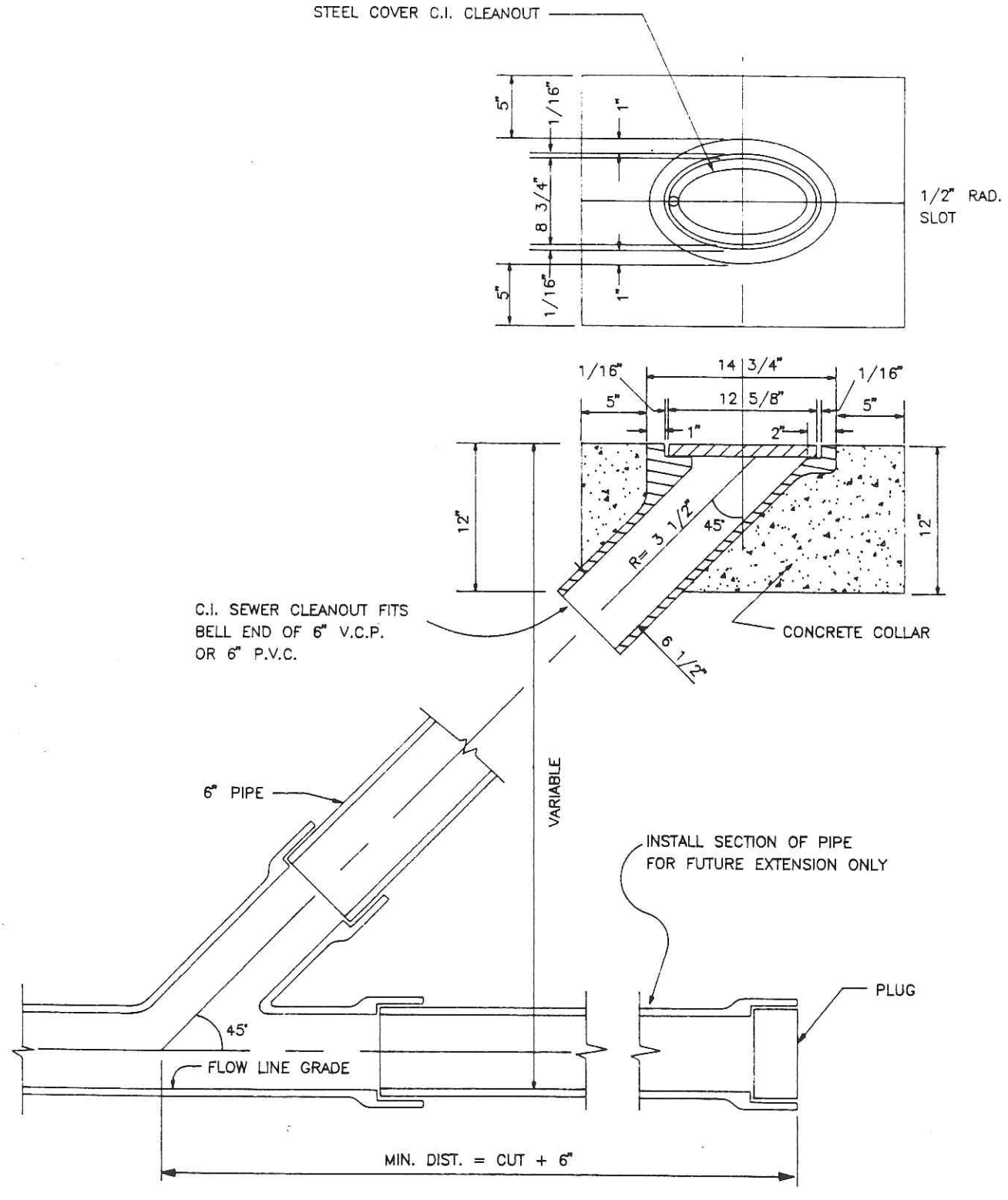


STEP DETAIL

NOTES:

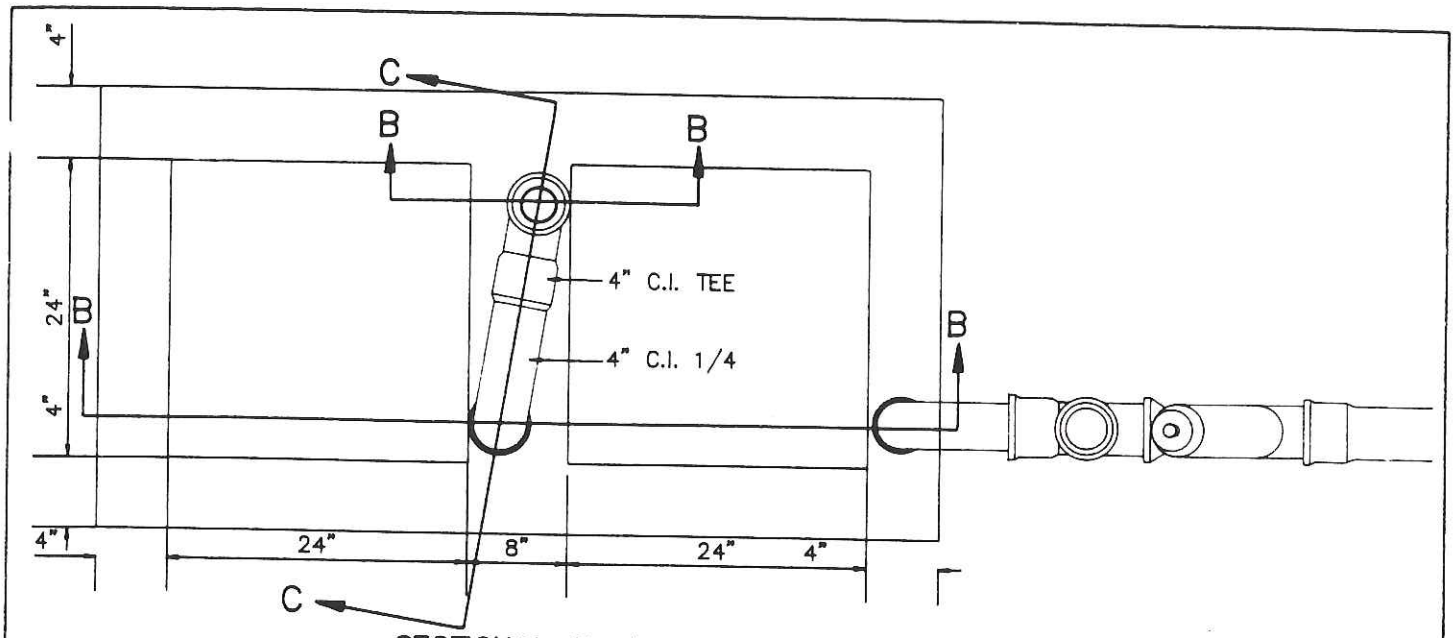
1. CONSTRUCTION OF MANHOLE SHALL BE IN ACCORDANCE WITH THE SEWER MANHOLE STANDARD S-3, EXCEPT AS MODIFIED HEREON..
2. AN ALTERNATE STEP MAY BE USED SUBJECT TO THE APPROVAL OF THE ENGINEER.
3. ALL STEPS WILL BE FIRMLY AND RIGIDLY SET WITH EPOXY GROUT OR EPOXY.
4. STEPS SHALL BE GALVANIZED AFTER BENDING.
5. COST OF STEPS SHALL BE INCLUDED IN PRICE OF THE MANHOLE.
6. IN MANHOLES WITH LATERAL LINE CONNECTIONS, THE STEPS SHALL BE PLACED IN THE WALL WITH NO LATERALS, OR THE WITH THE LEAST DIAMETER LATERAL, SUCH THAT A CONTINUOUS VERITICAL ALIGNMENT OF STEPS MAY BE ACHIVED.
7. MANHOLES WITH STEPS SHALL BE USED WHENEVER THE DISTANCE BETWEEN THE MANHOLE FLOW LINE AND THE TOP OF COVER IS EQUAL TO OR GREATER THAN 12 FEET.

MANHOLE WITH STEPS	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. S-7

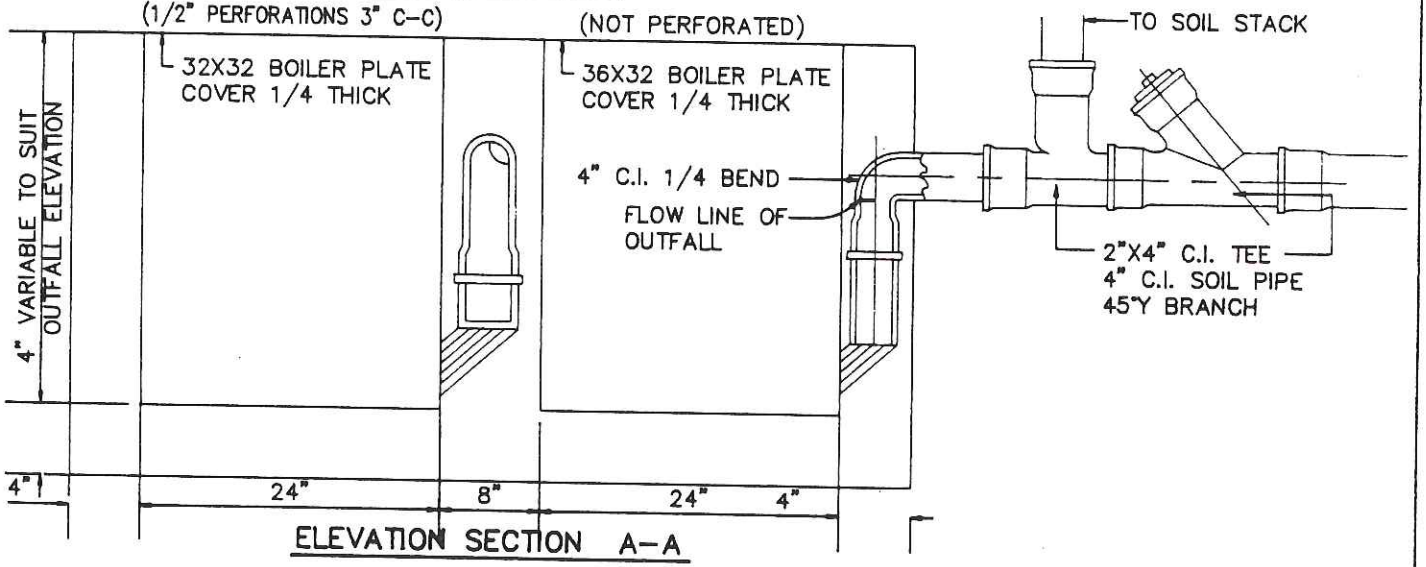


SLOPING LAMPHOLE WITH C.I. CLEANOUT & COVER

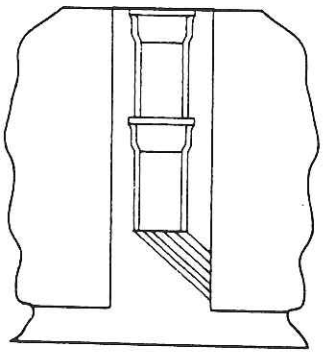
REVISIONS	CITY OF AVENAL	STD. NO.
	CITY ENGINEER _____ DATE _____	S-8



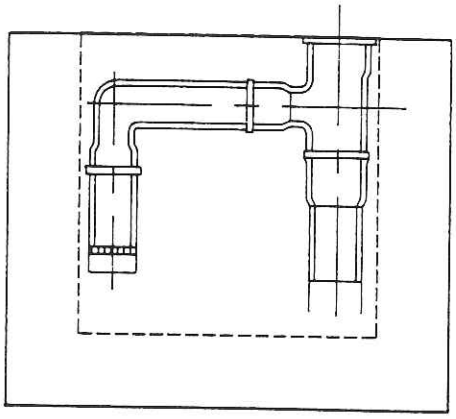
SECTIONAL PLAN



ELEVATION SECTION A-A



SECTION B-B

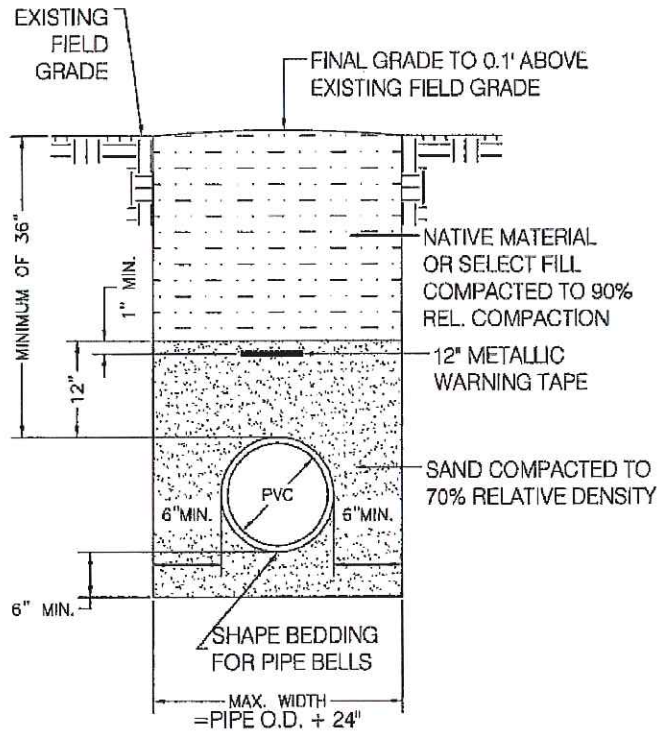


SECTION C-C

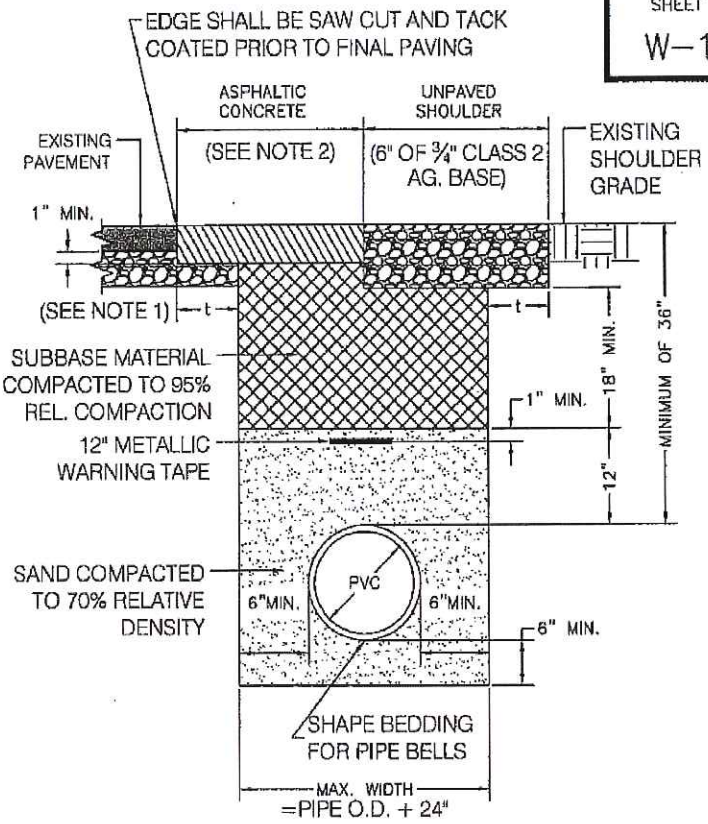
TO BE USED FOR:

1. INDUSTRIAL PLANTS
2. STEAM CLEANING PLANTS
3. SERVICE STATIONS CAR WASH RACKS

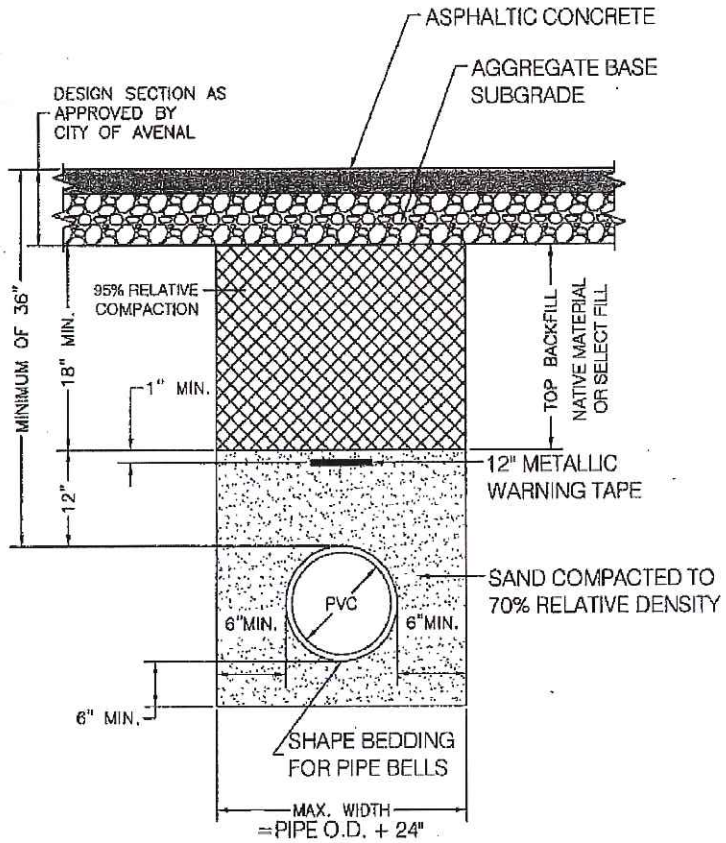
INDUSTRIAL GREASE TRAP	REVISIONS	CITY OF AVENAL CITY ENGINEER DATE	STD. NO. S-9



TRENCH IN OPEN AREAS



TRENCH IN EXISTING PAVED PORTIONS AND/OR UNPAVED SHOULDERS



TRENCH IN PROPOSED PAVED PORTIONS

NOTES:

1. t - EQUALS 6" MINIMUM FOR A TRENCH WIDTH LESS THAN OR EQUAL TO 24" OR 12" FOR A TRENCH WIDTH GREATER THAN 24".
2. THE TEMPORARY ASPHALTIC CONCRETE SHALL HAVE A MINIMUM THICKNESS OF 2 INCHES AND SHALL BE PLACED IMMEDIATELY AFTER BACKFILL AND MAINTAINED TO ¼" OF FINAL GRADE BY THE CONTRACTOR FOR THE 30 DAY PERIOD UNTIL PERMANENT SURFACING IS INSTALLED.
3. THE PERMANENT ASPHALTIC CONCRETE SHALL BE 1 INCH THICKER THAN THE EXISTING PAVEMENT, WITH A MINIMUM THICKNESS OF 4 INCHES.
4. THE ASPHALTIC CONCRETE SHALL MEET THE REQUIREMENTS OF CALTRANS STANDARD SPECIFICATIONS WITH METHOD OF PLACEMENT AS REQUIRED BY THE CITY OF AVENAL.
5. THE SUBBASE MATERIAL SHALL BE CLASS 2 AGGREGATE BASE PER SECTION 26 OF CALTRANS STANDARD SPECIFICATIONS.
6. RELATIVE COMPACTION IN ACCORDANCE WITH ASTM D-1557 FOR COHESIVE MATERIALS. RELATIVE DENSITY IN ACCORDANCE WITH ASTM D-4253 FOR NON-COHESIVE MATERIALS.
7. EXISTING ASPHALTIC CONCRETE SHALL BE REMOVED FROM THE JOB SITE.
8. COMPACTION SHALL BE TESTED BY AN OUTSIDE AGENCY AND THE RESULTS SUBMITTED TO THE CITY OF AVENAL FOR APPROVAL.
9. JETTING OF TRENCH BACKFILL IS NOT PERMITTED.
10. REFER TO THE STANDARD SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
11. DIMENSIONS SHOWN ARE REQUIRED UNLESS OTHERWISE APPROVED BY THE ENGINEER.

CITY OF AVENAL

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TRENCH DETAILS FOR POLYVINYL CHLORIDE PIPE (PVC)

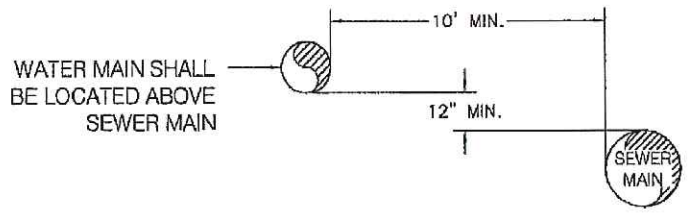
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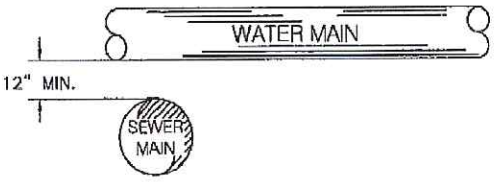
APRIL 2012

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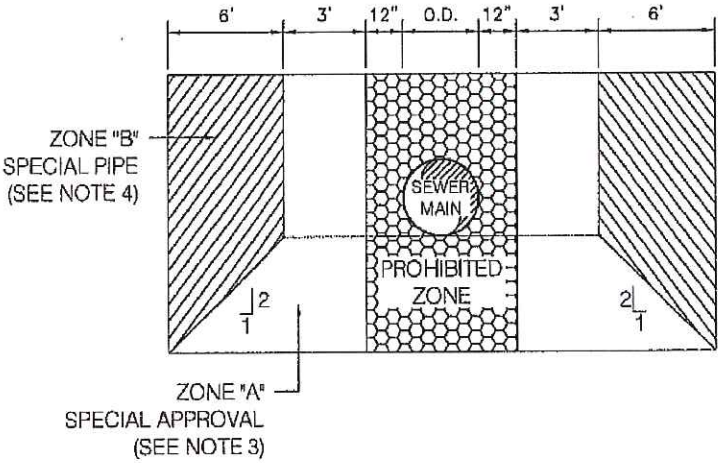


PARALLEL INSTALLATION

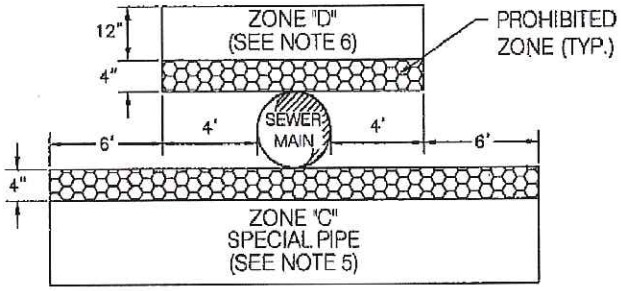


PERPENDICULAR CROSSING

BASIC SEPARATION REQUIREMENTS



PARALLEL INSTALLATION



PERPENDICULAR CROSSING

SPECIAL SEPARATION REQUIREMENTS

DIMENSIONS ARE FROM THE OUTSIDE OF THE SEWER MAIN TO THE OUTSIDE OF THE WATER MAIN

NOTES:

1. THE CONTRACTOR SHALL FOLLOW THE CALIFORNIA WATERWORKS STANDARDS CONTAINED IN SECTION 64630, TITLE 22 OF THE CALIFORNIA ADMINISTRATIVE CODE FOR THE SEPARATION REQUIREMENTS BETWEEN WATER MAINS AND SANITARY SEWER MAINS GUIDELINES PREPARED BY THE STATE OF CALIFORNIA DEPARTMENT OF PUBLIC HEALTH.
2. WHEN THE BASIC SEPARATION REQUIREMENTS CANNOT BE MET, THE CONTRACTOR SHALL INSTALL WATER MAINS ACCORDING TO THE SPECIAL SEPARATION REQUIREMENTS.
3. NO WATER MAINS PARALLEL TO SEWER MAINS SHALL BE INSTALLED WITHIN ZONE 'A' WITHOUT SPECIAL APPROVAL FROM THE DEPARTMENT OF PUBLIC HEALTH.
4. WHEN LOCATED IN ZONE "B", THE WATER MAIN SHALL BE CLASS 200 PVC, DR 14 PER AWWA C900 OR EQUIVALENT.
5. WHEN LOCATED IN ZONE "C", THE WATER MAIN SHALL HAVE NO JOINTS WITHIN ZONE "C" AND BE CLASS 200 PVC, DR 14 PER AWWA C900 OR EQUIVALENT.
6. WHEN LOCATED IN ZONE "D", THE WATER MAIN SHALL HAVE NO JOINTS WITHIN FOUR FEET (4') FROM EITHER SIDE OF THE SEWER MAIN AND BE CLASS 200 PVC, DR 14 PER AWWA C900 OR EQUIVALENT.
7. WATER MAINS AND SEWER MAINS SHALL NOT BE INSTALLED IN THE SAME TRENCH.

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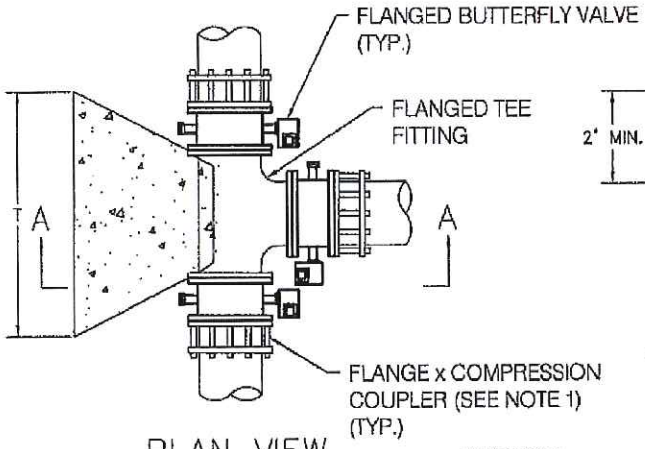
WATER MAIN & SEWER PIPELINE SEPARATION DETAIL

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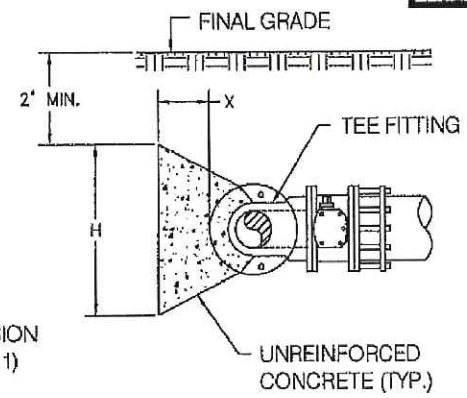
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PIPE SIZE	TEES		
	H	T	X
4"	1.5'	1.5'	1'
6"	1.5'	3'	1'
8"	2.5'	3.5'	1.5'
10"	3'	4'	1.5'
12"	3'	6'	1.5
14"	4'	5.5'	1.5'
16"	4.5'	5.5'	1.5'
18"	5'	5.5'	1.5'
20"	5'	6.5'	1.5'



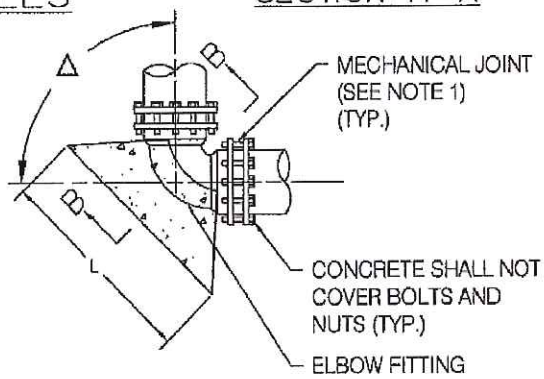
PLAN VIEW



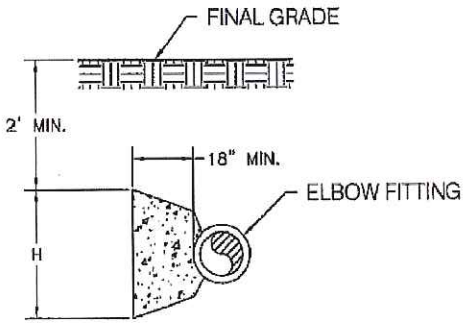
SECTION A-A

TEES

PIPE SIZE	HORIZONTAL BENDS MINIMUM DIMENSIONS BENDS (Δ)									
	3°-7°		>7°-22 ½°		>22 ½°-45°		>45°-60°		>60°-90°	
	H	L	H	L	H	L	H	L	H	L
4"	NO THRUST BLOCK REQUIRED		1.5'	1'	1.5'	1'	1.5'	1.5'	1.5'	2'
6"			1.5'	1.5'	1.5'	2.5'	1.5'	3'	1.5	4'
8"			2'	2'	2'	3'	2.5'	3.5'	2.5'	4.5'
10"	1.5'	1'	2'	2'	2.5'	3'	2.5'	4'	3'	4.5'
12"	2'	1'	2'	2'	3'	4'	3'	5.5'	3'	7.5
14"	2'	1.5'	3'	3'	4'	4'	4'	5.5'	4'	7.5'
16"	2'	2'	3'	4'	4.5'	4.5'	5'	6'	5'	8'
18"	2.5'	2'	3.5'	4'	4.5'	5'	5'	6'	5'	8'
20"	3'	4'	3.5'	5'	4.5'	6'	5'	7'	5'	9.5'



PLAN VIEW



SECTION B-B

BENDS

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NOTES:

1. FLANGE BY COMPRESSION COUPLERS MAY BE FLANGE BY MECHANICAL JOINT OR FLANGED COUPLING ADAPTER.
2. FITTINGS SHALL BE FLANGED OR MECHANICAL JOINT TYPE.
3. ALL FLANGED OR MECHANICAL JOINT TEES AND BENDS SHALL BE DUCTILE IRON (AWWA C-110 OR C-153) CLASS 150.THE INTERIOR SURFACES SHALL BE CEMENT MORTAR LINED PER AWWA C-104 AND THE EXTERIOR SURFACES SHALL BE COAL TAR COATED PER AWWA C-203 OR FUSION BONDED EPOXY LINED AND COATED (AWWA C-116).
4. ALL BELOW GROUND NUTS, BOLTS AND MISCELLANEOUS STEEL SHALL BE POLYETHYLENE ENCASED AS PER AWWA C-105 OR TAPE WRAPPED PER AWWA C-209, 20 MILS MINIMUM IN BOTH CASES.
5. ALL THRUST BLOCKS SHALL BE CAST AGAINST UNDISTURBED NATIVE MATERIAL OR APPROVED BACKFILL MECHANICALLY COMPACTED TO 95% RELATIVE COMPACTION. COMPACTION SHALL BE TESTED BY AN OUTSIDE AGENCY AND THE RESULTS SUBMITTED TO THE ENGINEER FOR APPROVAL.
6. THE CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI. ALL CEMENT SHALL BE TYPE V PORTLAND CEMENT WITH A MINIMUM OF 5 SACKS OF CEMENT PER CUBIC YARD OF CONCRETE.
7. FOR DESIGN PRESSURES GREATER THAN 150 PSI, THRUST BLOCK DRAWINGS AND CALCULATIONS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

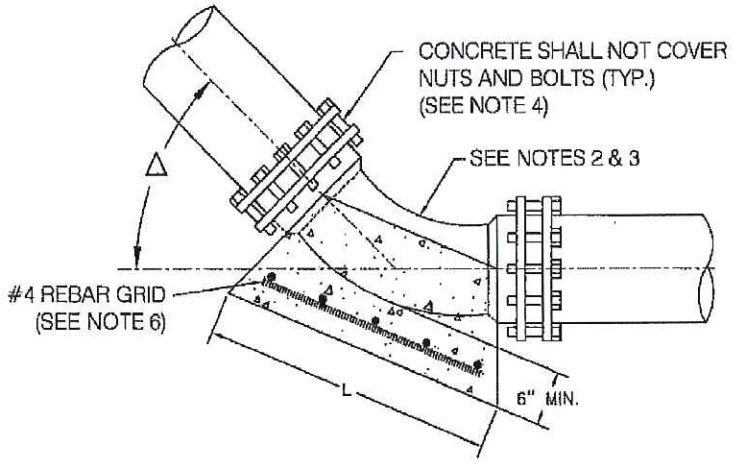
CITY OF AVENAL
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FITTINGS & THRUST BLOCKS FOR HORIZONTAL BENDS AND TEES

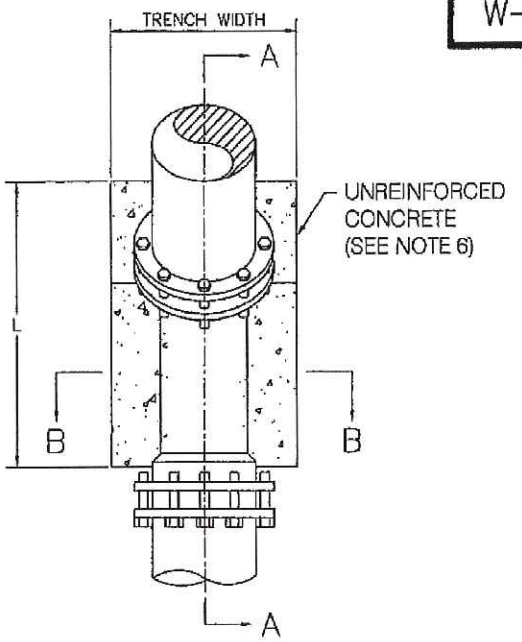
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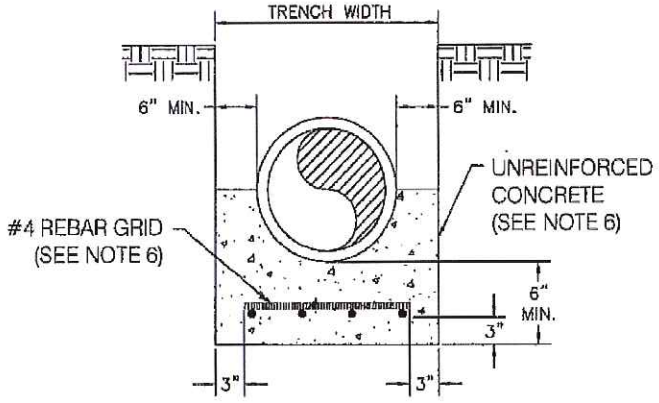
SECTION A-A



PLAN VIEW

VERTICAL UPWARD BENDS				
MINIMUM "L" VALUE				
SIZE	BENDS (Δ)			
	3°-7°	>7°-22 ½°	>22 ½°-45°	>45°-60°
4"	NA	1'	1'	1.5'
6"	NA	1'	2'	2.7'
8"	NA	1.7'	3.2'	4.2'
10"	1'	2.3'	4.5'	5.8'
12"	1'	3'	5.8'	7.6'
14"	1.2'	3.8'	7.5'	9.7'
16"	1.5'	4.6'	8.9'	11.6'
18"	1.7'	5.3'	10.4'	13.6'
20"	1.9'	6.1'	11.9'	15.5'

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Subject to Revision
APRIL 10, 2012



SECTION B-B

NOTES:

1. FLANGE BY COMPRESSION COUPLERS MAY BE FLANGE BY MECHANICAL JOINT OR FLANGED COUPLING ADAPTER.
2. FITTINGS SHALL BE FLANGED OR MECHANICAL JOINT TYPE.
3. ALL FLANGED OR MECHANICAL JOINT BENDS SHALL BE DUCTILE IRON (AWWA C-110 OR C-153) CLASS 150. THE INTERIOR SURFACES SHALL BE CEMENT MORTAR LINED PER AWWA C-104 AND THE EXTERIOR SURFACES SHALL BE COAL TAR COATED PER AWWA C-203 OR FUSION BONDED EPOXY LINED AND COATED (AWWA C-116).
4. ALL BELOW GROUND NUTS, BOLTS AND MISCELLANEOUS STEEL SHALL BE POLYETHYLENE ENCASED AS PER AWWA C-105 OR TAPE WRAPPED PER AWWA C-209, 20 MILS MINIMUM IN BOTH CASES.
5. ALL THRUST BLOCKS SHALL BE CAST AGAINST UNDISTURBED NATIVE MATERIAL OR APPROVED BACKFILL MECHANICALLY COMPACTED TO 95% RELATIVE COMPACTION. COMPACTION SHALL BE TESTED BY AN OUTSIDE AGENCY AND THE RESULTS SUBMITTED TO THE ENGINEER FOR APPROVAL.
6. IF THE MINIMUM DIMENSION "L" IS GREATER THAN THE TRENCH WIDTH, THE THRUST BLOCK SHALL BE REINFORCED WITH #4 REBAR GRID @ 12" O.C. EACH WAY, INSET 3" EACH WAY AND LOCATED AS SHOWN.
7. THE "L" DIMENSION IS CALCULATED BASED ON THE DESIGN PRESSURE OF 150 psi, 3' OF COVER AND THE REQUIRED BEARING SURFACE AREA (BSA) DIVIDED BY THE MINIMUM TRENCH WIDTH. CALCULATIONS FOR INCREASED COVER MAY BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
8. THE CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI. ALL CEMENT SHALL BE TYPE V PORTLAND CEMENT WITH A MIN IMUM OF 5 SACKS OF CEMENT PER CUBIC YARD OF CONCRETE.
9. FOR DESIGN PRESSURES GREATER THAN 150 PSI, THRUST BLOCK DRAWINGS AND CALCULATIONS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

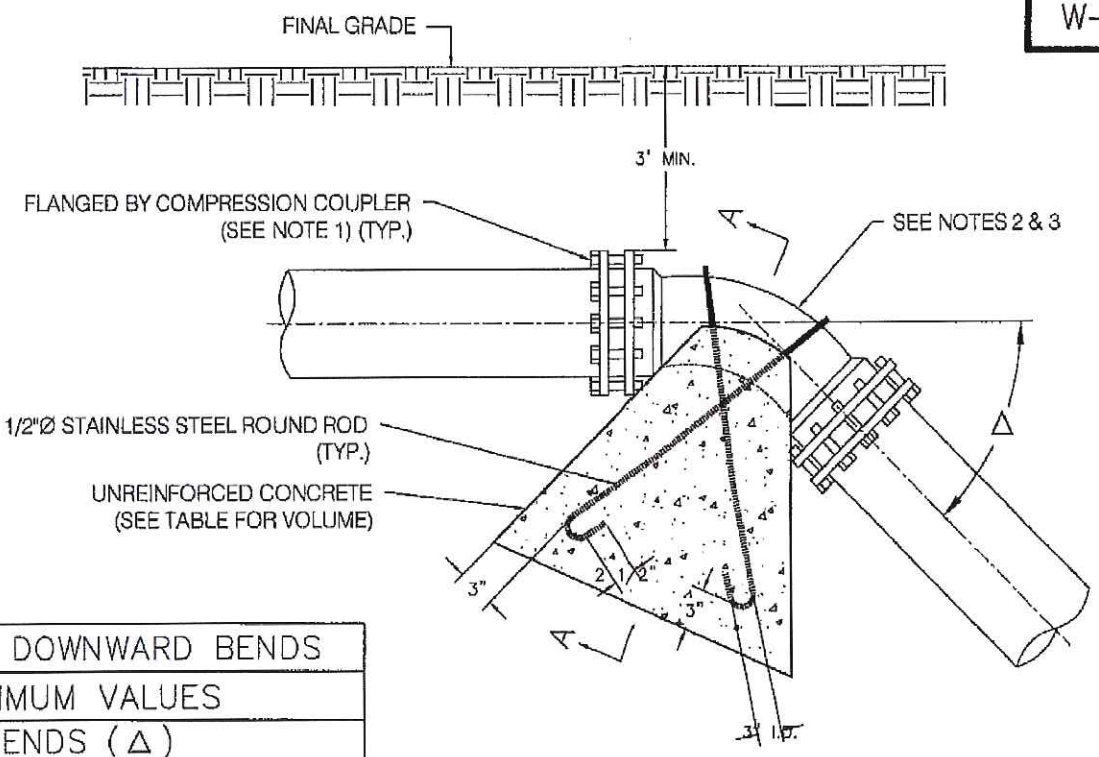
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FITTINGS & THRUST BLOCKS FOR VERTICAL UPWARD BENDS

SUMMERS ENGINEERING INC.
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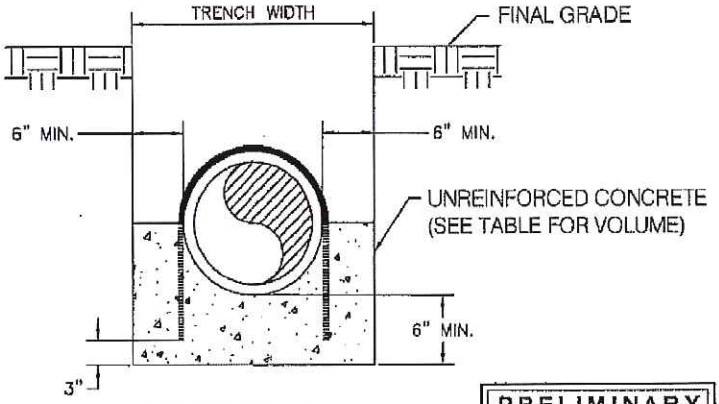
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PLAN VIEW

VERTICAL DOWNWARD BENDS				
MINIMUM VALUES				
PIPE SIZE	BENDS (Δ)			
	3°–7°	>7°–22 ½°	>22 ½°–45°	>45°–60°
	CU YRD	CU YRD	CU YRD	CU YRD
4"	0.25	0.5	0.5	0.5
6"	0.25	0.5	1	1.5
8"	0.5	1.5	2.5	3
10"	0.5	1.5	3	3.5
12"	1	2.5	4	5
14"	1	3.5	6	8
16"	1.5	4	8	10
18"	3	5	9	11
20"	3	6	10	12



SECTION A–A

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NOTES:

1. FLANGE BY COMPRESSION COUPLERS MAY BE FLANGE BY MECHANICAL JOINT OR FLANGED COUPLING ADAPTER.
2. FITTINGS SHALL BE FLANGED OR MECHANICAL JOINT TYPE.
3. ALL FLANGED OR MECHANICAL JOINT BENDS SHALL BE DUCTILE IRON (AWWA C-110 OR C-153) CLASS 150. THE INTERIOR SURFACES SHALL BE CEMENT MORTAR LINED PER AWWA C-104 AND THE EXTERIOR SURFACES SHALL BE COAL TAR COATED PER AWWA C-203 OR FUSION BONDED EPOXY LINED AND COATED (AWWA C-116).
4. ALL BELOW GROUND NUTS, BOLTS AND MISCELLANEOUS STEEL SHALL BE POLYETHYLENE ENCASED AS PER AWWA C-105 OR TAPE WRAPPED PER AWWA C-209, 20 MILS MINIMUM IN BOTH CASES.
5. ALL THRUST BLOCKS SHALL BE CAST AGAINST UNDISTURBED NATIVE MATERIAL OR APPROVED BACKFILL MECHANICALLY COMPACTED TO 95% RELATIVE COMPACTION. COMPACTION SHALL BE TESTED BY AN OUTSIDE AGENCY AND THE RESULTS SUBMITTED TO THE ENGINEER FOR APPROVAL.
6. THE CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI. ALL CEMENT SHALL BE TYPE V PORTLAND CEMENT WITH A MINIMUM OF 5 SACKS OF CEMENT PER CUBIC YARD OF CONCRETE.
7. FOR DESIGN PRESSURES GREATER THAN 150 PSI, THRUST BLOCK DRAWINGS AND CALCULATIONS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

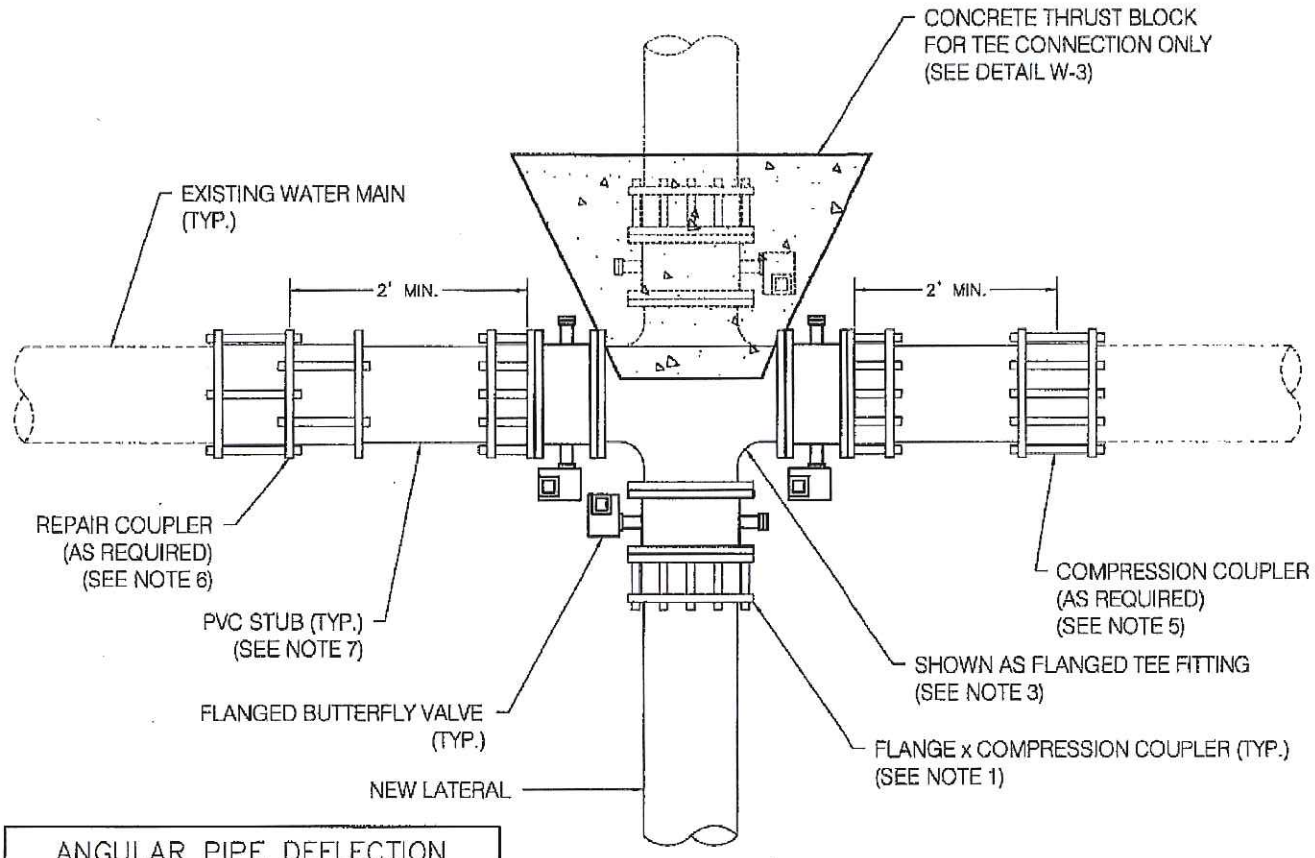
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FITTINGS & THRUST BLOCKS FOR VERTICAL DOWNWARD BENDS

SUMMERS ENGINEERING INC.
HANFORD Consulting Engineers CALIFORNIA

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PLAN VIEW

ANGULAR PIPE DEFLECTION MAXIMUM VALUES			
PIPE SIZE	SLEEVE LENGTH		
	5"	7"	10"
2" - 14"	4°	4 1/2°	4 1/2°
16" - 24"	2°	4°	4 1/2°
26" - 36"	1 1/2°	3 1/2°	3 1/2°
Note: Deflection (in degrees) is PER COUPLER			

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APRIL 10, 2012

NOTES:

1. FLANGE BY COMPRESSION COUPLERS MAY BE FLANGE BY MECHANICAL JOINT OR FLANGED COUPLING ADAPTER.
2. FITTINGS SHALL BE FLANGED OR MECHANICAL JOINT TYPE.
3. ALL FLANGED OR MECHANICAL JOINT CROSSES AND TEES SHALL BE DUCTILE IRON (AWWA C-110 OR C-153) CLASS 150. THE INTERIOR SURFACES SHALL BE CEMENT MORTAR LINED PER AWWA C-104 AND THE EXTERIOR SURFACES SHALL BE COAL TAR COATED PER AWWA C-203 OR FUSION BONDED EPOXY LINED AND COATED (AWWA C-116).
4. ALL BELOW GROUND NUTS, BOLTS AND MISCELLANEOUS STEEL SHALL BE POLYETHYLENE ENCASED AS PER AWWA C-105 OR TAPE WRAPPED PER AWWA C-209, 20 MILS MINIMUM IN BOTH CASES.
5. COMPRESSION COUPLERS SHALL BE ROMAC STYLE "501" OR APPROVED EQUAL.
6. FOR SEVERE ANGULAR PIPE DEFLECTION, ROMAC STYLE "RR501" REPAIR COUPLING SHALL BE USED OR APPROVED EQUAL.
7. PVC STUBS SHALL BE 2 FEET (2') MINIMUM IN LENGTH AND HAVE A CLASS AND PRESSURE RATING EQUAL TO, OR GREATER THAN, THE EXISTING WATER MAIN.
8. AT CONTRACTOR'S EXPENSE, ADDITIONAL FITTINGS AND PIPE SECTIONS MAY BE REQUIRED BY THE ENGINEER TO ACCOMMODATE SEVERE MISALIGNMENTS IN THE PIPELINE AFTER IT HAS BEEN CUT.

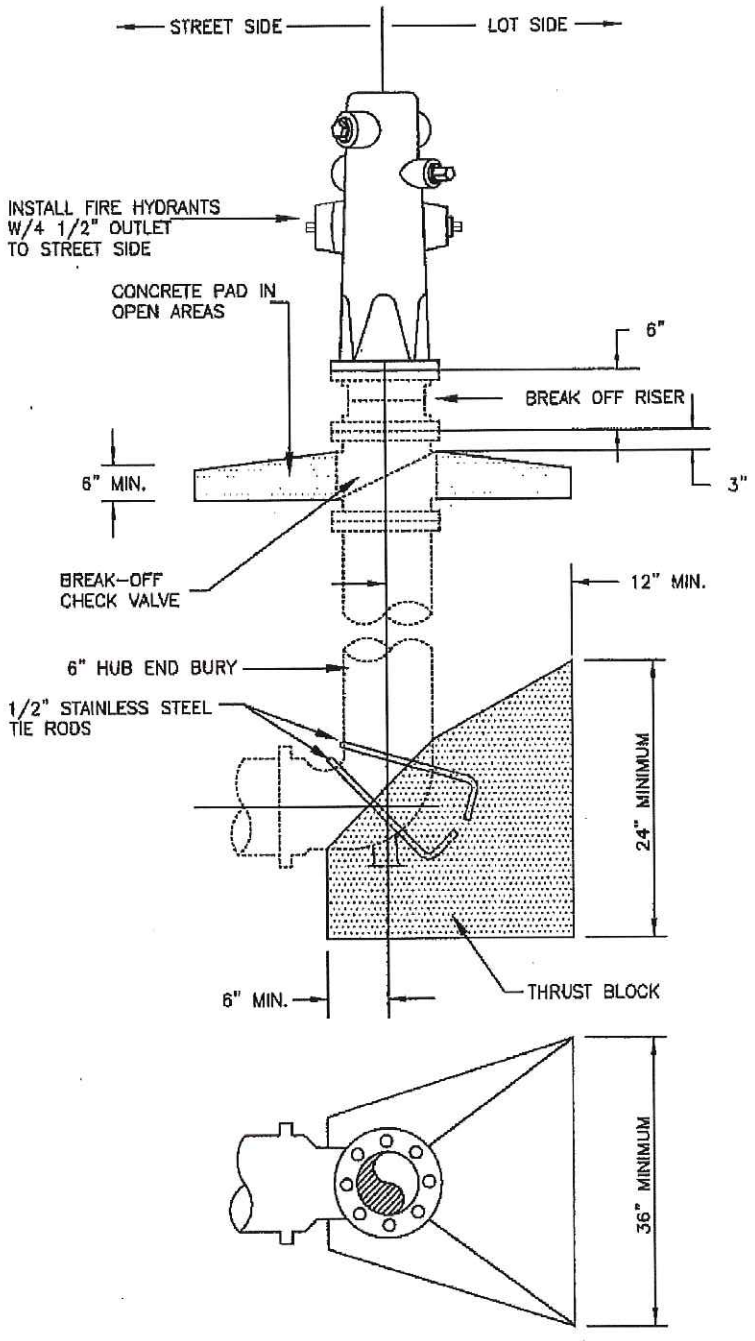
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"CUT-IN" TEE OR CROSS DETAIL FOR LATERAL CONNECTION

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NOTES:

1. FIRE HYDRANT SHALL BE CLOW 960 OR APPROVED EQUAL.
2. HYDRANT AND BREAK OFF RISER TO BE PAINTED WITH BRIGHT YELLOW INDUSTRIAL ENAMEL PAINT.
3. ALL BELOW GROUND NUTS, BOLTS, AND MISCELLANEOUS STEEL SHALL BE POLYETHYLENE ENCASED AS PER AWWA C-105 OR TAPE WARPED AS PER AWWA C-209, 20 MILS MINIMUM IN BOTH CASES.
4. THE CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI. ALL CONCRETE SHALL HAVE A MINIMUM OF 6 SACKS OF CEMENT PER CUBIC YARD OF CONCRETE.

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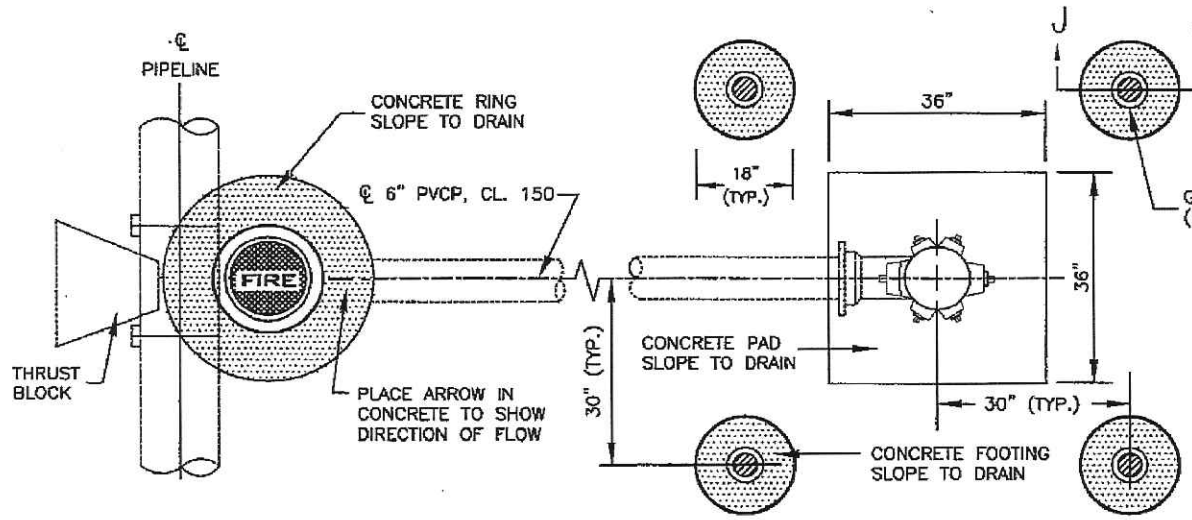
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FIRE HYDRANT DETAILS

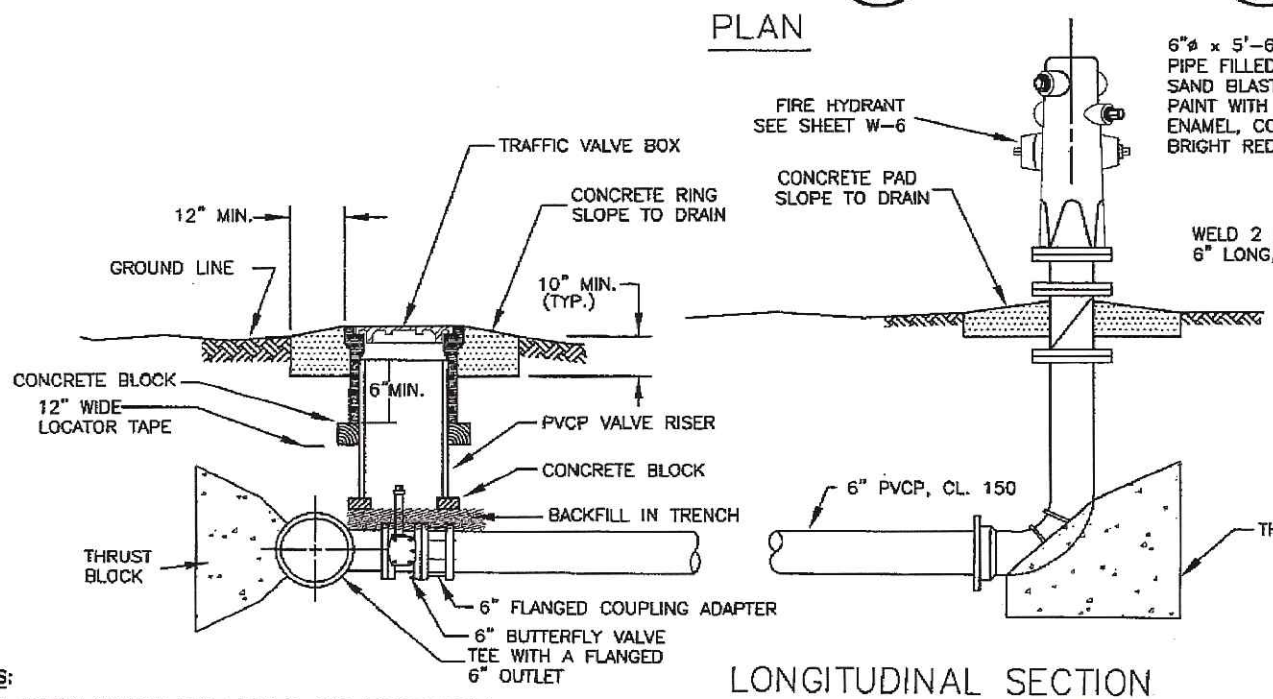
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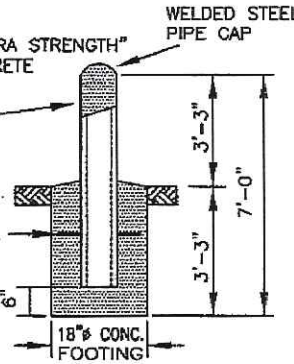
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PLAN



LONGITUDINAL SECTION



SECTION J-J
GUARD POST

PRELIMINARY
For Review Only
Subject to Revision
APRIL 10, 2012

NOTES:

1. ALL BELOW GROUND NUTS, BOLTS, AND MISCELLANEOUS STEEL SHALL BE POLYETHYLENE ENCASED AS PER AWWA C-105 OR TAPE WARPED AS PER AWWA C-209, 20 MILS MINIMUM IN BOTH CASES.
2. TRAFFIC VALVE BOX SHALL BE CHRISTY MODEL G-5 WITH CAST IRON LID MARKED "FIRE".
3. SEE SHEET W-9 FOR OTHER NOTES AND DETAILS.

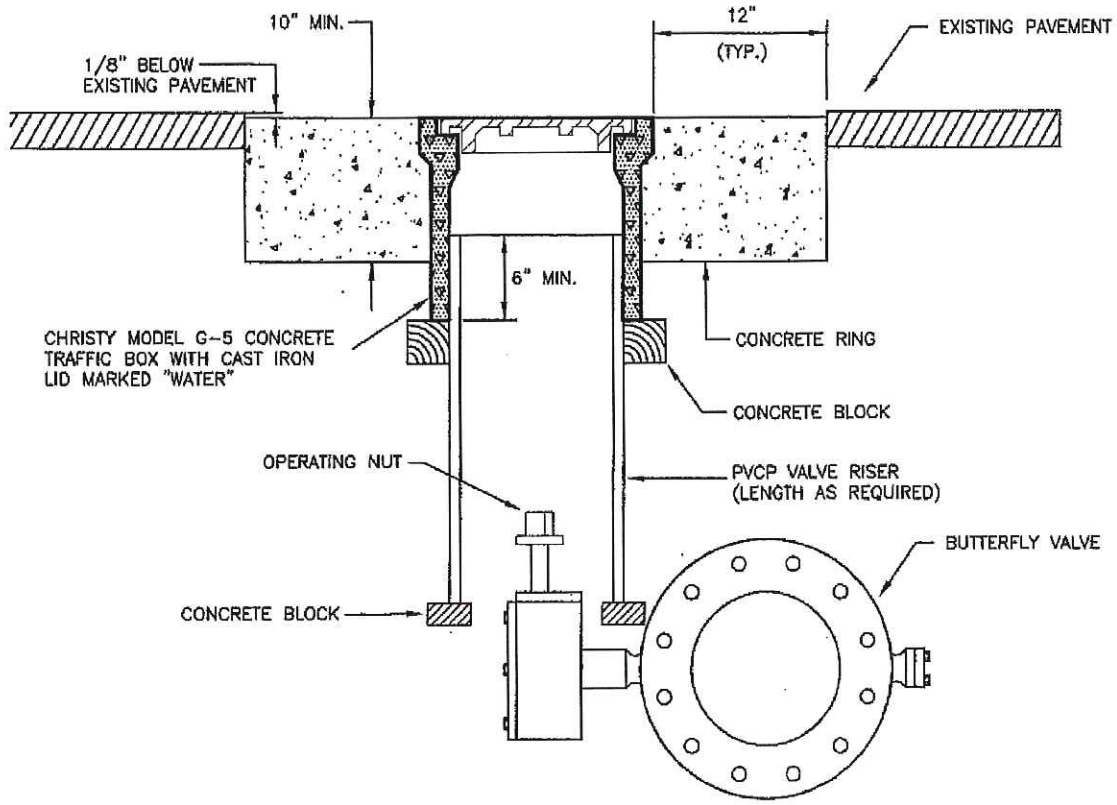
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FIRE HYDRANT INSTALLATION
FOR OPEN AREAS

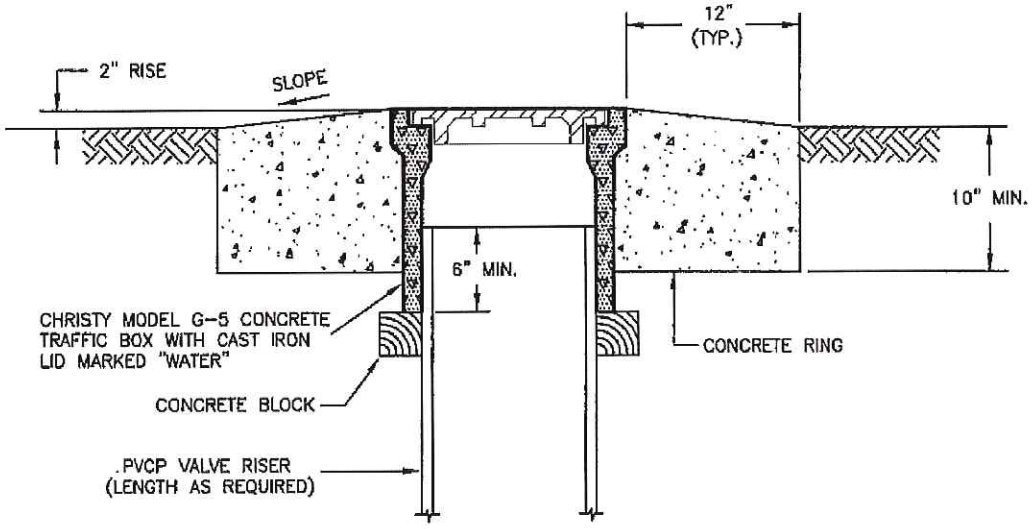
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PAVED AREAS



OPEN FIELD AREAS

NOTES:

1. CONCRETE RING IN PAVED AREAS SHALL BE LAMP BLACK COLOR.
2. ALL BUTTERFLY VALVES SHALL BE PRATT GROUND HOG, FLANGED SHORT BODY, NOT WAFER TYPE, AND CONFORM TO AWWA C-504. BUTTERFLY VALVES SHALL BE FURNISHED WITH SQUARE OPERATING NUT. EXTERIOR SURFACES SHALL BE COAL TAR COATED AS PER AWWA C-203 AND THE INTERIOR SHALL BE LINED WITH KEYSITE EPOXY #740, SCOTCHKOTE EPOXY #306 OR APPROVED EQUAL. IF TOP OF OPERATING NUT ON BUTTERFLY VALVE EXCEEDS 42", A VALVE NUT EXTENSION WILL BE REQUIRED.
3. ALL BELOW GROUND NUTS, BOLTS AND MISCELLANEOUS STEEL SHALL BE POLYETHYLENE ENCASED AS PER AWWA C-105 OR TAPE WRAPPED AS PER AWWA C-209, 20 MILS MINIMUM IN BOTH CASES.

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Subject to Revision
APRIL 10, 2012

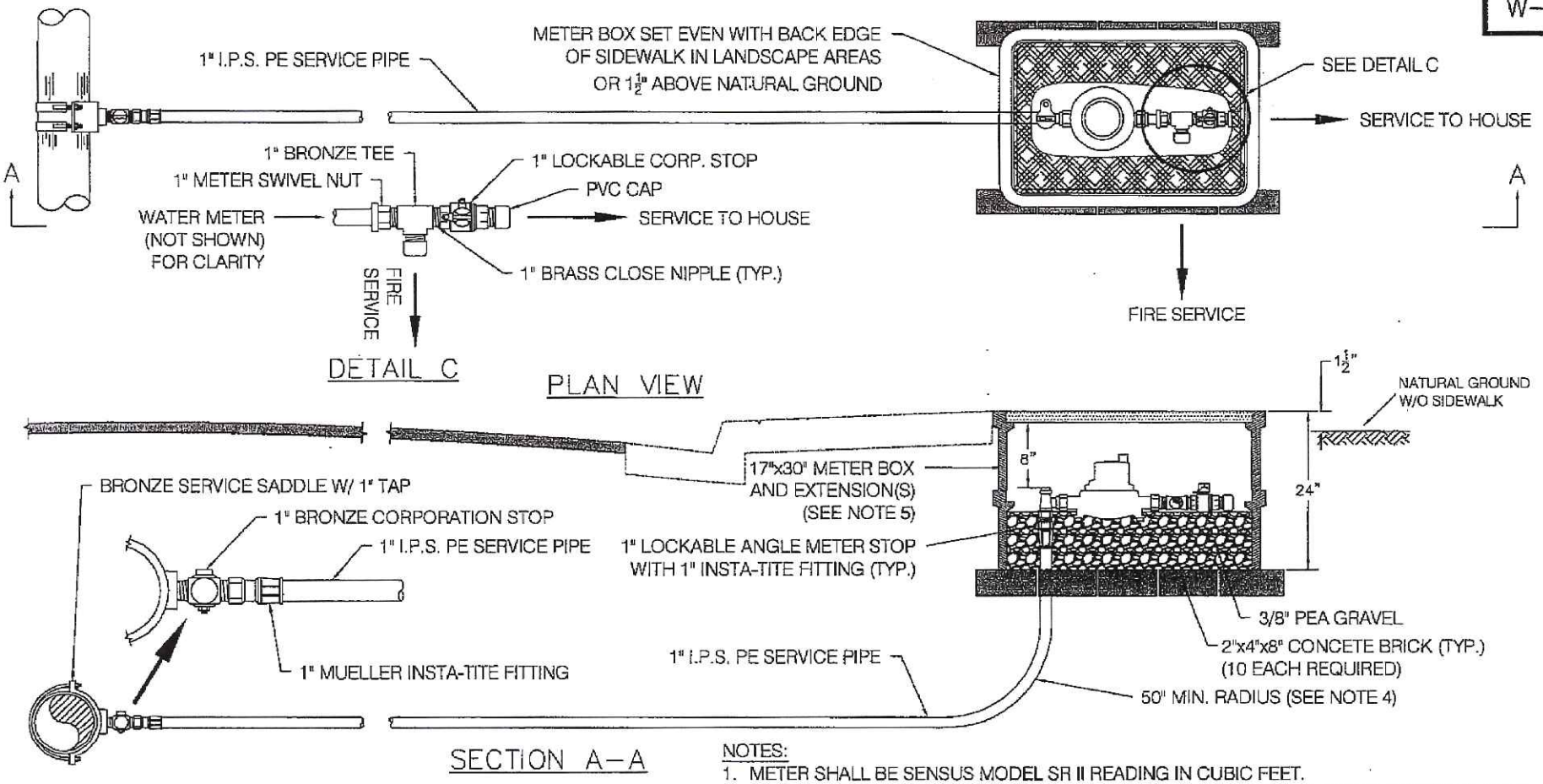
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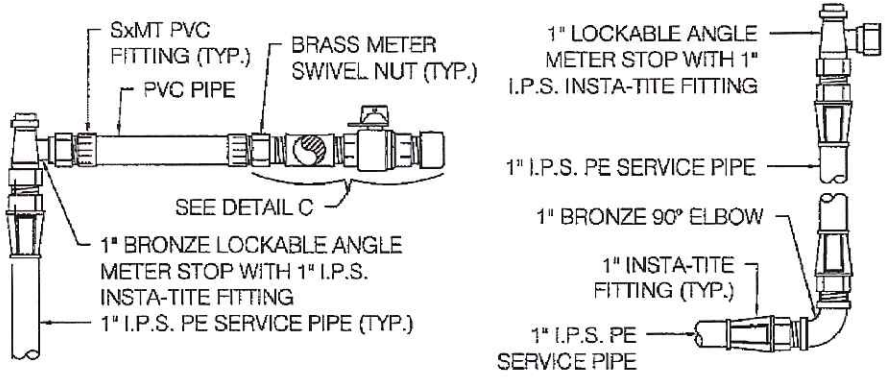
UNDERGROUND VALVE INSTALLATION

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HANFORD Consulting Engineers CALIFORNIA

APRIL 2012

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NOTES:

1. METER SHALL BE SENSUS MODEL SR II READING IN CUBIC FEET.
2. IF THE METER IS NOT INSTALLED IMMEDIATELY, THE CONTRACTOR SHALL FABRICATE AND INSTALL A JUMPER, LENGTH SHALL BE EQUAL TO THE LAY LENGTH OF THE METER TO BE INSTALLED, SEE DETAIL A.
3. 1" POLYETHYLENE PIPE SHALL BE IRON PIPE SIZE (I.P.S.) AND CONFORM TO ASTM D-2239, PE3408 WITH A PRESSURE RATING OF 200 PSI AND A SDR OF 7.
4. WHEN THE FIELD CONDITIONS WILL NOT ALLOW THE MINIMUM RADIUS, USE DETAIL B FOR THE REQUIRED INSTALLATION.
5. METER BOX AND EXTENSION SHALL BE AS MANUFACTURED BY CHRISTY B36 UTILITY BOX W/ GALVANIZED STEEL LID (61D) OR APPROVED EQUAL.

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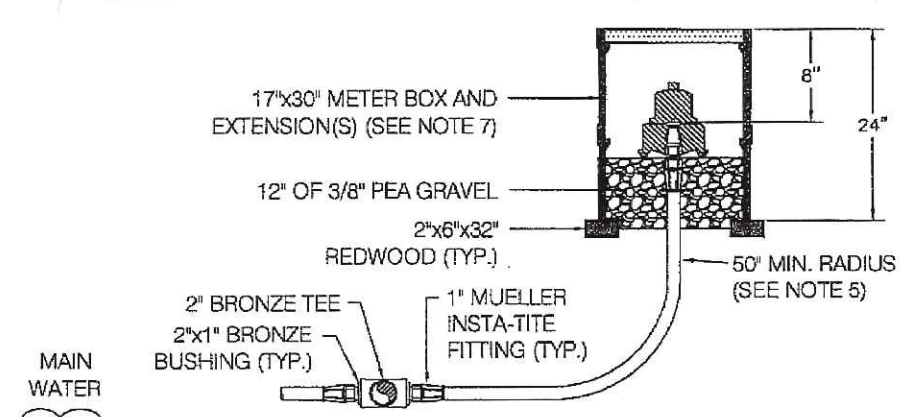
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¾" TO 1" METER CONNECTION WITH FIRE PROTECTION

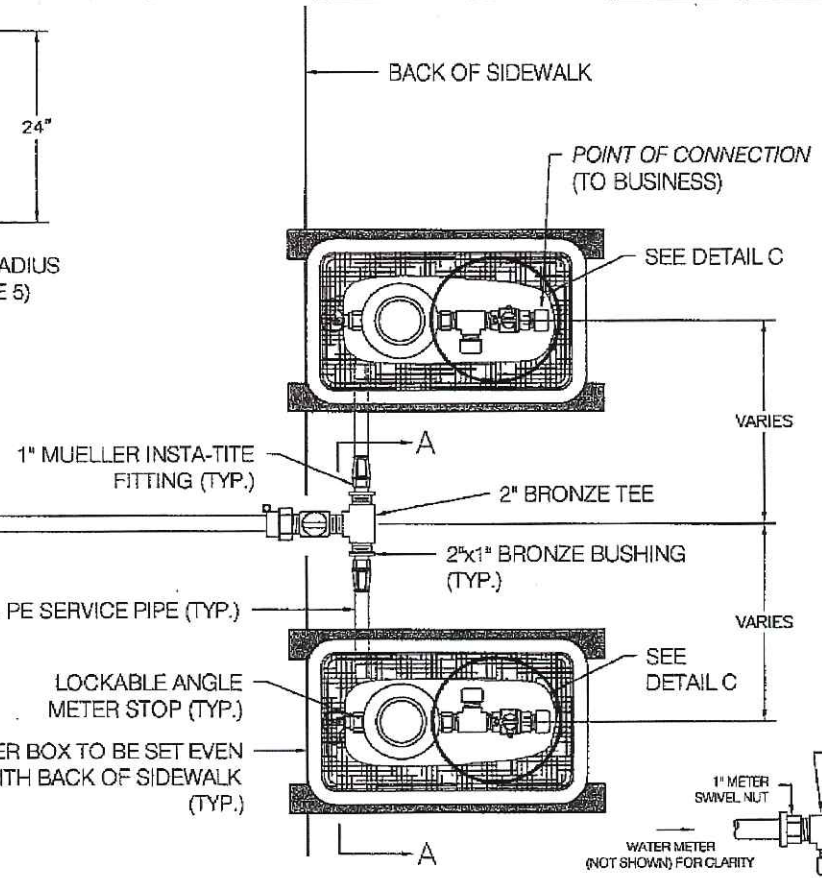
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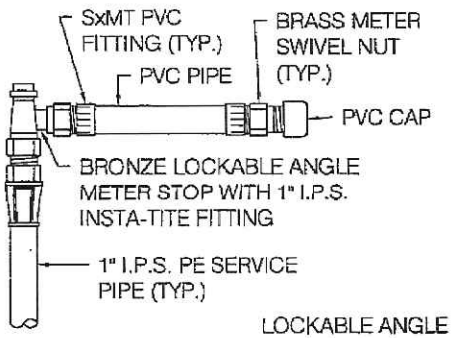
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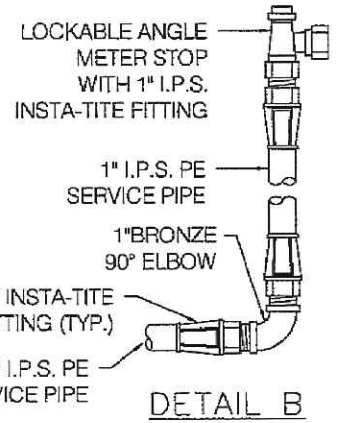


SECTION A–A

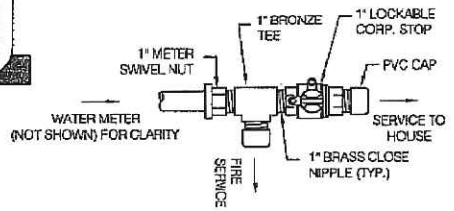




DETAIL A



DETAIL B



DETAIL C

NOTES:

1. METER SHALL BE SENSUS MODEL SR READING IN CUBIC FEET.
2. IF THE METER IS NOT INSTALLED IMMEDIATELY, THE CONTRACTOR SHALL FABRICATE AND INSTALL A JUMPER, LENGTH SHALL BE EQUAL TO THE LAY LENGTH OF THE METER TO BE INSTALLED, SEE DETAIL A.
3. 1" POLYETHYLENE PIPE SHALL BE IRON PIPE SIZE (I.P.S.) AND CONFORM TO ASTM D-2239, PE3408 WITH A PRESSURE RATING OF 200 PSI AND A SDR OF 7.
4. 2" POLYETHYLENE PIPE SHALL BE COPPER TUBE SIZE (C.T.S.) AND CONFORM TO ASTM D-2737, PE 3408 WITH A PRESSURE RATING OF 200 PSI AND A SDR OF 9.
5. WHEN THE FIELD CONDITIONS WILL NOT ALLOW THE MINIMUM RADIUS, USE DETAIL B FOR THE REQUIRED INSTALLATION.
6. COMPRESSION FITTINGS FOR 2" PE PIPE SHALL BE FORD PACK JOINT, MUELLER 110 COMPRESSION CONNECTION OR APPROVED EQUAL.
7. METER BOX AND EXTENSION SHALL BE AS MANUFACTURED BY CHRISTY CONCRETE PRODUCTS MODEL B36 WITH GALVANIZED METAL LID (61D) OR APPROVED EQUAL, TOTAL COMBINED HEIGHT SHALL BE 24 INCHES.

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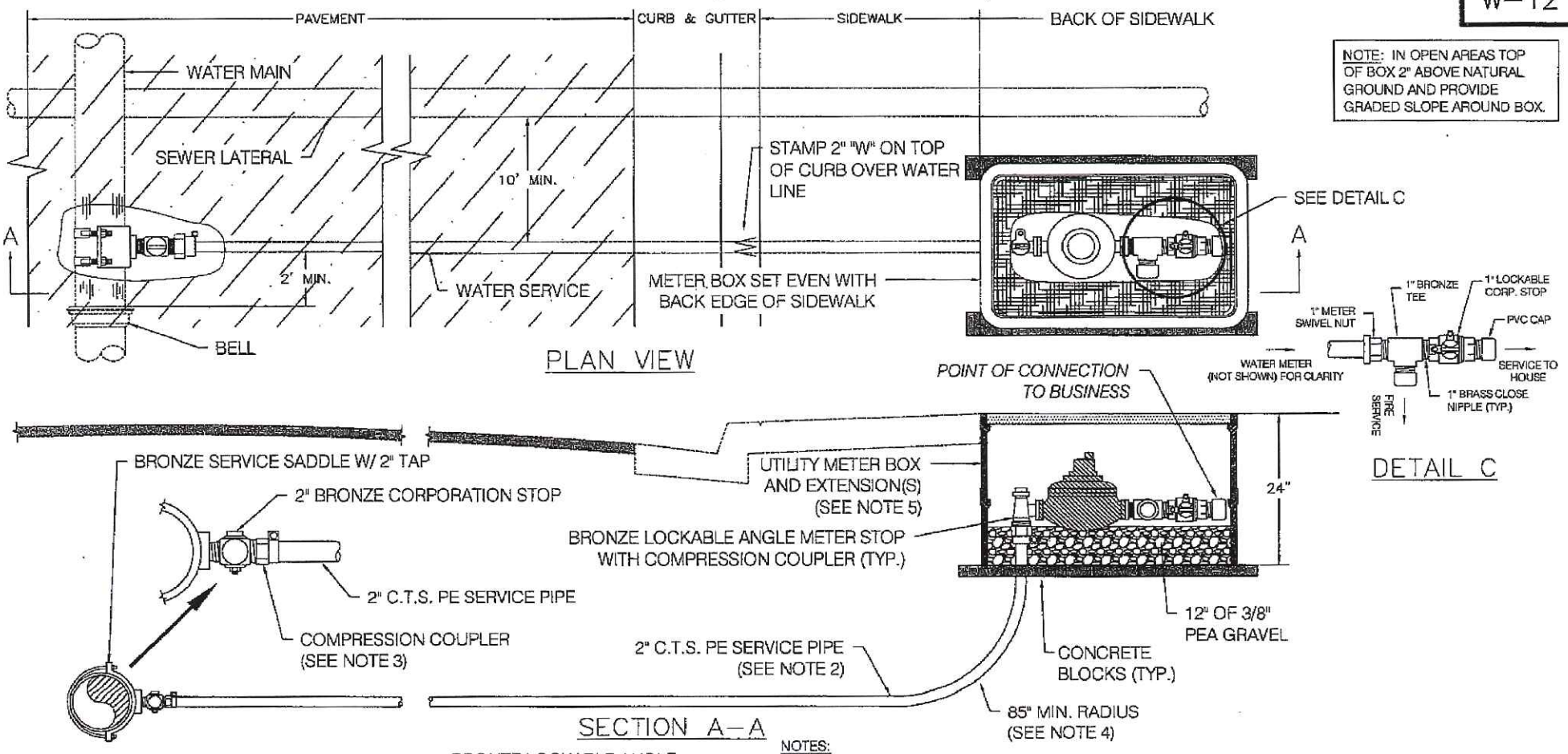
¾" TO 1" DOUBLE METER CONNECTION

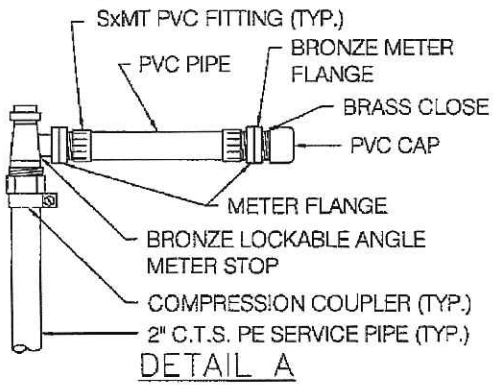
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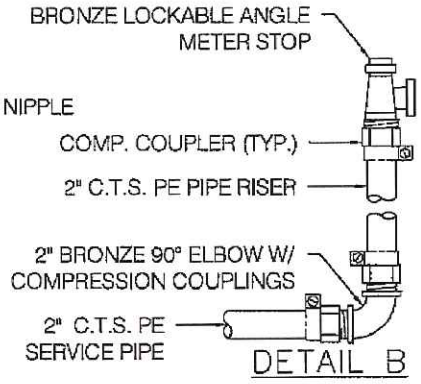
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NOTES:
1. METER SHALL BE SENSUS MODEL SR READING IN CUBIC FEET. IF METER NOT IMMEDIATELY INSTALLED, CONTRACTOR SHALL INSTALL A TEMPORARY "JUMPER" EQUAL TO METER LENGTH (SEE DETAIL A).
2. POLYETHYLENE PIPE SHALL BE COPPER TUBE SIZE (C.T.S.) AND CONFORM TO ASTM D-2737, PE 3408 WITH A PRESSURE RATING OF 200 PSI AND A SDR OF 9.
3. COMPRESSION COUPLERS SHALL BE FORD PACK JOINT, MUELLER 110 COMPRESSION CONNECTION OR APPROVED EQUAL.
4. WHEN FIELD CONDITIONS WILL NOT ALLOW THE MINIMUM RADIUS, USE DETAIL B FOR REQUIRED INSTALLATION. METER BOX AND EXTENSION SHALL BE AS MANUFACTURED BY CHRISTY CONCRETE PRODUCTS MODEL N36 WITH GALVANIZED METAL LID (6ID) OR APPROVED EQUAL, TOTAL COMBINED HEIGHT SHALL BE 24 INCHES.
5. SUBMIT DETAILS TO THE DISTRICT ENGINEER FOR APPROVAL ON SERVICES LARGER THAN 2" IN SIZE.

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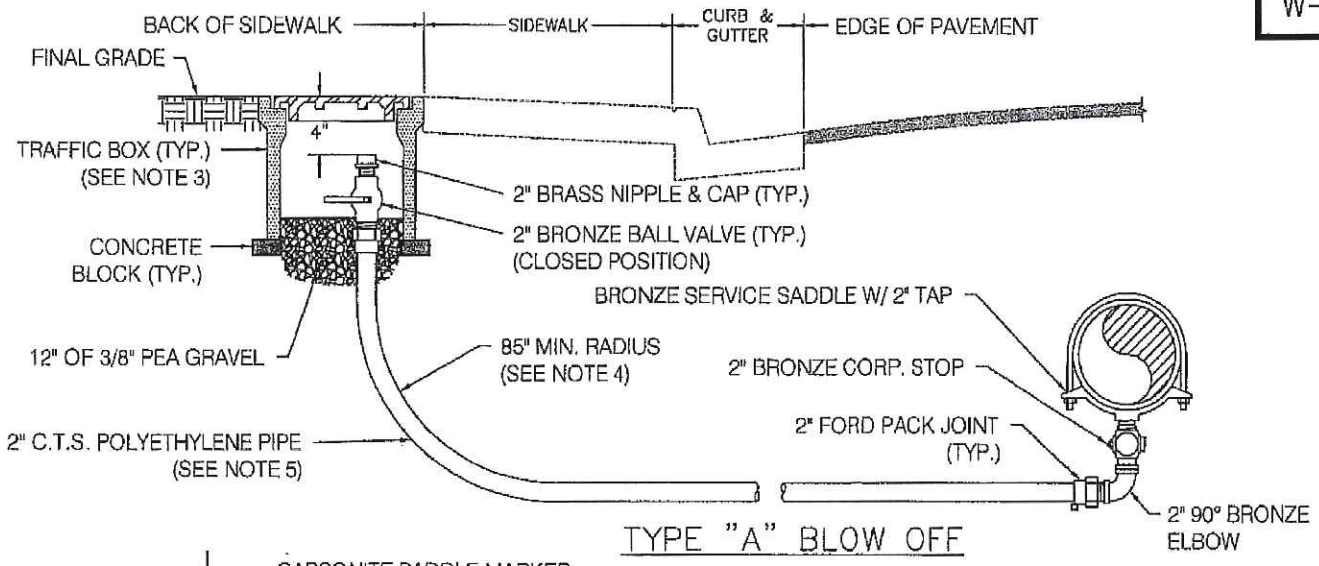
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1½" to 2" SERVICE CONNECTION

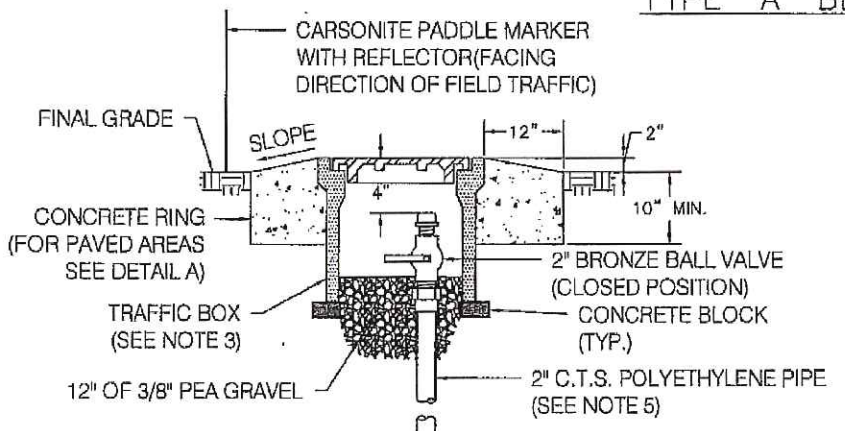
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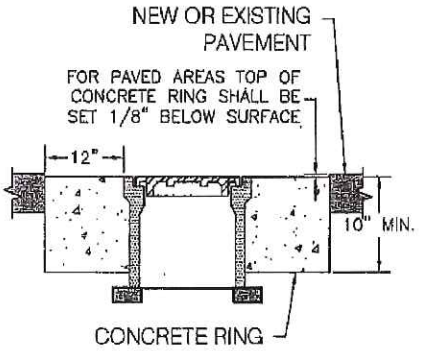
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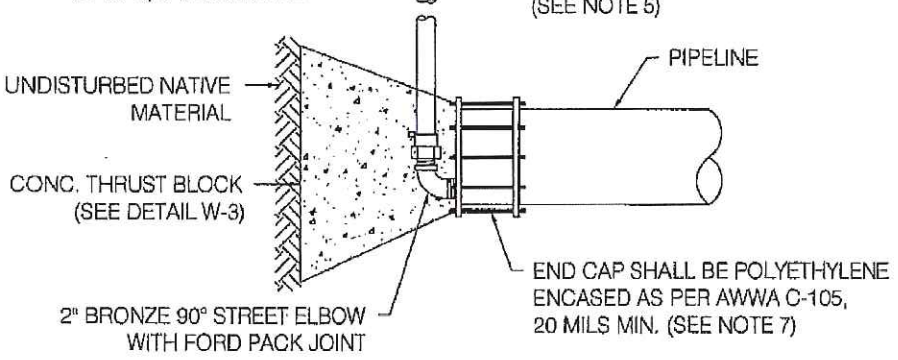


TYPE "A" BLOW OFF

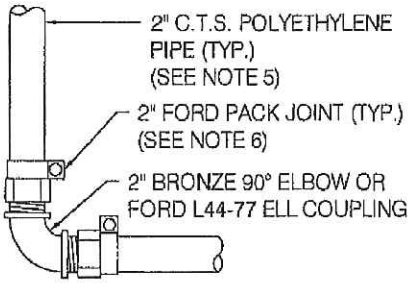




DETAIL A



TYPE "B" BLOW OFF



DETAIL B
(SEE NOTE 4)

NOTES:

1. BLOW OFFS SHALL BE INSTALLED ON ALL END RUNS OF WATER MAINS WHETHER TEMPORARY OR PERMANENT.
2. FOR DEVELOPED AREAS WITH ATTACHED SIDEWALKS, BLOW OFF SHALL BE LOCATED BEHIND THE SIDEWALK. FOR DETACHED SIDEWALKS, BLOW OFF SHALL BE LOCATED BEHIND THE CURB.
3. TRAFFIC VALVE BOX SHALL BE CHRISTY MODEL G-12 WITH CAST IRON LID MARKED "WATER" OR APPROVED EQUAL.
4. WHEN FIELD CONDITIONS WILL NOT ALLOW THE MINIMUM RADIUS, USE DETAIL B FOR REQUIRED INSTALLATION.
5. 2" POLYETHYLENE PIPE SHALL BE COPPER TUBE SIZE (C.T.S.) AND CONFORM TO ASTM D-2737, PE 3408 WITH A PRESSURE RATING OF 200 PSI AND A SDR OF 9.
6. COMPRESSION COUPLERS SHALL BE FORD PACK JOINT, MUELLER 110 COMPRESSION CONNECTION OR APPROVED EQUAL.
7. END CAP SHALL BE A ROMAC STYLE "EC501" END CAP COUPLING OR APPROVED EQUAL.

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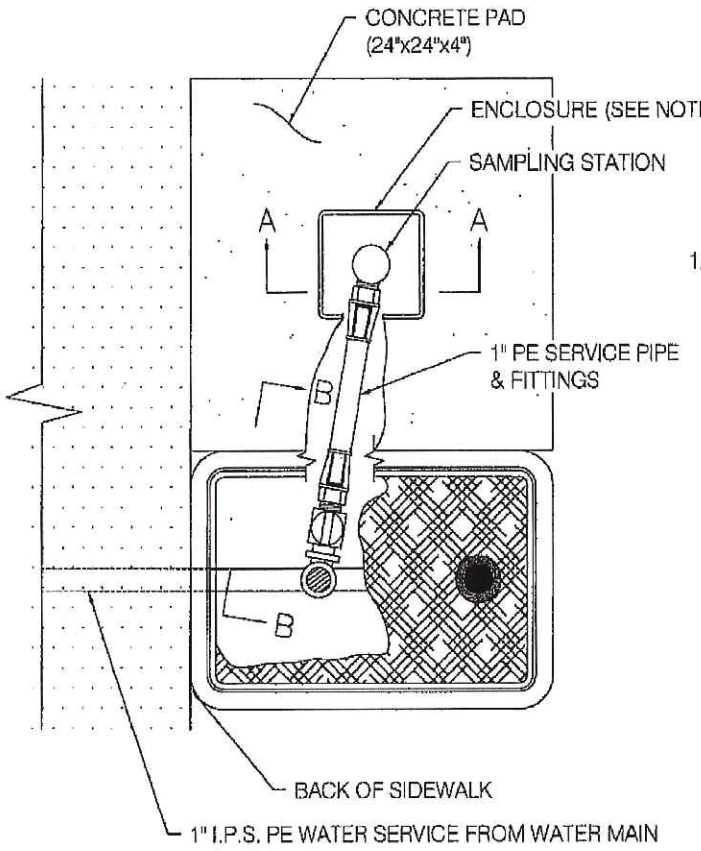
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BLOW OFF ASSEMBLIES

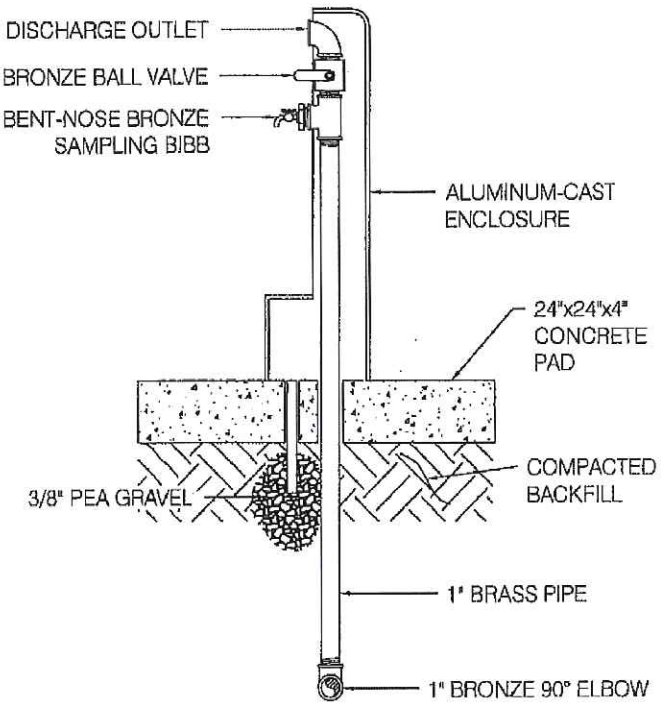
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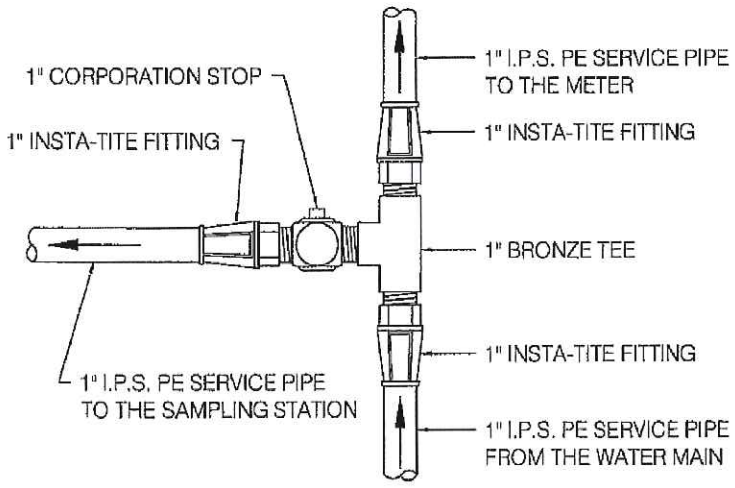
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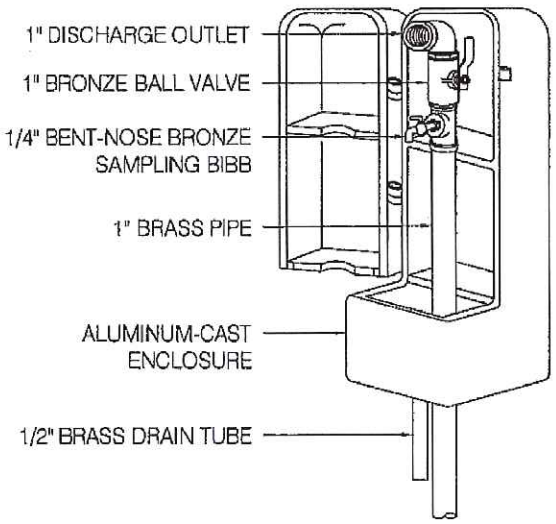
PLAN VIEW
(METER OMITTED FOR CLARITY)



SECTION A-A



SECTION B-B



ECLIPSE No. 88-WC

NOTES:
1. SAMPLING STATION SHALL BE *THE KUPFERLE FOUNDRY COMPANY* "ECLIPSE No. 88-WC" OR APPROVED EQUAL.
2. SAMPLING STATION SHALL FACE TOWARD THE SIDEWALK.
3. FOR METER ASSEMBLY AND INSTALLATION SEE DETAIL W-10, W-11 OR W-12.
4. ENCLOSURE SHALL BE FURNISHED WITH FACTORY APPLIED EPOXY COATING, GREEN IN COLOR. FIELD APPLIED TOUCH-UP MAY BE REQUIRED AFTER INSTALLATION AND TESTING.

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APRIL 10, 2012

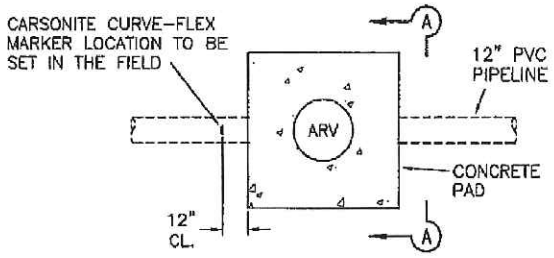
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SAMPLING STATION

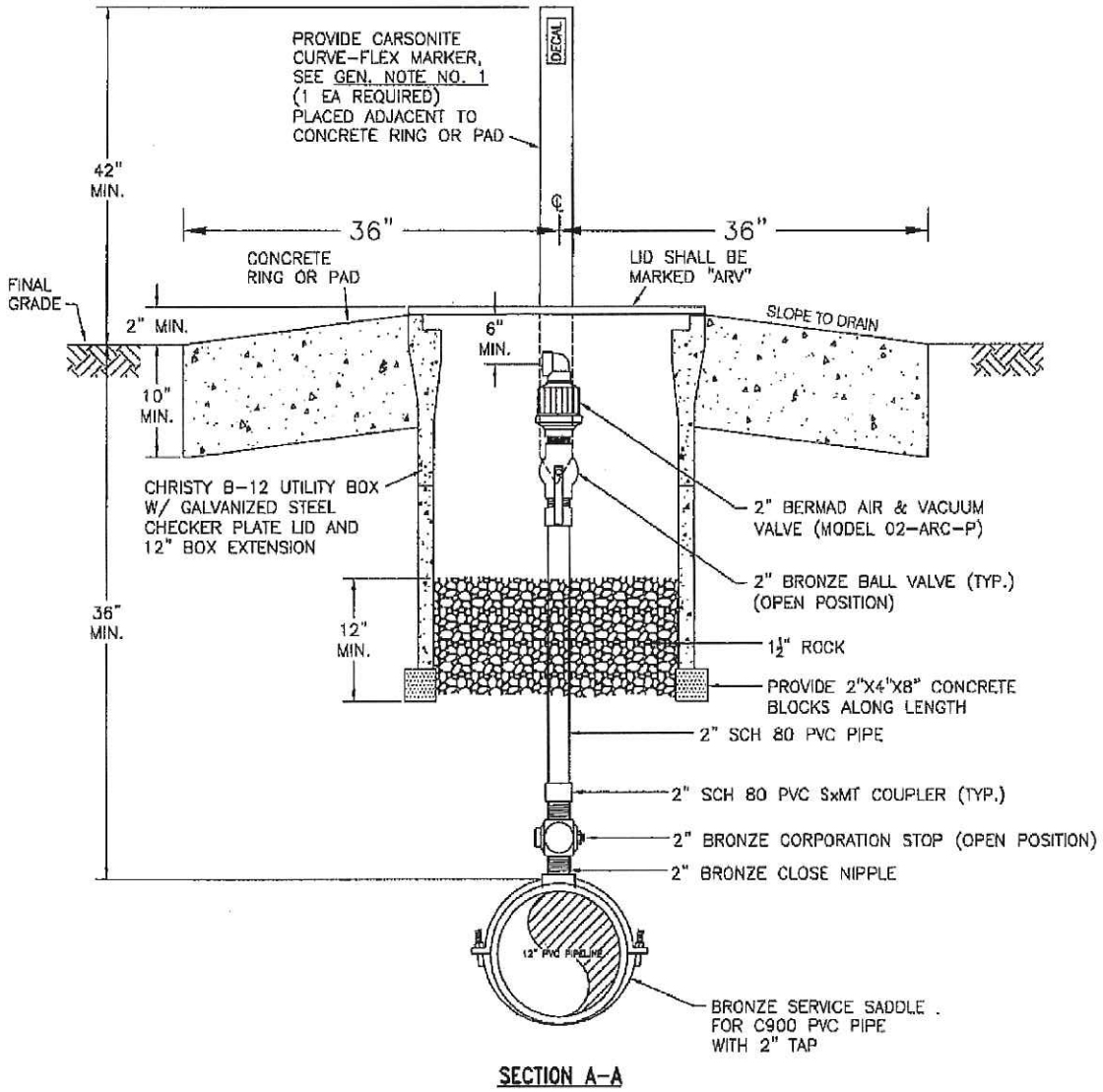
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APRIL 2012

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PLAN VIEW



SECTION A-A

AIR RELEASE VALVE INSTALLATION

NOTES:
1. THE CARSONITE CURVE-FLEX MARKER WITH DOUBLE SIDE DECAL "CAUTION WATER PIPELINE" BEFORE DIGGING CALL COLLECT INSTALLED ALONG ℄ OF PIPELINE.

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APRIL 10, 2012

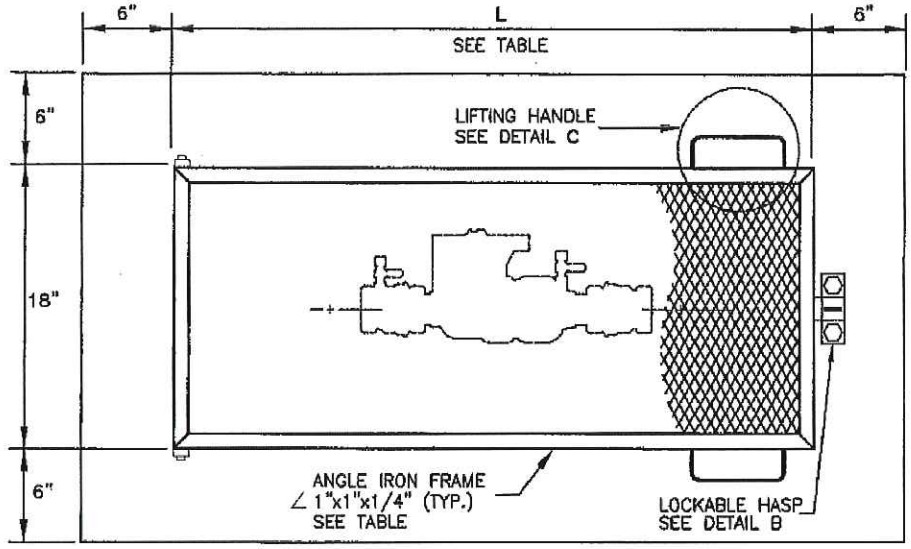
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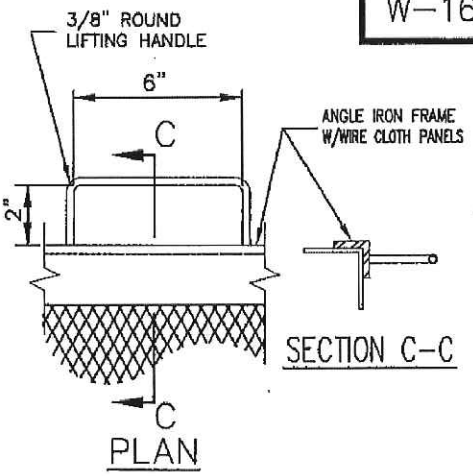
AIR RELEASE VALVE ASSEMBLY

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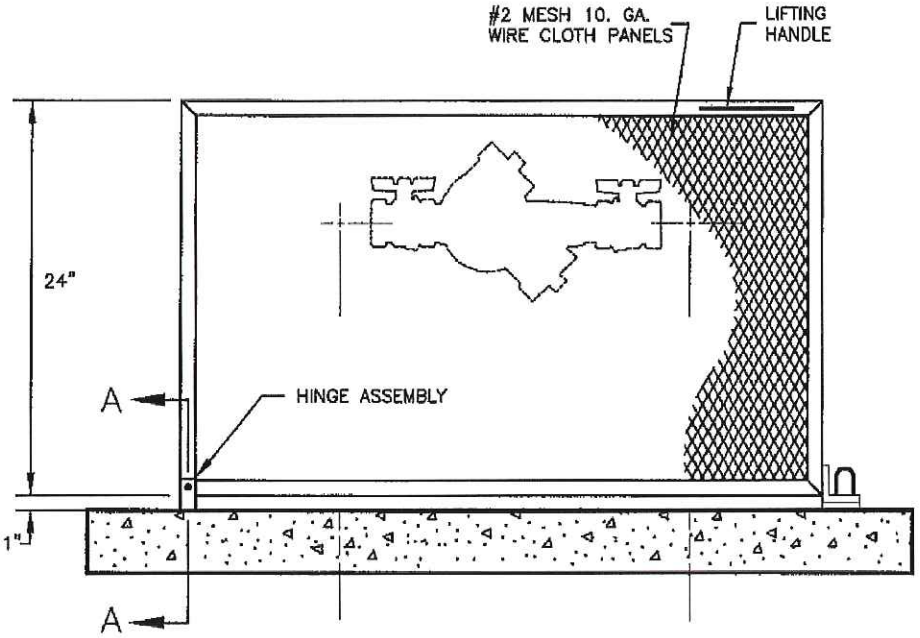
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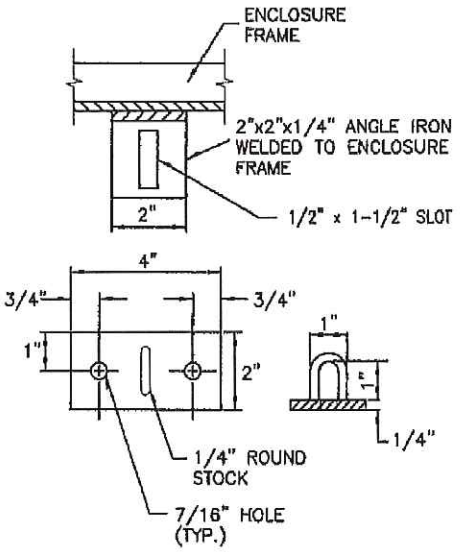




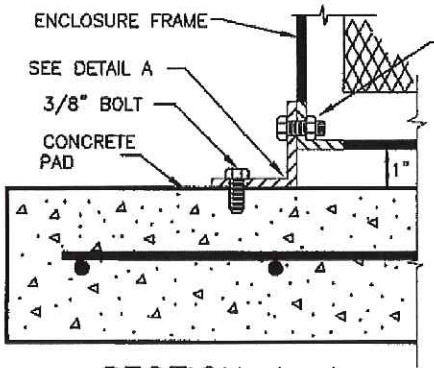
DETAIL C



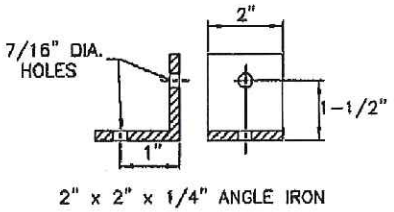
PROTECTIVE ENCLOSURE DETAIL



DETAIL B



SECTION A–A



DETAIL A

NOTES:

1. THE BACKFLOW PREVENTER PROTECTIVE ENCLOSURE AND MISCELLANEOUS STEEL SHALL BE GALVANIZED AND PAINTED WITH VISTA GREEN ENAMEL PAINT OR POWDER COATED GREEN. THE ENCLOSURE IS AVAILABLE AT WEST VALLEY SUPPLY (559) 945–4500.
2. THE CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI. ALL CEMENT SHALL BE PORTLAND TYPE II WITH A MINIMUM OF 6 SACKS OF CEMENT PER CUBIC YARD OF CONCRETE.

TABLE	
SIZE	L
3/4" – 1"	30"
1-1/2" – 2"	42"

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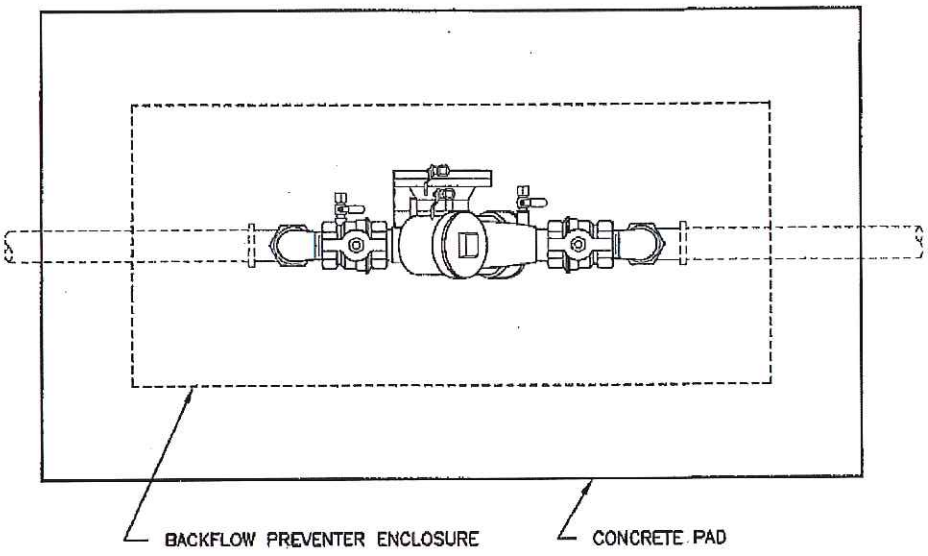
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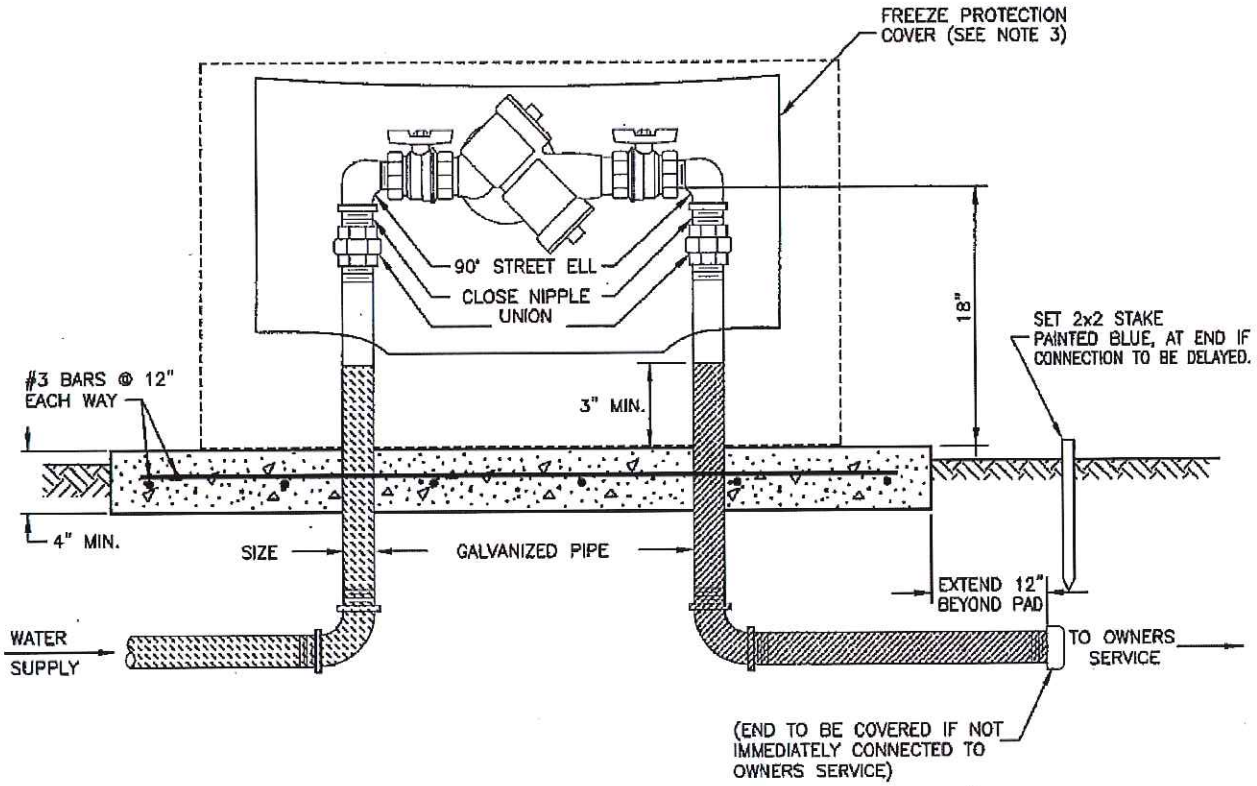
¾" TO 2" REDUCED PRESSURE BACKFLOW PREVENTER INSTALLATION

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NOTES:

1. ALL BACKFLOW PREVENTERS SHALL BE FROM THE APPROVED LIST OF THE FOUNDATION FOR CROSS CONNECTION CONTROL AND HYDRAULIC RESEARCH AT THE UNIVERSITY OF SOUTHERN CALIFORNIA. THEY SHALL BE TESTED (PROVIDE A COPY TO DISTRICT) THE OWNER PRIOR TO ACTIVATION.
2. BELOW GROUND GALVANIZED PIPING TO BE COATED WITH PROTECTIVE WRAPPING TAPE AS PER AWWA C–209, 20 MILS MINIMUM.
3. THE FREEZE PROTECTION COVER SHALL BE MANUFACTURED BY WEATHER GUARD BLANKET OR APPROVED EQUAL. THE BLANKET SIZE TO BE APPROVED BY THE CITY.
4. SEE SHEET W–~~17~~ 16 FOR BACKFLOW PREVENTER ENCLOSURE AND CONCRETE PAD DETAILS.

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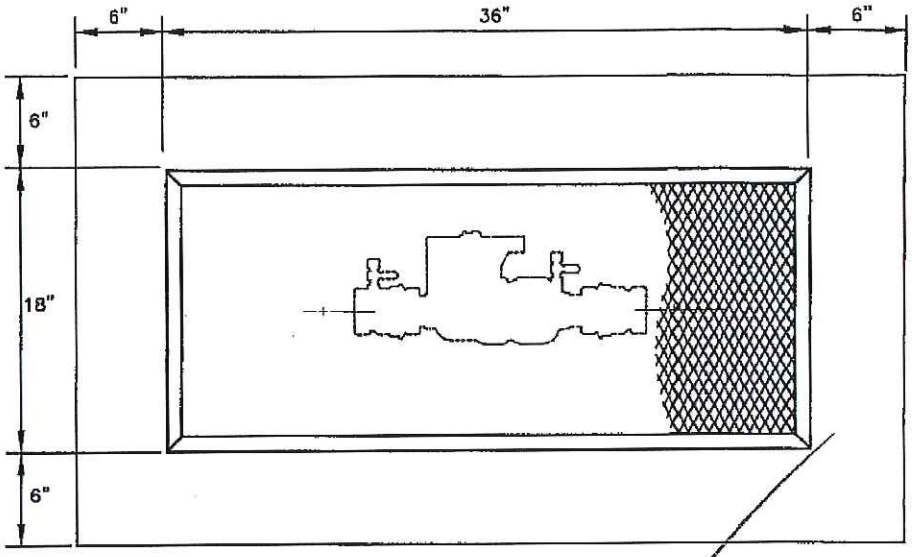
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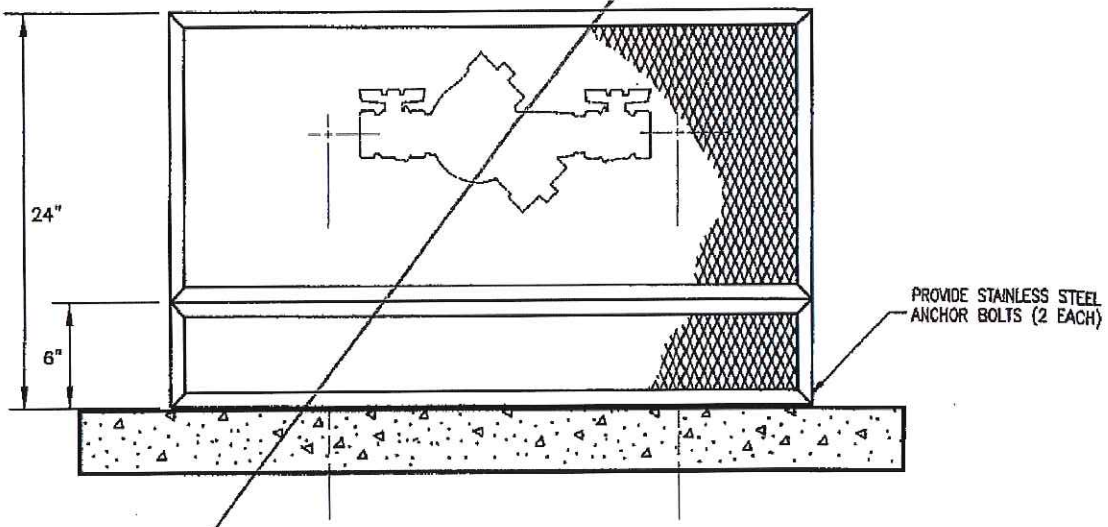
$\frac{3}{4}$" TO 2" REDUCED PRESSURE BACKFLOW PREVENTER INSTALLATION

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PROTECTIVE ENCLOSURE DETAIL

NOTES:

1. THE BACKFLOW PREVENTER PROTECTIVE ENCLOSURE AND MISCELLANEOUS STEEL SHALL BE GALVANIZED AND PAINTED WITH VISTA GREEN ENAMEL PAINT OR POWDER COATED GREEN. THE ENCLOSURE IS AVAILABLE AT WEST VALLEY SUPPLY (559) 945-4500.
2. THE CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI. ALL CEMENT SHALL BE PORTLAND TYPE II WITH A MINIMUM OF 5 SACKS OF CEMENT PER CUBIC YARD OF CONCRETE.

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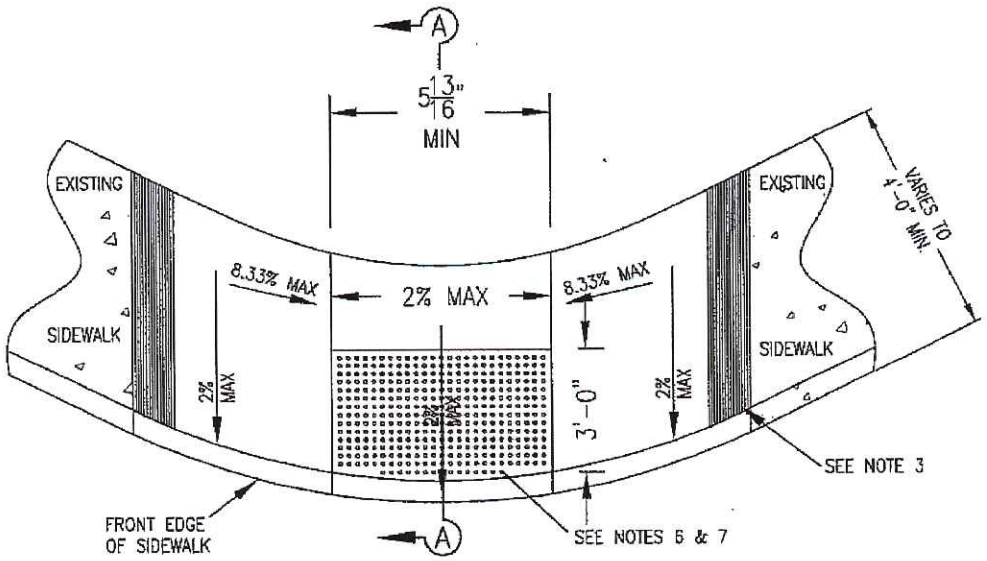
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¾" TO 2" REDUCED PRESSURE
BACKFLOW PREVENTER INSTALLATION

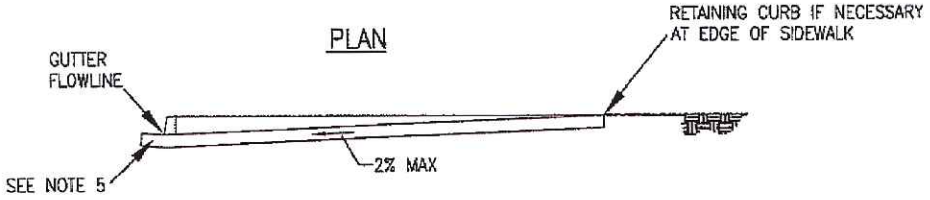
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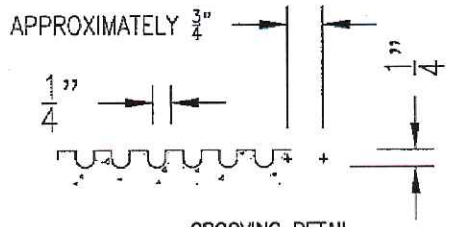
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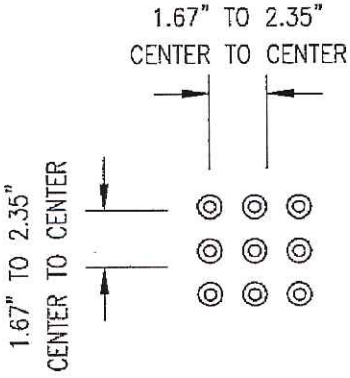
SECTION A-A



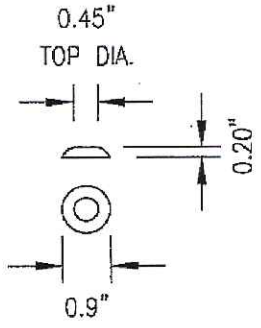
GROOVING DETAIL

GENERAL NOTES

1. THE CURB RAMP SHALL BE OUTLINED, AS SHOWN, WITH A 1'-0" WIDE BORDER WITH ¼" GROOVES APPROXIMATELY ¾" ON CENTER. SEE GROOVING DETAIL.
2. TRANSITIONS FROM RAMPS AND LANDING TO WALKS, GUTTERS OR STREETS SHALL BE FLUSH AND FREE OF ABRUPT CHANGES.
3. MAXIMUM SLOPES OF ADJOINING GUTTERS, THE ROAD SURFACE IMMEDIATELY ADJACENT TO THE CURB RAMP OR ACCESSIBLE ROUTE SHALL NOT EXCEED 5 PERCENT WITHIN 4'-0" OF THE TOP AND BOTTOM OF THE CURB RAMP.
4. CURB RAMPS SHALL HAVE A DETECTABLE WARNING SURFACE THAT EXTENDS THE FULL WIDTH AND 3'-0" DEPTH OF THE RAMP. DETECTABLE WARNING SURFACES SHALL CONFORM TO THE DETAILS ON THIS DRAWING. THE CAST IN PLACE YELLOW RAISED TRUNCATED DOME MANUFACTURED BY ARMOR-TILE MAY BE PURCHASED FROM WHITE CAP INDUSTRES OR APPROVED EQUAL.
5. THE EDGE OF THE DETECTABLE WARNING SURFACE NEAREST THE STREET SHALL BE BETWEEN 6" AND 8" FROM THE GUTTER FLOWLINE.
6. THE MINIMUM SIDEWALK AND RAMP THICKNESS, "T", SHALL BE 3½" MINIMUM.
7. UTILITY PULL BOXES, MANHOLES, VAULTS AND ALL OTHER UTILITY FACILITIES WITHIN THE BOUNDARIES OF THE CURB RAMP WILL BE RELOCATED OR ADJUSTED TO GRADE PRIOR TO, OR IN CONJUNCTION WITH, CURB RAMP CONSTRUCTION.



RAISED TRUNCATED DOME PATTERN (IN-LINE) DETECTABLE WARNING SURFACE



RAISED TRUNCATED DOME

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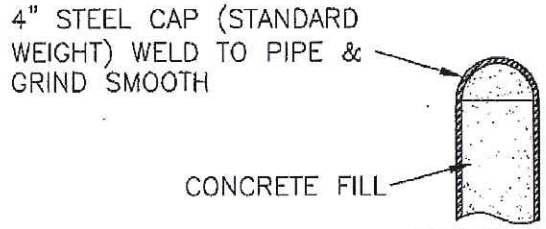
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HANDICAP RAMP DETAIL

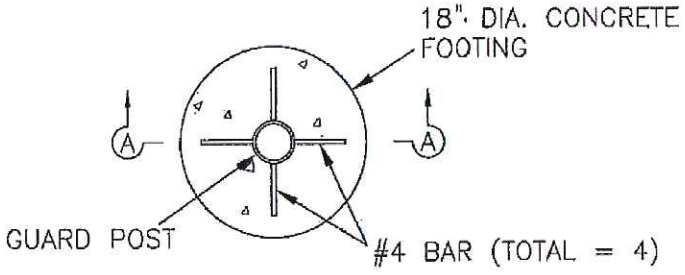
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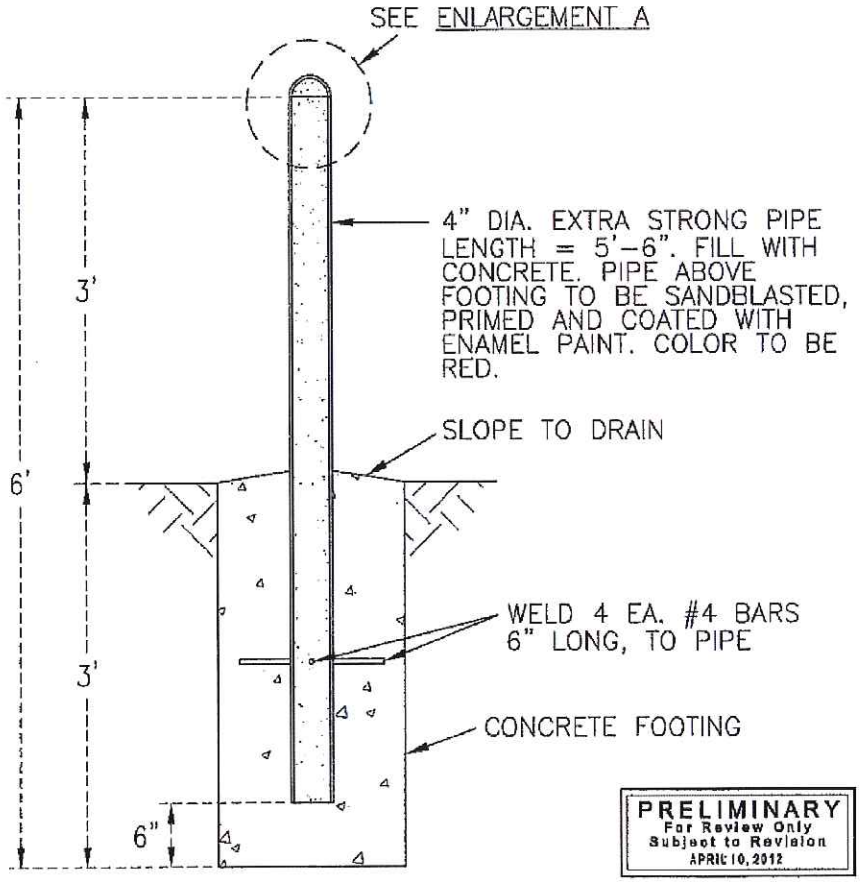
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ENLARGEMENT A



PLAN



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SECTION A-A

NOTES:
1. THE CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI. ALL CONCRETE SHALL HAVE A MINIMUM OF 5 SACKS OF CEMENT PER CUBIC YARD OF CONCRETE.
2. THE CONTRACTOR SHALL FILL COMPLETED GUARD POSTS WITH CONCRETE AND ALLOW TO SET A MINUMUM OF TWO (2) DAYS PRIOR TO INSTALLATION.

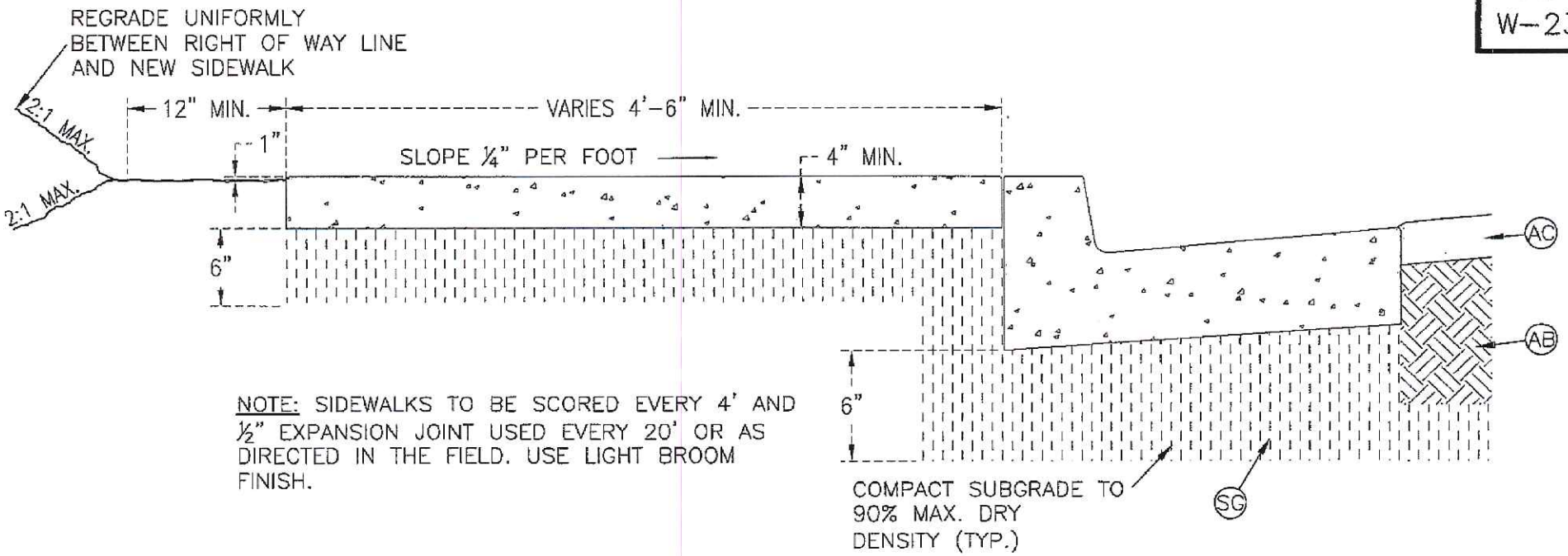
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GUARD POST
INSTALLATION

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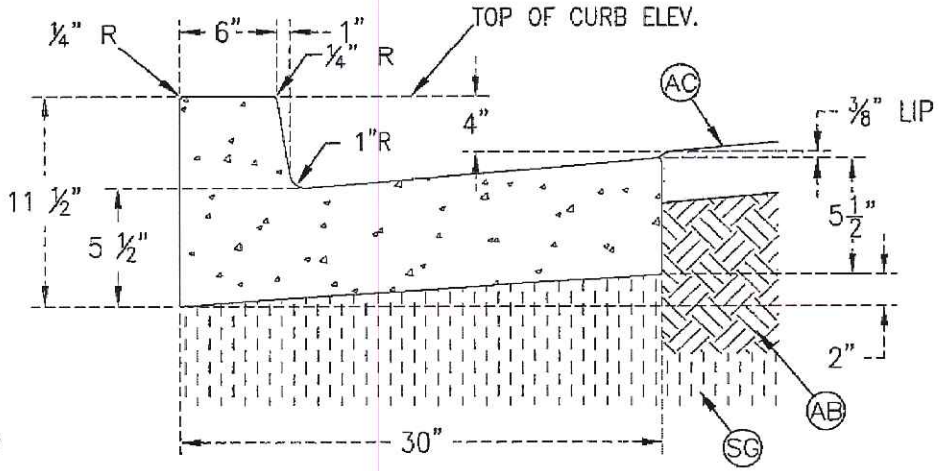
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NOTE: SIDEWALKS TO BE SCORED EVERY 4' AND ½" EXPANSION JOINT USED EVERY 20' OR AS DIRECTED IN THE FIELD. USE LIGHT BROOM FINISH.

TYPICAL CITY SIDEWALK DETAIL

(INCLUDE COST OF THE COMPACTED AGGREGATE BASE FILL)



TYPICAL CURB AND GUTTER DETAIL

NOTES:
1. THE CONCRETE SHALL HAVE A MINUMU COMPRESSIVE STRENGTH OF 3,000 PSI. ALL CONCRETE SHALL HAVE A MINIMUM OF 6 SACKS OF CEMENT PER CUBIC YARD OF CONCRETE.

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CITY OF AVENAL
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SIDEWALK, CURB, AND GUTTER DETAILS

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APRIL 2012

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