

RESOLUTION NO. 19-17

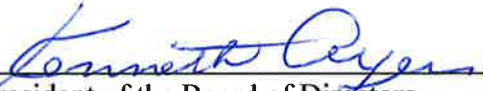
**RESOLUTION OF THE BOARD OF DIRECTORS OF
RUNNING SPRINGS WATER DISTRICT ADOPTING
STANDARDS FOR DOMESTIC WATER AND SEWER
FACILITIES**

WHEREAS, the Board of Directors desires to adopt its Standards for Domestic Water and Sewer Facilities;

NOW, THEREFORE, BE IT RESOLVED that the Board of Directors of Running Springs Water District does hereby approve and adopt the attached Standards for Domestic Water and Sewer Facilities.

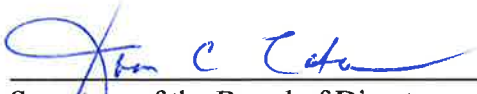
ADOPTED this 19th day of July, 2017.

Ayes: Ayers, Bennett, Terry, Grabow, Mackzum
Noes: 0
Abstentions: 0
Absent: 0



President of the Board of Directors
Running Springs Water District

ATTEST:



Secretary of the Board of Directors
Running Springs Water District

RUNNING SPRINGS WATER DISTRICT



STANDARDS FOR DOMESTIC WATER AND SEWER FACILITIES

**REVISED
July 19, 2017**

Resolution No. 19-17

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DEFINITIONS, TERMS AND ABBREVIATIONS

DEFINITIONS

This document is intended for Developers and Residents who wish to make improvements to existing water or sewer facilities or who wish to install new water or sewer facilities. Engineers that are working on Capital Improvement Projects for the District should use this document as the basis of their design but must also contact the District General Manager for a current boiler plate specification document for use in preparing project specifications.

Wherever used in this Standards, Specifications and Contract Documents, the following shall have the meanings indicated which shall be applicable to both the singular and plural thereof.

Acceptance, Final Acceptance - The formal action by the District's Board of Directors accepting the Work as being complete through a Board Action during a regular or special Board Meeting.

Accepted Bid - The bid (proposal) accepted by the District's Board of Directors through a Board Action during a regular or special Board Meeting.

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

Agreement - The written agreement (contract) executed between the District and the Contractor covering the performance of the Work.

Approved Equal – Means the written approval by the District or the District Engineer that proposed substitutes for a declared standard or piece of equipment is acceptable for the intended use. "Equal" products must meet or exceed the standards of performance of the item(s) specified or detailed on the plans and in the specifications. All requests for substitutions shall be made in writing a minimum 15 working days before the intended Bid Opening or use. For items approved on Capital Projects after a contract has been awarded, cost reductions shall be credited to the District where cost increases will be absorbed by the Contractor. For Developer projects, approval for substitutions will be secured prior to the use and/or installation of the equipment. Substitute items that are installed prior to securing written approval will be subject to removal at the Developer's expense; failure to remove unapproved substitute items will result in non-approval of the work and the Developer will not be allowed to connect to District facilities.

"As-Built" or "Record Drawing" Plans – These are red lined modifications to the contract drawings, schematics or other graphical representation of the work completed by the Contractor. All field changes shall be marked on *both* the Contractor's and Inspector's field copies of the official contract plan set at the time field changes are made. At the end of the project, prior to final acceptance by the District, the Contractor's set of "Record Drawings" shall be submitted to the

District in both hard copy and digital format (digital format shall note the changes via a revision cloud on each sheet).

Bid - The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

Bidder - Any person, firm or corporation submitting a Bid for the Work.

Bonds - Bid, Performance, and Payment Bonds and other instruments of security, furnished by the Contractor and his surety in accordance with the Contract Documents.

Change Order - A written order to the Contractor authorizing an addition, deletion or revision in the Work within the general scope of the Contract Documents, or authorizing an adjustment in the Contract Price or Contract Time.

Certificate of Insurance (or Insurance Certificate) and Endorsement - A document underwritten by an insurance company in the types and amounts listed in the Contract which name the District and Engineer (if applicable) as additional endorsees; Insurance must meet the issuing requirements as set forth in the Contract.

Contract - The written contract (agreement) executed between the District and the Contractor covering the performance of the Work.

Contract Documents - The Contract Documents for District sponsored Capital Improvement Projects include: Request for Bid, Information for Bidders, Bid, Bid Bond, Agreement, Payment Bond, Contract Performance Bond, Certificate of Insurance and Endorsement, Notice of Award, Notice to Proceed, Notice of Completion, Notice of Termination, Change Order, General Conditions, Supplemental General Conditions, Special Conditions, Detailed Technical Provisions, Cost Estimate, Drawings, and Addenda.

The Contract Documents for Developer sponsored Capital Improvement or Other Improvement Projects shall include: Detailed Plan and Profile Drawings, Detailed Technical Specifications, Cost Estimates, Project Schedule, Developer Fees, Inspection Fees, Certified Tests during construction, and submittal of digital and hard copy red lined record drawings at the conclusion of construction.

Contract Performance Bond - A written guarantee from a bonding or insurance company that will ensure the contract work is completed either by the Contractor, or by other forces hired by the District and paid by the Bonding/Insurance Company upon default by the successful Contractor to complete the work in the allotted time frame.

Contract Price - The total monies payable to the Contractor under the terms and conditions of the Contract Documents.

Contract Time - The number and type of days stated in the Contract Documents for the completion of the Work; if the type of day is not specified, it shall mean working day (Monday through Friday, excluding District observed holidays).

Contractor - The person, firm or corporation with whom the District has executed the Agreement.

Detailed Technical Provisions - A part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction system, standards and workmanship.

District - Running Springs Water District, its officials, employees, consultants and agents.

District's Representative - The person or engineering firm authorized by the District to represent it during the performance of the Work by the Contractor and until final acceptance. The District's Representative is referred to throughout the Contract Documents as if singular in number and masculine in gender. The District's Representative means the District's representative or his assistants.

Drawings - The part of the Contract Documents which show the characteristics and scope of the Work to be performed and which have been prepared or approved by the Engineer; see also **Plans**. All plans Drawings or Plans shall contain the following:

Title Sheet
Index Sheet: Index of Drawings, Vicinity Map, Location Map, General Notes
Plan and Profile Sheet(s)
Detailed Drawing Sheet(s)

Engineer - The person, firm or corporation named as such in the Contract Documents.

Field Order - A written order effecting a change in the Work not involving an adjustment in the Contract Price or an extension of the Contract Time, issued by the Engineer to the Contractor during construction.

Laboratory - The laboratory authorized by the District or the District's representative to test materials and work involved in the Project.

Manufacturer - A person, firm or corporation that fabricates, processes, or creates from raw materials or component parts, materials or equipment to be incorporated into the Project.

Notice of Award - The written notice of the acceptance of the Bid from the District to the successful Bidder.

Notice of Completion - The written notice of the acceptance of the completed project by the District's Board of Directors to the contractor.

Notice to Proceed - Written communication issued by the District to the Contractor authorizing him to proceed with the Work and establishing the date of commencement of the Work.

Notice of Termination - The written notice of the termination of the contract by the District to the contractor; this may be with or without cause or for the sole convenience of the District pursuant to the provisions of the Contract.

Payment Bond - A written guarantee from a bonding or insurance company that will ensure that products and services secured by the General Contractor are paid in the event the Contractor defaults or fails to honor its obligations under the contract to each supplier or subcontractor.

Plans - Contract drawings, schematics or other graphical representation of the work to be completed by the Contractor.

Plan Review by the District (Developer Plans) -The District will review plans submitted by Developers within 15 working days for the first review and ten (10) working days for each subsequent review. Plan reviews in excess of three (3) will require the Developer and the Developer's Engineer to meet with the District's General Manager, appropriate water, sewer or fire staff, and the District Engineer to formulate a way to resolve the outstanding issues. Plan review by the District and/or the District Engineer may be accelerated by payment of a fast-track fee established by District Resolution each Fiscal Year. Upon payment of the appropriate fees and submittal of five (5) bond sets of plans and accompanying specifications (if any) as well as a digital copy in PDF format, the review timer will start.

Project - The undertaking to be performed as provided in the Contract Documents.

Request for Bid - The District shall either formally or informally request sealed quotes, or "bids" for services to be provided by a Contractor. Formal Bid Requests shall be published in accordance with either the State Public Contracting Code or the Federal contracting Requirements and will be open to all eligible Contractors so licensed in accordance with the Notice Inviting Bids. Informal Bid Requests will be issued to those Contractors already on a Pre-Qualified List of Contractors; a Notice Inviting Bids will not be published and only those Contractors that are pre-qualified and that have been invited will be allowed to submit a quote or bid to the District for the work proposed.

Resident Project Representative - The authorized representative of the District who is assigned to the Project site or any part thereof.

Shop Drawings - All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a Subcontractor, Manufacturer, Supplier or distributor, which illustrate how specific portions of the Work shall be fabricated or installed. Six (6) sets of each are required for review; digital copies are permissible but the Contractor/Developer will pay for printing costs incurred either by the District or the District Engineer necessary for providing the requisite originally stamped document that is to remain on-site during the progress of the project. Upon

approval by the District, two (2) copies will be returned to the Contractor/Developer for its use during construction; one (1) set bearing the original approval stamp shall remain on-site for the duration of the project.

Special Conditions - Modifications to Detailed Technical Provisions.

Specifications - The General Conditions, Supplemental General Conditions, Special Conditions, and Detailed Technical Provisions of these Contract Documents.

Standard Drawings - These Standard Drawings shall form the basis of all District project drawings; the design engineer shall incorporate the appropriate standard into the project design or shall modify the standard as needed to fit site conditions; modifications to the Standard Drawings shall be shown on the contract documents with the intended modifications and shall state such on the drawing that the standard has been modified – hand or digitally altered District Standards are not acceptable.

Subcontractor - An individual, firm or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work at the site.

Substantial Completion - That date as certified by the District Engineer when the construction of the Project or a specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the Project or specified part can be utilized for the purposes for which it is intended.

Supplemental General Conditions - Modifications to General Conditions that are specifically applicable to a specific project.

Supplier - Any person or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the site.

Utility - Public or private fixed works for the transportation of fluids, gases, power, signals or communications.

Work - All labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in the Project.

Written Notice - Any notice to any party of the Agreement relative to any part of this Agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address, or delivered in person to said party or his authorized representative on the Work.

TERMS

Wherever used in the Contract Documents, the terms “directed”, “required”, “permitted”, “ordered”, “designated”, “prescribed”, or terms of like import are used, it shall be understood that the direction, requirements, permission, order, designation, or prescription of the District’s Representative is intended. Similarly, the terms “approved”, “acceptable”, “satisfactory”, “or equal”, or terms of like import shall mean approved by or acceptable to or satisfactory to the District’s Representative, unless otherwise expressly stated.

The word “provide” shall be understood to mean furnish and install.

ABBREVIATIONS

AC	asphalt cement
ANSI	American National Standards Institute
ASA	American Standards Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
Cal-OSHA	California Occupational Safety and Health Administration
CBC	California Building Code
CFC	California Fire Code
CI	cast iron
CMI&C STL	cement mortar lined and coated steel
DI	ductile iron
DDW	Division of Drinking Water, State Water Resources Control Board
ft	foot or feet
g	gram or grams
gpm	gallon(s) per minute
HDPE	high density polyethylene
in	inch or inches
ISO	International Organization for Standardization
MCC	motor control center
mg/L	milligrams per liter
NEC	National Electric Code
NFPA	National Fire Protection Association
NGS	National Geodetic Survey
OSHA	Occupational Safety and Health Administration

PLC	programmable logic controller
psi	pounds per square inches
PVC	polyvinyl chloride
rpm	revolution(s) per minute
RSWD	Running Springs Water District
RWQCB	Regional Water Quality Control Board
SCADA	Supervisory Control and Data Acquisition
SCAQMD	South Coast Air Quality Management District
SSPC	Steel Structures Painting Council
TW	twin wire
U/L	Underwriters' Laboratories, Inc. or UL
UFC	Uniform Fire Code
VFD	variable frequency drive

NOTICE REGARDING MATERIALS THAT DO OR MAY CONTAIN ASBESTOS

The Contractor and Developer are hereby noticed that some existing District owned facilities were constructed prior to 1980 and do or may contain asbestos fibers. Materials in which asbestos may or will be found include asphalt cement or transit pipe, truss pipe, concrete blankets, insulation, etc.

The Contractor shall follow California Occupational Safety and Health Administration (Cal-OSHA) requirements and guidelines for the connection to asbestos containing material, including tapping and the removal of pipe sections; only qualified persons/firms certified by the State of California shall cut and remove pipe or other asbestos containing materials. Steps shall be taken by the Contractor to prevent friable asbestos or other asbestos particles regardless of size from entering the soil, the groundwater table, surrounding streams, or the air.

**PART 1.
DESIGN CRITERIA**

SECTION 1.1. DOMESTIC WATER DESIGN CRITERIA

A Feasibility Study shall be performed by the District Engineer to ensure District facilities have the capacity to supply both domestic and fire protection flow the newly developed areas. The Developer shall pay the fee to the District prior to the preparation of the Study. A full set of plans and information that includes the number of dwelling units, fixture units and flow calculations shall be provided prior to the commencement of the Study. Once the Study has been completed, the Developer will be directed to the most logical connection point for the facility, or if the Developer will be required to install a new water main line along with the required connection point.

The following requirements pertain to the design and preparation of Plans for construction of the various components to the domestic water system.

1.1.01. GENERAL

- a. Scope - All wells, transmission and distribution mains, storage reservoirs and booster stations to be owned, maintained and/or operated by the District shall be designed and plans prepared in accordance to the criteria set forth in this section, and shall be so designed to conform to all applicable State and local laws, ordinances and regulations.
- b. Design Competence - In general, all water facilities shall be designed by Professional Engineers licensed in the State of California according to accepted practice in the water field. All designs of booster stations and water reservoirs shall be approved by the District. The Developer shall provide the District with an estimate of the design cost and shall submit plans prepared by its engineer to the District for approval prior to beginning the work.
- c. Legal Access - Each lot to be served by water shall abut a public street or recorded easement containing a water line, or be provided with permanent legal access to such waterline. Permanent legal access or easement shall be a minimum of 25-feet in width and shall be granted to Running Springs Water District in perpetuity for the sole purpose of maintaining utilities within said easement.
- d. Deviations - Deviations from any of the criteria adopted herein may be permitted upon written request to and approval by the District.
- e. Rules and Regulations - Other controlling documents regarding water service include, but are not limited to, *Running Springs Water District Ordinance No. 8* and *Resolution No. 16-82*.

1.1.02. WATER DOMESTIC USE DEMAND

Water flow for domestic use shall be designed based on the following demand data:

Average Daily Use of one hundred and eighty (180) gallons per capita per day
Peak Daily Flow of two (2) times the average daily flow
Peak Hourly Flow of four (4) times the average annual daily flow

1.1.03. FIRE FLOW

a. Fire Flow - Fire flow demand on the system shall be as follows:

Single Family Residential (R-1)	1,000 gallons per minutes (gpm) for 3 hours
Single Family Residential (R-1) adjacent to forest service lands.....	
.....	2,000 gpm for 2 hours
Multiple-Family Residential (R-2 & R-3).....	1,500 gpm for 6 hours
Commercial.....	2,250 gpm for 6 hours
Institutional.....	2,250 gpm for 6 hours

The above flows shall be based on twenty (20) pounds per square inch (psi) minimum residual pressure at the point of fire flow.

Due to the nature of forest wild fires, Fire Pumps shall not be used to meet fire flow demand.

In addition to the flow requirements at the fire hydrant, the Developer will be required to provide a fire sprinkler system for each structure erected on each lot in accordance with the current Building Code. A fire meter will be installed at each lot per District Standard Drawing No. W-22 for the interior fire sprinkler system. This system shall be designed by a qualified licensed contractor or engineer.

- b. Fire Access - All roads in the District receiving fire protection service shall be paved with asphalt concrete or Portland cement concrete to a minimum width of twenty-six (26) feet. Dead-end roads shall terminate in a cul-de-sac with turning radius to accommodate fire trucks without the need to back up.
- c. Other Fire Requirements - Developers shall contact the District's Fire Chief regarding additional rules and regulations of the District, the latest addition of the California Building Code (CBO), the Uniform Fire Code (UFC) and the International Organization for Standardization (ISO).

1.1.04. SUPPLY

- a. General - The supply system shall be designed as a multi-source system capable of handling daily peak demand with the largest source of supply not in operation.
- b. Wells - Wells shall be housed in a structure compatible with the surroundings. Provisions within this structure shall be made to facilitate removing of pumps, motors and other

equipment. Wells shall be located upon land to which legal access is provided and for which a permanent easement or title is recorded. Vertical turbine pumps shall meet the standards set forth in American Water Works Association (AWWA) Standard E-101.

1.1.05. STORAGE

Storage capacity shall consist of operational storage plus fire flow storage as related to each pressure zone. Operational storage shall consist of fifty percent (50%) of the peak daily flow for one (1) day. The inclusion of emergency storage shall be considered for pressure zones adjacent to forest service lands.

Design of welded steel water reservoirs shall conform to AWWA D-100, latest edition; the freeboard requirement for sloshing shall not apply. Appurtenances shall include two (2) wall access hatches, gauge board, drain pipe, roof hatch, galvanized ladder, remote water level monitoring equipment, four (4) one-and-one-quarter-inch (1-1/4") heavy half coupling nozzles with bronze bushings and any other appurtenances required by AWWA or California Occupational Safety and Health Administration (Cal-OSHA).

Glass-lined storage tanks will be reviewed on a case-by-case basis.

Storage facilities shall be located upon land to which legal access is provided and for which a permanent easement or title is recorded. Access road shall be paved and the site landscaped and protected by chain-link fence.

1.1.06. BOOSTER STATIONS

- a. General - Booster stations shall be located in areas accessible to both men and equipment and upon land to which legal access is provided and for which a permanent easement or title is recorded.
- b. Pumps - Booster stations shall be designed with a minimum of two (2) pumps. In systems where pumps shall meet instantaneous peak demands, without supplementary flows from storage, the pump capacity shall be based on peak hour demand with one (1) pump out of service. In systems with adequate available flows from storage to supplement pumping, pump capacity shall be based on peak day demand with one (1) pump out of service. Protection shall be provided to protect pumps from operating under no-flow conditions, over pumping and overloading by means of appropriate automatic controls. Vertical pump turbines shall meet or exceed the standards set forth in AWWA Standard E-101.
- c. Structure - Booster pumps shall be housed in a weather-tight structure compatible with the surroundings. Provisions within this structure shall be made to facilitate removing of pumps, motors and other equipment.

1.1.07. TRANSMISSION AND DISTRIBUTION MAINS

- a. Capacity - The capacity of water mains shall be determined by using the Williams & Hazen Formula with a “C” value = 140 for polyvinyl chloride (PVC) pipe. The velocity of the water in the pipe shall be limited to eight (8) feet per second maximum under fire flow conditions.
 - 1. The minimum pipe diameter shall be eight (8) inches unless a smaller diameter is approved by the District.
 - 2. Minimum pressure in mains shall not be less than forty (40) psi during peak operations without fire flows and shall not be less than twenty (20) psi during peak operations with fire flow.
- b. Depth of Cover - A three and one-half (3-1/2) foot (42”) minimum depth of cover from top of pipe to finish grade or top of pavement shall be maintained on all pipelines below grade.
- c. Location and Alignment - Wherever possible, water mains shall be located in public streets parallel to street centerlines. On a typical mountain road section the main shall be located five (5) feet from the center of paving on the “fill” side of the road.
- d. Clearance from Sewer Lines - Where possible, a minimum horizontal clear distance of ten (10) feet shall be provided between water line and sewer line laid parallel. Where such lines cross a minimum vertical clearance of one-foot (1-ft) shall be provided with the sewer under the water line.

If the above conditions cannot be met, special construction will be required according to the requirements set forth on Standard Drawing No. S-1.

- e. Mains Under Structures - No water mains shall be located beneath a structure except as approved in writing by the District.
- f. Looped Lines and Flush-Outs - Looped lines shall be provided where economically feasible. Where dead-ends are necessary, include provisions for flushing. No flushing device shall be connected directly to a sewer. Flush-out assembly and size shall conform to Standard Drawing No. W-8.

Fire Hydrants may be used for flush-out, where applicable and upon approval by the District.

- g. Valves - Provide sufficient valves to permit isolation without taking adjacent sections out of service for repair of leaks and breaks and in accordance with good water works practice. Except for transmission lines, in no case should a length of pipe greater than one thousand

three hundred twenty (1,320) feet be left without valve control. A valve box and cover shall conform to Standard Drawing No. W-11 in these Specifications, unless part of an assembly covered by another Standard Drawing.

h. Fire Hydrants - Fire hydrants shall be spaced along distribution mains as follows:

- Single Family Residential (R-1).....600 feet maximum
- Multiple-Family Residential, Commercial or Industrial.....300 feet maximum

Spacing of fire hydrants shall not exceed the above maximum distances but hydrants may be spaced at closer intervals in conformance with requirements of local fire control authorities. Hydrants shall be located at street corners or intersections whenever practical and in all cases on the “bank” side of the road section. Hydrants shall be six (6) inch with two, two and one-half (2 - 2-1/2) inch outlets and one, four and one-half (1 - 4-1/2) outlet streamer. Hydrant installation assembly shall conform to Standard Drawing No. W-2.

i. Service Connection – Domestic Service connection assembly shall conform to Standard Drawings No. W-5A or W-5B. Residential fire service connection assembly shall conform to Standard Drawing No. W-22. Irrigation Service is to be considered on a case-by-case basis pursuant to current District Resolutions and Policies.

j. Air and Vacuum Valves - Air release valves, air vacuum valves and air-vacuum combination valves shall be used in supply, transmission and distribution lines according to accepted practice in the water field. Air-vacuum combination valves shall be provided at all high points in distribution system mains.

Air and vacuum valve assemblies shall conform to Standard Drawing No. W-6.

k. Blow-Offs - Blow-off assemblies will be required at all low points in distribution system mains except at dead-ends where a flush-out is provided. Blow-off assemblies shall conform to Standard Drawing No. W-7 in these Specifications.

l. Thrust Blocks - Concrete thrust blocks shall be installed, as required, according to Standard Drawings No. W-3A and W-3B in these Specifications.

m. The Contractor shall provide and install locator wire over all plastic pipe water mains. The wire shall be 12 gauge twin wire (TW) solid, soft drawn, insulated copper wire. The wire shall be wrapped around the pipe at ten (10) foot intervals and brought up inside each gate valve to within six (6) inches of the valve cover all in accordance with Standard Drawing No. W-14 in these Specifications.

1.1.08. ELECTRICAL EQUIPMENT

- a. All electrical starters, switches, lights, motors, fixtures, controllers and instruments shall be enclosed and constructed in accordance with the National Board of Fire underwriter's specifications to prevent the hazardous conditions anticipated. Arc-flash and shock hazard warning marking shall be located in accordance with NFPA 70 of National Electrical Code. The Health and Safety Code of the State of California shall also be complied with. Outside type convenience outlets shall have ground fault with separate circuit and breaker.
- b. All starters shall be of the magnetic type and shall be provided with hand-off automatic selector switches. Only copper wire conductors shall be permitted.
- c. The motor starter shall be operated automatically from a wet well liquid-level control. Controls of the air-purging type are required with programmable controller and modem capable of sending signals to a SCADA system located at the District office.
- d. All pump motors shall be of variable frequency drive (VFD) unless otherwise approved by the District.
- e. Programmable Logic Controllers (PLCs) shall be TESCO L2000 or approved equal. Autodialer shall be AD-2000, 4 Channel Auto Voice Dialer or approved equal.

1.1.09. AUTOMATIC CONTROLS

Wells, booster stations and storage facilities shall be electrically interconnected to give the system complete automatic control. Provisions shall be made for manual operation of all controls in the event of failure of automatic controls and all automatic controls shall be designed fail-safe. A sensor shall be installed the full depth of the well with a gauge in the control panel that reads in feet of water above the well pump. Arc-flash requirements shall be met with all electrical equipment to be installed in accordance with the latest National Electric Code (NEC) requirements.

1.1.10. MISCELLANEOUS REQUIREMENTS

- a. Pump Discharge Runs - A gate valve shall be placed on the discharge line of each pump. A check valve shall be placed on each discharge line between the gate valve and the pump.
- b. Sufficient valves shall be provided to isolate each pump from the system.
- c. Air release valve, properly vented to the outside of the pump house, shall be provided on each pump discharge line between the check valve and the pump.

- d. Discharge lines shall be protected by a valve to prevent pressure surges created by starting and stopping of the pumps. A pressure relief valve shall also be required in the discharge line.

1.1.11. PLAN PREPARATION

Plan prepared for additions to the District's water system and submitted to the District for approval shall be in substantial form and meet the requirements as herein set forth.

- a. The Drawings shall be on Mylar or vellum in the size of 36 inches by 24 inches (36" x 24" – D-size Format) or other sizes approved by the District. Digital copies in PDF, AutoCAD or other formats acceptable to the District recorded in appropriate media may be required.
- b. The General Notes shall appear once on the first plan and profile sheet. A key map showing all roads shall be shown on the second plan sheet. All required certifications and approvals shall also appear on the first sheet
- c. Each sheet shall have a title block in the lower right-hand corner with approval blanks for the District and District Engineer. The title block shall show the designation of "Running Springs Water District" and the name of the improvement.
- d. Each sheet shall have a "North" arrow, when applicable.
- e. Plan and profile are required for pipelines eight (8) inches in diameter and larger, or for all pipelines not in a paved street. The plan and profile shall have a scale of 1 inch = 40 feet horizontal and 1 inch = 4 feet vertical unless otherwise approved by the District.
- f. At least one (1) bench mark shall be shown and/or described on each plan and profile sheet. The indicated elevation shall be referenced to a National Geodetic Survey (NGS) datum.
- g. Profiles shall show pipe size; existing ground elevation; appurtenances; the depth, size, location and nature of all other utilities which cross over or under the water lines at the location and nature of special construction such as concrete blankets or encasements; flow line elevation at grade changes; and any other information pertinent and necessary to the proper construction and recordation of the water lines.
- h. The Plans shall show the tract and lot numbers of all properties adjacent to the water lines to be constructed.
- i. The Plans shall show limits and types of street pavements, curb, gutter and sidewalk.
- j. The Plans shall show all right-of-way lines, the distance from the centerline of all roads, rights-of-way and easements to the center of the water main to be constructed and other distances necessary to easements.

- k. The Plans shall show location of proposed service connections; tie to street stationing.
- l. The Plans shall show exact location of all structures within twenty (20) feet of the water centerline.
- m. Water line and sewer line plans and profiles may be combined provided that the plan and profile preparation requirements for sewers are satisfied.

1.1.12. TECHNICAL SPECIFICATIONS

The District's Technical Specifications shall be utilized in the design of water facilities. Technical Specifications are in Part 4 in these Specifications.

1.1.13. STANDARD DRAWINGS

The District's Standard Drawings shall be utilized in the design of water facilities. Standard Drawings are in Part 5 in these Specifications.

1.1.14. PRE-DESIGN CONFERENCE

A Pre-Design Conference shall be held with engineers and District staff prior to development of Plans in order that any special considerations may be discussed.

1.1.15. DISTRICT ENGINEER CERTIFICATION

The following certificate shall be placed on the front page of the improvement Plans:

I CERTIFY THAT THE DESIGN OF THE WATER SYSTEM HEREON IS
UBSTANTIALLY IN ACCORDANCE WITH THE REQUIREMENTS OF THE
RUNNING SPRINGS WATER DISTRICT.

Approved by: _____ Date: _____
RSWD Engineer

1.1.16. IMPROVEMENT PLAN QUALIFICATION

Approved Construction Plans shall be valid for a period of one (1) year from the date of the District's approval. If construction has not started within the above period of time, the Construction Plans will be resubmitted by the Developer for additional review and subsequent approval by the District. The new approval will be contingent upon revising the Drawings to reflect changes in District Standards, current Building, Plumbing and Health and Safety codes, and changes in actual files conditions.

SECTION 1.2. SEWER DESIGN CRITERIA

A Feasibility Study shall be performed by the District Engineer to ensure District facilities have the capacity to accept and handle proposed flow from the newly developed areas. The Developer shall pay the fee to the District prior to the preparation of the Study. A full set of plans and information that includes the number of dwelling units, fixture units and flow calculations shall be provided prior to the commencement of the Study. Once the Study has been completed, the Developer will be directed to the most logical connection point for the facility, or if the Developer will be required to install a new sewer main line along with the required connection point.

The following requirements pertain to the design and preparation of Plans for construction of the various components to the sewer system.

1.2.01. GENERAL

- a. Scope – All sewers, sewage lift stations, treatment facilities and appurtenances to be owned, maintained and/or operated by the District shall be designed according to the criteria set forth in this section. The same criteria shall hold for system served but not owned, maintained and/or operated by the District insofar as said criteria may affect the efficiency of the District's system. All additions to the District's system shall be plan-checked and inspected by the District.
- b. Design Competence – All District facilities shall be designed by Professional Engineers licensed in the State of California according to accepted practice in the sewerage field. All designs of sewage lift stations and wastewater treatment facilities shall be approved by the District. The Developer shall provide the District with an estimate of the design cost and shall submit plans prepared by its engineer to the District for approval prior to beginning the work.
- c. Sewage Lift Stations and Inverted Siphons – Every effort should be made, within economic reason, to avoid sewage lift stations. Inverted siphons and exposed piping will be allowed only upon written approval from the District, and then only under the most severe circumstances.
- d. Legal Access – Each lot to be served by sewer shall abut a public street or recorded easement containing a sewer, or be provided with permanent legal access to such a sewer. The location of the street, easement or legal access shall permit gravity flow from the lower portion of the lot to the sewer main. Deviations from any of the criteria adopted herein may be permitted upon written request to an approval by the District. Permanent Legal

Access or Easement shall be a minimum of 25-feet in width and shall be granted to Running Springs Water District in perpetuity for the sole purpose of maintaining utilities within said easement.

- e. Rules and Regulations – Other controlling documents regarding sewer service include, but not limited to, *Running Springs Water District Ordinance No. 23*.
- f. Roughness Coefficient – The roughness coefficient used in design shall be $n = 0.013$ for all sewers. If any Manufacturer claims that the “n” factor of his pipe should be less, he must submit documented evidence to substantiate his claim. The reliability of such evidence shall be determined by the District.
- g. Size - All gravity sewer pipes up to and including twelve (12) inch diameter shall be sized to carry the peak flow when fifty percent (50%) full (i.e., $q/Q \leq 0.50$). All larger sewer pipe, except those designed as laterals shall be sized to carry the peak flow when seventy five percent (75%) full (i.e., $q/Q \leq 0.75$). This requirement shall apply regardless of the cross section of the sewer. No sewer main with an internal diameter less than eight (8) inches shall be installed without prior written approval of the District.
- h. Sewer Slopes and Velocities – The minimum allowable slope is that which will give a velocity of not less than two (2) feet per second at peak flow. The purpose of this requirement is to prevent sewage sedimentation and subsequent generation of corrosive gases. The velocity shall be determined by means of the “Manning Formula”, i.e.:

$$V = \frac{1.49}{An} r^{\frac{2}{3}} s^{\frac{1}{2}}$$

In sewers of uniform size passing through manholes without a major change in direction of slope, there shall be no arbitrary drop between inlet and outlet. In sewers which change slope but do not change directions or size, the slopes of the incoming sewers shall be carried through to the outlet of the manhole. Where diameters change, and in junctions involving major direction or slope changes, the various elevators shall be chosen to match water surfaces under average flow conditions at ultimate development of the tributary area (not under maximum flow conditions).

- i. Minimum Slopes – Minimum slopes to be used with various pipe sizes are listed below:

Diameter (inches)	Slope (foot/foot)	Slope (inches/1000 feet)
6	0.0060	72
8	0.0040	48

Diameter (inches)	Slope (foot/foot)	Slope (inches/1000 feet)
10	0.0029	34.8
12	0.0022	26.4
15	0.0016	19.2
18	0.0012	14.4
21	0.0010	12
24	0.0008	9.6

Minimum slopes shall only be used to prevent lengthy runs of deep mains or other critical factors. Under most conditions a minimum slope of one percent ($\pm 1\%$) shall be used.

- j. Exceptions to Minimum Slopes – Where topography limits or prevents the use of minimum slopes as described herein, the District may require an engineer’s report. This report shall describe the alternatives and their economies. The report shall also include an evaluation of prospective maintenance and sewer gas problems. Greater minimum slope than those specified in Section 1.2.01.i hereof may be required where the presence of hydrogen sulfide may be detrimental to and affect the life of the sewer pipe being used.
- k. Slope in Force Main – In force mains, a continuous uphill slope shall be provided from the source to the outlet. The intention is to avoid formation of air pockets.
- l. Curved Sewers – Curvilinear vertical and horizontal alignments will be permitted under the following conditions:
 - 2. No more than one (1) horizontal circular curve and one (1) vertical curve shall be permitted between any two (2) manholes. The curve may be a combination horizontal and vertical, but in no instance may there be more than one (1) vertical and one (1) horizontal curve between two (2) manholes
 - 3. At least one (1) end of the curve shall terminate in a manhole.
 - 4. No sewer on a curvilinear alignment shall be less than eight (8) inch diameter.
 - 5. Curved sewers are necessary to significantly reduce the number of manholes needed or needed to help maintain separation requirements between water main and sewer main.
 - 6. The deflection of joints shall not exceed that recommended by the pipe Manufacturer.

- m. Sewer Under Structure – No sewer main or lateral shall be located beneath a structure except as approved in writing by the District.
- n. Structural Integrity – Provisions shall be made in all cases to preserve the structural integrity of the pipes, conduits, or structures affected.
- o. Depth of Sewer – Permission from the District must be obtained if the following minimum depths cannot be met. In general, the load on the pipe must be considered and adequate precautions should be taken to protect it either by means of encasement support or added strength.

Minimum cover of pipe for various locations:

In public streets in pavement (service to properties permitting).....	5 ft
Lateral sewer (at curb or edge of pavement).....	4 ft
In recorded easement not subject to vehicular traffic.....	3 ft
In recorded easement subject to vehicular traffic.....	5 ft
Stream crossing (below scour line of drainage course, concrete blanket may be required)	3 ft

- p. Sewer Laterals - A sewer lateral serving a single family dwelling or equivalent shall be at least four (4) inch inside diameter. Sewer laterals shall conform to Standard Drawings No S-7 and S-8 and Section 4.19 of these Specifications. Sewer laterals in waterways, easements and deep cuts shall have the end of the lateral brought to minimum depth of five (5) feet from top of ground.
- q. Special Sewer Design Conditions – When it is necessary to construct sewers and appurtenances in areas where a potential erosion hazard exists, individual design considerations shall be given to provide additional protection to the sewer facilities in order to prevent damage. Special design considerations are applicable to stream and canyon crossings, parallel construction to stream beds, construction on steep slopes requiring special anchorage, and shallow sewer construction in roadways. Concrete encasements, cut-off walls, special backfill material (soil cement) and special erosion control facilities may be required.
- r. Clearance from Other Utilities – Special care shall be exercised in locating sewer lines near other utilities, especially water lines. Sewer lines shall, wherever possible, be located one-foot (1-ft) below water lines; where parallel installations occur, a ten-foot (10-ft) horizontal separation shall be maintained. If the above conditions cannot be met, special construction will be required according to the requirements set forth on Standard Drawing No. S-1.

- s. The Contractor shall provide and install locator wire over all plastic pipe sewer mains. The wire shall be 12 gauge twin wire (TW) solid, soft drawn, insulated copper wire. The wire shall be wrapped around the pipe at ten (10) foot intervals and shall terminate at the outside edge of the manhole frame in accordance with Standard Drawing No. S-2 in these Specifications. Install 4" to 6" wide green tape marked "SEWER" or "SANITARY SEWER" at least 4" but no more than 10" above the top of the sewer main; each segment shall be a minimum of 2-feet long spaced at least 10-feet but no more than 14-feet from end to the next end for the length of construction – marker tape shall be centered on the pipe.

1.2.02. OVERSIZING REQUIRED BY DISTRICT

The District may find that the capacity of certain new sewer and sewage lift stations within an area under development should be increased to accommodate future additional development. In such a case, the quantity of additional flow shall be determined by the District's Engineer. The flow resulting from the addition of the developer's and the District Engineer's "computed peak flow" shall be used as the basis of design. The District may pay for any resulting increase in size or depth according to the District's Rules and Regulations.

1.2.03. MANHOLES AND CLEANOUTS

- a. Manhole Location and Spacing – Manholes shall be located at all junctions, all changes in direction (except curved sewers), and all changes in pipe size. Where the distance between manholes required for the foregoing reasons exceeds three hundred (300) feet, good judgment should be used in placing intermediate manholes at points of probable sewer intersections, at beginning or end of curves, or lacking other reasons, at approximately equal intervals. In general, the maximum of three hundred (300) feet should be observed. Good judgment should be used in the locations of manholes along water courses. Manholes and cleanouts shall conform to Standard Drawings No. S-4A, S-4B, S-5 and S-6.
- b. Shallow Manholes – Manholes three (3) feet or less in depth above the shelf shall be of special design; these shall not occur within a public street or other access road that will carry vehicular traffic.
- c. Cleanouts – Dead-end sewer not over one hundred and seventy five (175) feet in length shall terminate in standard cleanouts. Dead-ends over one hundred and seventy five (175) feet shall terminate in standard manholes unless future extension of said dead-end will include a manhole within three hundred (300) feet, in which case a temporary cleanout is permitted; future extension must occur within two (2) years otherwise the more permanent manhole will be required. Sewer mains shall be installed the full width of a parcel where there could be a possibility of the sewer main being extended. Cleanouts shall conform to Standard Drawing No. S-6 and Sections 4.20 of these Specifications.

- d. Drop Manholes – Drop manhole will not be permitted without the written approval of the District.
- e. Frame and Cover – All manholes and cleanouts shall have cast iron frames and covers. Frames and covers shall conform to Standard Drawings No. S-4A, S-4B, S-5 and S-6 and Section 4.20 of these Specifications.

1.2.04. SEWAGE LIFT STATIONS

- a. General – Sewage lift stations shall only be utilized where it is impossible to provide gravity flow to interceptor sewers, trunk sewers, or other portions of the collection system. The use of submersible pumps in a wet well with a separate valve vault is required. Sewage lift stations shall be located in areas accessible to both men and equipment and upon land to which legal access is provided and for which a permanent easement or title is recorded. Where structures above ground are required, the structure shall be compatible with the surroundings. A bypass shall be provided for wet-well maintenance.
- b. Capacity – Capacity of the pumps shall be sufficient to handle ultimate peak flow (i.e. 1.93^* x average daily flow) from the tributary area with one pump out of service. If areas outside the proposed development may best be sewerred to a sewage lift station, the District reserves the right to order oversizing of such facilities and provide reimbursement to the developer for the cost increment of the additional construction. The wet well storage capacity shall be sized to be compatible with pump capacity and to eliminate frequent pump cycling.
- c. Stand-by Power – An emergency generator shall be provided for all lift stations ; the Developer is required to coordinate with the South Coast Air Quality Management District (SCAQMD) for the required permit(s) and shall select the appropriate generator fuel source (natural gas, diesel, propane, etc.). Each Generator shall be capable of running two (2) pumps for a period of not less than 12 hours.
- d. Flow Meter – A digital electromagnetic flow recorder with meter mounted transformer shall be provided in the valve vault or a separate vault. The electromagnetic meter shall be as manufactured by ABB or approved equal.
- e. Pumps and Motors – At least two (2) pumps shall be provided at each lift station. Pump discharge pipe shall be no less than four (4) inches in diameter. The pump shall be installed so that it will maintain a positive head at the suction inlet under normal operating conditions. The speed of the pumps and motors shall be no greater than seventeen hundred and sixty

* Subject to adjustment based on sewer model simulation.

(1,760) revolutions per minute (rpm), and the pump shaft shall not be supported by the motor shaft. Submersible pumps shall be capable of passing a 3-inch (minimum) sphere.

- f. Structure – The wet well or manhole shall be completely separated from the main sewage lift station structure. The sewage lift station structure shall house the motor control center (MCC) and the emergency generator and shall be designed by qualified engineers. Comply with all requirements of the State Division of Industrial Safety during construction of the lift station, including provisions for access, and for the protection of persons and property from mechanical or electrical equipment within the wet well and the supporting building.
- g. Electrical Equipment – All electrical starters, switches, lights, motors, fixtures, controllers and instruments shall be enclosed and constructed in accordance with the National Board of Fire underwriter’s specifications to prevent the hazardous conditions anticipated. Arc-flash and shock hazard warning markings shall be located in accordance with NFPA 70 of National Electrical Code; comply with the Health and Safety Code of the State of California at all times. Outside type convenience outlets and those outlets near water sources shall have ground fault with separate circuit and breaker.
 - 2. All starters shall be of the magnetic type and shall be provided with hand-off, automatic selector switches.
 - 3. The motor starter shall be operated automatically from a wet well liquid-level control. Controls of the air-purging type are required with programmable controller and modem capable of sending signals to a Supervisory Control and Data Acquisition (SCADA) system located at the District office.
 - 4. Stand-by equipment shall be started automatically upon power failure.
 - 5. Control panel components shall be mounted in the front cover and shall include, but not be limited to, the following for each pump.
 - Running Time Meter
 - Running Light
 - Auto-Off-Manual Test Switch
 - Breaker Switch
 - Frequency Counter
 - Digital Display and Logging
 - 6. Only copper wire conductors will be permitted.

7. All pump motors shall be of variable frequency drive (VFD) unless otherwise approved by the District.
 8. Programmable Logic Controllers (PLCs) shall be TESCO L2000 or approved equal. Autodialer shall be AD-2000, 4 Channel Auto Voice Dialer or approved equal.
- h. Miscellaneous Requirements
1. Adequate ventilation shall be provided for all lift stations. The ventilation equipment should have a minimum capacity of six (6) turnovers per hour under continuous operation. With intermittent operation, a two (2) minute turnover should be provided. Equipment shall start automatically with door opening.
 2. Gate valve and lever and weight operated swing-check valve shall be located within a separate valve vault.
 3. Chemicals or air injecting into the force main may be required by the District, depending upon an analysis of possible sulfide conditions.
 4. Steel fabricated factory units, if permitted, shall be provided with cathodic protection.
 5. High level alarm circuits shall be wired to a common terminal to transmit signals to the District office via the District's SCADA system.
 6. An electric thermostatically controlled heater shall be provided in the generator building.
 7. Generator building for lift station equipment shall be provided with water service with back-flow prevention device, wash up sink, heater and 115 volt outlets.

1.2.05. PLAN PREPARATION

Plan prepared for additions to the District's sewerage system and submitted to the District for approval shall be in substantial form and meet the requirements as herein set forth.

- a. The Drawings shall be on Mylar or vellum in the size of 36 inches by 24 inches (36" x 24" – D-size Format) or other sizes approved by the District. Digital copies in PDF, AutoCAD or other formats acceptable to the District recorded in appropriate media may be required.
- b. The General Notes shall appear once on the second plan sheet which shall also contain a vicinity map and a location map of the work area. A key map showing all roads shall be

- shown on the second plan sheet. All required certifications and approvals shall appear on the first sheet.
- c. Each sheet shall have a title block in the lower right-hand corner with approval blanks for the District and District Engineer. The title block shall show the designation of “Running Springs Water District” and the name of the improvement.
 - d. Each sheet shall have a “North” arrow.
 - e. The plan and profile shall have a scale of 1 inch = 40 feet horizontal and 1 inch = 4 feet vertical unless otherwise approved by the District.
 - f. At least one (1) bench mark shall be shown and/or described on each plan and profile sheet. The indicated elevation shall be referenced to a National Geodetic Survey (NGS) datum.
 - g. The profile shall show the size of pipe; the pipe class; manhole center location by station; invert; elevation of sewer pipe at manhole center; the existing ground elevation; the grade of pipes in percent; the depth, size, nature and location of all other utilities which cross over or under the sewer; location and nature of special construction such as the encasement or bored casings; and any other information pertinent and necessary to the proper construction and recordation of the sewers, unless otherwise approved by the District.
 - h. The Plans shall show the tract and lot numbers of all properties adjacent to the sewer to be constructed.
 - i. The Plans shall show limits and types of street pavements, curb, gutter and sidewalk.
 - j. The Plans shall show all right-of-way lines, the distance from the centerline of all roads, rights-of-way and easements to the center of the sewer to be constructed.
 - k. The Plans shall show location of proposed sewer service connections; tie to street stationing.
 - l. The Plans shall show exact location of all structures within fifty (50) feet of the centerline of the sewer to be constructed. Show all water wells within three hundred (300) feet of the centerline of the sewer to be constructed.
 - m. Sewer line and water line plans and profiles may be combined provided that the plan and profile preparation requirements for water lines are satisfied.

1.2.06. TECHNICAL SPECIFICATIONS

The District’s Technical Specifications shall be utilized in the design of sewer facilities. Technical Specifications are in Part 4 in these Specifications.

1.2.07. STANDARD DRAWINGS

The District's Standard Drawings shall be utilized in the design of sewer facilities. Standard Drawings are in Part 5 in these Specifications.

1.2.08. PRE-DESIGN CONFERENCE

A Pre-Design Conference shall be held with the Developer's engineers and District staff prior to development of Plans in order that any special considerations may be discussed.

1.2.09. DISTRICT ENGINEER CERTIFICATION

The following certificate shall be placed on the front page of the improvement Plans:

I CERTIFY THAT THE DESIGN OF THE SANITARY SEWER SYSTEM HEREON IS SUBSTANTIALLY IN ACCORDANCE WITH THE REQUIREMENTS OF THE RUNNING SPRING'S WATER DISTRICT.

Approved by: _____ Date: _____
RSWD Engineer

1.2.10. IMPROVEMENT PLAN QUALIFICATION

Approved Construction Plans shall be valid for a period of one (1) year from the date of the District's approval. If construction has not started within the above period of time, the Construction Plans will be resubmitted by the Developer for additional review and subsequent approval by the District. The new approval will be contingent upon revising the Drawings to reflect changes in District Standards, current Building, Plumbing and Health and Safety codes, and changes in actual field conditions.

**PART 2.
PROCEDURAL DOCUMENTS**

SECTION 2.1. PROJECT SPECIFICATIONS

As needed, the District may secure Capital Improvement Project Design Services from and individual or engineering firm other than the District Engineer. In such cases, Capital Improvement Project Specifications shall utilize the latest District Boilerplate (available from either the District Office or the District Engineer's Office). The Project Specifications shall follow the current State of California Public Contract Code in its entirety and shall include the following sections:

NOTICE INVITING BID/NOTICE TO BIDDERS

1. Scope of Work
2. Coordination of Work
3. Location and Size of Work
4. Flow and Acceptance of Water and SWPPP Requirements
5. Removal of Water
6. Standard Specifications
7. Wage Rates, Certified Payroll and Labor Code Requirements
8. Insurance Requirements
9. Additional Insurance Requirements
10. Licensing Requirements
11. Award, Execution and Termination
12. Ineligibility of Contractor
13. Bid Security
14. Required Bonds
15. Financial Solvency/Bankruptcy
16. Job Foreman Qualifications/Supervision by Contractor
17. Time for Completion and Liquidated Damages
18. Saturday, Sunday, Holiday and Night Work
19. Sanitary Arrangements
20. Noise/Air Mitigation Measures

21. Water to be Furnished by District
22. Protection of People and Property, and Restoration of Existing Improvements
23. Record Drawings (“As-Built” Drawings)
24. Submittals
25. Measurement and Payment
26. Surveys, Permits and Regulations
27. Separate Contracts
28. Subcontracting
29. Engineer’s Authority
30. Land and Rights-of-Way
31. Warranty/Guaranty
32. Arbitration
33. Taxes
34. Conflict
35. Legal Relations and Responsibility

BID, BID PROPOSAL

36. Bid Form
37. Bid Proposal
38. Anti-Trust Claim
39. Labor Code Certification
40. Non-Collusion Declaration
41. Public Contract Code Statement
42. Certificate of Non-Discrimination
43. Contractor Licensing Statement
44. Site Visit Certification
45. Past disqualification Statement
46. Technical Ability and Experience Statement
47. Bid Bond Form
48. Agreement Form

- 49. Payment Bond Form
- 50. Performance Bond Form

Developer sponsored Capital Improvement Projects or other Projects that are intended to be turned over to the District upon completion of construction, which are paid for solely with private funding sources, may follow any agreement that is commonly accepted practice in the construction industry, otherwise the projects will need to follow the provisions of projects that are designed and constructed by the District. Prior to ceding improvements to the District, the Developer shall provide written proof that the improvements are free of liens, claims, demands, conditions or restrictions and that all material and labor costs have been paid by the Developer.

SECTION 2.2. PROJECT DRAWINGS

Project Drawings shall include the following information:

GENERAL INFORMATION

- Each sheet shall be Standard D-size Format at 24"x36"
- Each sheet will have the outside border fall 3/4" from the edges of the sheet
- All Border widths shall be 1/16"

TITLE SHEET

- RUNNING SPRINGS WATER DISTRICT shall appear at the top of the sheet
- Project Description shall be centered on the sheet
- Date of Project shall be located below project description
- The lower third of the sheet shall include the Board of Directors on the left side of the sheet and the General Manager and Secretary to the Board on the right side of the sheet
- Include the Engineer's name, address and phone number along the bottom of the sheet
- Include the Developer's information along the bottom of the sheet as applicable
- Include a signature line and a date line in the lower right portion of the sheet next to the Page or Sheet Number
- Include the Page Number on the lower right corner of the sheet
- Engineer-of-Record Stamp and Signature in lower right of the sheet

INDEX SHEET

- Index of Drawings
- Bench Mark and Basis of Bearing Information
- Vicinity Map
- Location Map
- Legend of All Graphical Symbols to be used for the Project
- General Notes
- Construction Notes and Quantities

- The bottom 1.75” of the sheet shall be the information border and shall contain:
 - USA Dig Alert Information
 - Private Engineer’s Note to Contractor
 - Revision Block
 - Engineer-of-Record Stamp
 - Engineer-of-Record Signature and Date block
 - Engineering Firm Information
 - Scale
 - Project Sheet Description block with RUNNING SPRINGS WATER DISTRICT above the Sheet Title and separated by a line for the full width of the Description Block
 - Page Number and the Total Number of Pages shall be located on the lower right hand side of the Border Block

PLAN AND PROFILE SHEET

- The upper half of the sheet shall be delineated with a profile section
- The lower half of the sheet shall be for the plan view of the project
- Include Construction Notes – per sheet quantities are optional (only include those to be used on each sheet)
- Include a North Arrow with the appropriate orientation
- Legend of Graphical Symbols (only include those to be used on each sheet)
- Plan View Scale shall be 10 times (10x) greater than the Vertical Scale, i.e., 1” = 20’ horizontal (plan view) and 1” = 2’ vertical
- The bottom 1.75” of the sheet shall be the information border and shall contain:
 - USA Dig Alert Information
 - Private Engineer’s Note to Contractor
 - Revision Block
 - Engineer-of-Record Stamp
 - Engineer-of-Record Signature and Date block
 - Engineering Firm Information
 - Scale

- Project Sheet Description block with RUNNING SPRINGS WATER DISTRICT above the Sheet Title and separated by a line for the full width of the Description Block
- Page Number and the Total Number of Pages shall be located on the lower right hand side of the Border Block

DETAILED DRAWING SHEET

- The sheet may be divided into sections with solid lines at the option of the Engineer; divider lines shall be 1/32" wide
- Plan View and Sectional Information shall contain a title and a scale
- Include Construction Notes – per sheet quantities are optional (only include those to be used on each sheet)
- Legend of Graphical Symbols (only include those to be used on each sheet)
- Include a North Arrow with the appropriate orientation for each Plan View Detail
- The bottom 1.75" of the sheet shall be the information border and shall contain:
 - USA Dig Alert Information
 - Private Engineer's Note to Contractor
 - Revision Block
 - Engineer-of-Record Stamp
 - Engineer-of-Record Signature and Date block
 - Engineering Firm Information
 - Scale
 - Project Sheet Description block with RUNNING SPRINGS WATER DISTRICT above the Sheet Title and separated by a line for the full width of the Description Block
 - Page Number and the Total Number of Pages shall be located on the lower right hand side of the Border Block

**PART 3.
GENERAL CONDITIONS**

SECTION 3.1.
ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS

3.1.01.

The Developer's Contractor/Engineer may be furnished additional instructions and detail drawings by the District Engineer or General Manager, as necessary to carry out the Work required by the Contract Documents.

3.1.02.

The additional drawings and instruction thus supplied will become a part of the Contract Documents. The Contractor shall carry out the Work in accordance with the additional detail drawings and instructions.

SECTION 3.2. SCHEDULES, REPORTS AND RECORDS

3.2.01.

A preconstruction conference will be held prior to commencement of the Work. Attendees shall be the Contractor, his Subcontractors, if applicable, the District, the Engineer, representatives of Federal, State or local regulatory or enforcement agencies, and any other parties deemed appropriate by the District.

3.2.02.

The Contractor shall submit to the District progress schedules, testing and compaction reports, record drawings and other data where applicable as are required by the Contract Documents for the Work to be performed.

3.2.03.

Prior to the start of construction, the Contractor shall submit a construction progress schedule to the Engineer for approval. Said schedule shall include, but is not limited to, the following information: Contractor's name, address and telephone number; Project/Contract number; date prepared; Engineer-of-Record's name; District's name; date of Notice to Proceed; Contract completion date; and, list of all important activities, including construction and material delivery, with starting and ending dates for each activity.

The schedule shall be prepared so that it can be updated by the Contractor when significant changes in an activity time and/or completion time occur, as the Engineer may direct. After the schedule is approved by the Engineer, six (6) paper copies and one (1) digital PDF copy shall be furnished to the Engineer for distribution; this will be required for subsequent schedule updates as well.

The General Manager/Engineer reserves the right to alter said schedule to prevent excessive public nuisance or to provide for timely facilities testing and connection to other installations dependent upon each project.

SECTION 3.3. SHOP DRAWINGS

3.3.01.

The Developer's Contractor/Engineer shall provide Shop Drawings as may be necessary for the prosecution of the Work as required by the Contract Documents. The Engineer's approval of any Shop Drawings shall not release the Contractor from responsibility for deviations from the Contract Documents.

3.3.02.

When submitted for the Engineer's review, Shop Drawings shall bear the Contractor's certification that he has reviewed, checked and approved the Shop Drawings and that they are in conformance with the requirements of the Contract Documents. The following Contractor's certification shall appear on all submittals:

"It is hereby certified that the (equipment, material) shown and marked in this submittal is that proposed to be incorporated into this Project, is in compliance with the Contract Documents, can be installed in the allocated spaces, and is submitted for approval.

Certified By: _____

Date: _____

3.3.03.

Portions of the Work requiring a Shop Drawing or sample submission shall not begin until the Shop Drawing or submission has been approved by the Engineer. A copy of each approved Shop Drawing and each approved sample shall be kept in good order by the Contractor at the site and shall be available to the Engineer.

3.3.04.

The following procedures will apply to shop drawing submittals:

The Contractor shall submit to the Engineer for approval, six (6) copies of all Shop Drawings. These Drawings shall be complete, certified by the Contractor, and shall contain all required information in detail. The Contractor shall make any corrections to Shop Drawings required by the Engineer. Digital copies will only be accepted upon payment of \$0.25 per sheet (8 1/2 x 11 or 14), \$0.30 per sheet (11 x 17), and \$3.50 per plan sheet (up to 24 x 36 – add \$1.10 for larger sheets) for each set to be printed, including two (2) for the Engineer's Office and two (2) original stamped and approved sets for the Contractor's use during construction. One (1) original stamped and

approved submittal shall remain on the job site for each submittal item. Submittals that require a resubmit will require additional fee payment; payment must be made prior to review commencement.

When approved by the Engineer, each copy of the Drawings will be stamped approved, signed, and dated by the Engineer. One (1) original stamped and approved submittal shall remain on the job site for each submittal item; photocopies or other copies of the approved submittal will not be accepted by the Inspector assigned to the project.

Two (2) sets of said approved Drawings will be returned to the Contractor.

The approval of the Drawings shall not be construed as a complete check, but will indicate only that the general method of construction and detailing is satisfactory.

Upon the Contractor's receipt of approved shop drawings, he shall furnish to the Engineer instruction and maintenance manuals and parts lists of all major equipment furnished. Data in these manuals shall cover completely all items as specified and as supplied.

Time allowed for Shop Drawing review shall be thirty calendar (30) days after received by the Engineer; fast-track reviews will be back charged to the Contractor at the current Engineer's Standard Hourly Billing Rate on file with the District.

**SECTION 3.4.
MATERIALS, SERVICES AND FACILITIES**

3.4.01.

It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all surveying, materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the Work within the specified time.

3.4.02.

Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the Work. Stored materials and equipment to be incorporated in the Work shall be located so as to facilitate prompt inspection. The Contractor shall be entirely responsible for damage or loss to material and equipment until the Work has been completed by the Contractor and accepted by the District.

3.4.03.

Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the Manufacturer.

3.4.04.

Materials, supplies and equipment shall be in accordance with samples submitted by the Contractor and approved by the Engineer.

3.4.05.

Materials, supplies or equipment to be incorporated into the Work shall not be purchased by the Contractor or the Subcontractor subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.

3.4.06.

Whenever it is provided that the Contractor shall furnish materials or manufactured articles, or shall do work for which no detailed specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable in the market from firms of established good reputation, or, if not ordinarily carried in stock, shall conform to the usual standards for first class materials or articles of the kind required, with due consideration of the use to which they are to be put. In general, the Work performed shall be in full conformity and

harmony with the intent to secure the best standard of construction and equipment of the Work as a whole or in part.

3.4.07.

All equipment, materials, and supplies to be incorporated in the work shall be new, unless otherwise specified.

SECTION 3.5. INSPECTION AND TESTING

3.5.01.

All materials and equipment used in the construction of the Project shall be subject to adequate inspection and testing by the District and other Agencies which have jurisdiction in accordance with generally accepted standards, policies and practices.

3.5.02.

The District shall provide all inspection for work which will connect to the District Facilities – all testing and inspection required by the District shall be paid for by the Developer.

3.5.03.

If local laws, ordinances, rules, regulations or orders of any public authority having jurisdiction within the project area require any Work to specifically be inspected, tested, or approved by someone other than the District, the Developer's Contractor will give the District Engineer timely notice of readiness; usually 48 hours' notice. The Contractor will furnish the Engineer the required certificates of inspection, testing or approval. All inspection fees imposed by public agencies other than the District shall be paid for by the Developer's Contractor.

3.5.04.

Inspections, tests, or approvals by the Engineer or others shall not relieve the Contractor from his obligations to perform the Work in accordance with the requirements of the Contract Documents.

3.5.05.

The Engineer and his representatives will at all times have access to the Work. In addition, authorized representatives and agents of any participating Federal, State, County or Local Agency shall be permitted to inspect all work, materials, and other relevant data and records. The Contractor will provide proper facilities for such access and observation of the Work and also for any inspection, or testing thereof.

3.5.06.

If any Work is covered contrary to the written instructions of the Engineer or work done for which the Contractor has not requested and received inspection, it must, if requested by the Engineer, be uncovered for his observation and replaced at the Contractor's expense.

3.5.07.

If the Engineer considers it necessary or advisable that covered Work be inspected or tested by others, the Contractor, at the Engineer's request, will uncover, expose or otherwise make available for observation, inspection or testing as the Engineer may require, that portion of the Work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such Work is defective, the Contractor will bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction.

3.5.08.

Upon request of the Engineer, the Contractor shall furnish certification of compliance that fabricated or manufactured products conform to the standards of the industry as specified in the Contract Documents and that said fabricated or manufactured products were fabricated or manufactured under the quality control standards of the stated specifications of the Contract Documents.

SECTION 3.6. SUBSTITUTIONS

3.6.01.

Whenever a material, article or piece of equipment is identified in the Contract Documents or these Standards by reference to brand name or catalog number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function shall be considered. The Contractor may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the Contract Documents by reference to brand name or catalog number, and if, in the opinion of the Engineer, such material, article, or piece of equipment is of equal substance and function to that specified, the Engineer may approve its substitution and use by the Contractor. The Contractor warrants that if substitutes are approved, no major changes in the function or general design of the Project will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the Contractor without a change in the Contract Price or Contract Time.

3.6.02.

“Equal” products must meet or exceed the standards of performance of the item(s) specified or detailed on the plans and in the specifications. All requests for substitutions shall be made in writing a minimum 15 working days before the intended Bid Opening or use. For items approved on Capital Projects after a contract has been awarded, cost reductions shall be credited to the District where cost increases will be absorbed by the Contractor. For Developer projects, approval for substitutions will be secured prior to the use and/or installation of the equipment. Substitute items that are installed prior to securing written approval will be subject to removal at the Developer’s expense; failure to remove unapproved substitute items will result in non-approval of the work and the Developer will not be allowed to connect to District facilities.

SECTION 3.7. PATENTS

3.7.01.

The Contractor shall pay all applicable royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and save the District harmless from loss on account thereof, including attorney's fees, except that the District shall be responsible for any such loss when a particular process, design, or the product of a particular Manufacturer or Manufacturers is specified. However, if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Engineer.

SECTION 3.8. CORRECTION OF WORK

3.8.01.

The Contractor shall promptly remove from the premises all Work rejected by the Engineer for failure to comply with the Contract Documents, whether incorporated in the construction or not, and the Contractor shall promptly replace and re-execute the Work in accordance with the Contract Documents and without expense to the District and shall bear the expense of making good all Work of other Contractors destroyed or damaged by such removal or replacement.

3.8.02.

All removal and replacement Work shall be done at the Contractor's expense. If the Contractor does not take action to remove such rejected Work within ten (10) days after receipt of Written Notice, the District may remove such Work and store the materials at the expense of the Contractor.

SECTION 3.9.
REMOVAL, RELOCATION OR PROTECTION OF EXISTING
UTILITIES

3.9.01.

Nothing herein shall be deemed to require the District to indicate the presence of existing service laterals or appurtenances whenever the presence of such Utilities on the site of the Project can be inferred from the presence of other visible facilities, such as buildings, meter and junction boxes, on or adjacent to the site of the construction; provided, however, nothing herein shall relieve the District from identifying main or trunk lines in the Drawings and Specifications.

3.9.02.

If the Contractor while performing the Work discovers Utility facilities not identified by the District in the Drawings or Specifications, the Contractor shall immediately notify the District and the Utility in writing.

PART 4.
DETAILED TECHNICAL PROVISIONS

SECTION 4.1. EARTHWORK

4.1.01. GENERAL

The Contractor shall furnish all labor, equipment, appliances and materials as required or necessary to clear, grub, excavate, trench, fill, backfill and grade for the construction of all structures, pipelines, service laterals, ditches, embankments and graded areas as shown and specified.

Due to the sensitive creek-bed areas in and around Running Springs, the Contractor shall take additional care to ensure no water from the construction site leaves the site; it is the Contractor's responsibility to protect Deep Creek and City Creek at all costs as environmental fines can be extreme.

4.1.02. OBSTRUCTIONS

When the proper completion of the Work requires their temporary or permanent removal of improvements, landscaping, etc., the Contractor shall, at his own expense, remove, and without unreasonable delay, temporarily or permanently replace or relocate to the satisfaction of the District and of any other person or agency having jurisdiction, all water pipes, gas pipes, drainage lines, irrigation lines, sewer lines, pipelines, conduits, culverts, roads, driveways, fences, bridges, railroad tracks, wires, poles, towers, retaining walls, buildings, curbs, gutters, concrete walks, trees, shrubs, lawns, and all other improvements of whatsoever character not required by law to be removed by the District thereof; and all such improvements temporarily removed shall be maintained until permanently replaced, all at the Contractors expense.

Where the Work is to be constructed in or adjacent to areas which have been improve by lawns, trees, shrubs, or gardens, the Contractor shall remove such trees or plants as may be necessary for the prosecution of the Work and give them proper care and attention until the Work has been satisfactorily completed, after which the Contractor shall replace them in as nearly the original condition and location as is reasonably possible. Where it is necessary to deposit the excavated materials on lawns during the process of construction, the Contractor shall first lay burlap or canvas on the lawn to prevent contact between the excavated material and the lawn.

Unless otherwise indicated on the Drawings, General or Special Conditions, or unless otherwise cared for by the District of a public Utility or franchise, all water, gas, oil, or irrigation lines, lighting, power, or telephone conduits or wires, or sewer lines, or TV cables, structures, house connections in place, and all other surface or subsurface structures or lines shall be maintained by the Contractor and shall not be disturbed, disconnected, damaged by him during the progress of the Work; provided that should the Contractor in the performance of the Work disturb, disconnect, or damage

any of the above, all expenses, of whatever nature, arising from such disturbance, or in the replacement of repair thereof, shall be borne by the Contractor.

All shrubs and brush, including stumps and roots, fences, rock, stones, debris, and all obstructions of whatsoever kind or character, whether natural or artificial, encountered in the construction of the Work shall be removed unless otherwise specified on the construction Plans.

In the installation of pipelines outside of public rights-of-way or in easements, trees shall not be removed unless otherwise authorized in writing by the Engineer, and all fences, structures and landscaping which are removed or damaged by the Contractor shall be restored to their original condition and/or repaired to the to the satisfaction of the Engineer as soon as that portion of the Work is installed, at the Contractor's expense without any compensation therefore. Any damage done to private property by reason of Work on easements shall be the responsibility of the Contractor.

Tunneling under trees will be required unless otherwise authorized in writing by the Engineer. All trees along the Work which are not to be removed, shall be protected from injury. The trunks of trees shall be covered with burlap or stakes shall be driven around them for complete protection.

The Contractor shall restore all areas and objects that were damaged or disrupted due to construction activities to a condition as good as existing prior to construction. Said restoration shall be completed by the Contractor as a continuing follow-up of any portion of pipeline installation.

Material that is removed as hereinabove specified, and is not to be incorporated in the improvement being constructed, shall be disposed of away from the construction site at the Contractors expense. If burning is anticipated, the Contractor shall obtain all necessary permits and shall give ample and proper notice to the local fire warden.

The Contractor's attention is directed to the possible existence of pipe and other underground improvements which may or may not be shown on the Plans. All reasonable precautions shall be taken to preserve and protect any such improvements whether shown on the Plans or not. Pursuant to Section 4215 of the California Government Code, the District will be responsible for the timely removal, relocation or protection of existing main or trunk line Utility facilities located on the site of the Project, if such utilities are not identified by the District in the Drawing and Specifications.

A diligent search of known Utility records has been made in the endeavor to indicated on the Drawings the nature and location of all Utilities which exist within the limits of the Work. However, the accuracy of completeness of the Utilities indicated on the Drawings is not guaranteed. Utility structures and/or service connections to adjacent property may or may not be shown on the Drawings. The Contractor shall contact "Underground Service Alert" (U.S.A., telephone number

811) and inform them of the proposed Project and work schedule. Provide them with information required for notification at known Utilities in the area.

The Contractor shall cooperate with the Utility companies' representative in the field in order to ascertain the location of the Utility lines ahead of trenching operations. The Contractor shall excavate and expose the Utility, at least five hundred (500) feet, ahead of trenching operations in order that the inspector representing the Engineer may adjust the alignment of the pipeline to provide the least amount of interference with the Utility as determined by the inspector.

The Contractor acknowledges his responsibility as set forth herein and specifically waives the provisions of California Government Code Section 4215 which designates such responsibility to certain public agencies.

4.1.03. EARTHWORK IN COUNTY AND STATE RIGHTS-OF-WAY

Earthwork within the rights-of-way of the State of California, Department of Transportation, the County Road Department, or other governmental agencies having jurisdiction, shall be done in accordance with the requirements and the provisions of the permits issued by those agencies for the construction within their respective rights-of-way. Such requirements and provisions, where applicable, shall take precedence and supersede the provisions of these Specifications. The requirements of these Detailed Technical Provisions shall be the minimum requirement.

4.1.04. SAFETY PRECAUTIONS

All excavations shall be performed, protected and supported as required for safety and in the manner set forth in the operating rules, orders and regulations prescribed by the Division of Industrial Safety of the Departments of Industrial Relations of the State of California. Barriers shall be placed at each end of all excavations and at such places as may be necessary along excavations to prevent accidents. Lights shall also be placed along excavations from sunset each day to sunrise of the next day until such excavation is entirely refilled.

The Contractor shall furnish such watchmen, guards, fences, warning signs, walks, and lights as shall be necessary and shall take all other necessary precautions to prevent damage or injury to persons and property.

4.1.05. EXCAVATED MATERIAL

Arrangement for disposing of excess excavated material shall be made by the Contractor. Excavated material suitable for backfill shall be stored temporarily in such a manner as will facilitate Work under the Contract. Backfill material stored at or near the site shall be contained such that none of it leaves the storage area either by wind, rain or other means; a SWPPP shall be submitted and approved prior to storing material.

4.1.06. SHORING, SHEETING AND BRACING

Where sheet piling, shoring, sheeting, bracing, or other supports are necessary, they shall be furnished, placed, maintained and removed by the Contractor. Sheet piling and other supports shall be withdrawn in such a manner as to prevent additional backfill on pipelines which might cause overloading. At all times the rules of the Division of Industrial Safety of the Department of Industrial Relations of the State of California with respect to excavation and construction shall be strictly observed.

In advance of any excavation of any trench or trenches five (5) feet or more in depth, the Contractor shall submit for acceptance of the District, or by a registered civil or structural engineer employed by the District to whom the authority to accept has been delegated, a detailed plan showing the design or shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from the shoring system standards established by the Construction Safety Orders, the plan shall be prepared by a registered civil or structural engineer. Nothing herein contained shall be deemed to allow the use of shoring, sloping, or protective system less effective than that required by the Construction Safety Orders of the State Division of Industrial Safety. Shoring shall be in compliance with Section 6707 of Chapter 9, Part 1, and Division 5 of the Labor Code of the State of California.

Nothing contained in these Specifications shall be construed to impose tort liability on the District, Engineer, or any of their employees.

Section 6424 of the California Labor Code requires a permit for trenches five (5) feet or more in depth. The District will not issue a permit for trenching operations. The Contractor, prior to beginning construction, shall obtain from the State Division of Industrial Safety a permit authorizing said construction.

4.1.07. CLEARING AND GRUBBING

Areas where construction is to be performed shall be cleared of all trees, shrubs, brush, rubbish, and other objectionable material of any kind which, if left in place, would interfere with the proper performance or completion of the contemplated Work, impair its subsequent use, or form obstruction therein. Trees and other natural growths outside the actual lines of construction operation shall not be destroyed and such measures as are necessary shall be taken by the Contractor for the protection thereof.

Organic material from clearing and grubbing operations will not be permitted for use as excavation backfill.

It shall be the Contractor's responsibility to remove and dispose of all excess material resulting from clearing and grubbing operations at his own expense. The Contractor shall make his own arrangements for disposal sites at his own expense, at which said material may be wasted.

4.1.08. CONTROL OF WATER

The Contractor shall provide and maintain at all times during construction ample means and devices with which to promptly remove and dispose of all water entering the excavations or other parts of the Work. No concrete footings or floors shall be laid in water nor shall water be allowed to rise over them until the concrete or mortar has set as least eight (8) hours. Water shall not be allowed to rise unequally against walls for a period of twenty-eight (28) days. Ground water shall not be allowed to rise around pipe installations until jointing compound in the joints has set.

The Contractor shall dispose of the water from the Work in a suitable manner without damage to adjacent property. No water shall be drained into Work built or under construction. Water shall be disposed of in such a manner as not to be a menace to the public health.

Dewatering for structures and pipelines shall commence when ground water is first encountered, and shall be continuous until such times as water may be allowed to rise in accordance with the provisions of this section.

The cost of complying with the provisions of this section of Detailed Technical Provisions shall be considered included as Bid item and no additional compensation will be allowed.

4.1.09. PIPELINE EXCAVATION

- a. Excavation - Excavation for pipelines, fittings, valves and appurtenances shall be open trench to the depth and in the direction necessary for the proper installation of the same as shown on the Plans or as otherwise directed by the Engineer, except where another method is specifically called for on the Plans or in these Detailed Technical Provisions.
- b. Limit of Excavation - Except with specific approval of the Engineer, no more than four hundred (400) feet of open trench shall be excavated in advance of laying of pipe. All operations shall be carried out in an orderly fashion. Backfilling and cleanup work shall be accomplished as sections of the pipe installation are approved. Public travel through the work shall be impeded or obstructed as little as possible. At the end of each working day, there shall be no more than ten (10) feet of open trench, excluding manhole excavations, for each operation. The remainder of the trench excavated that day shall be backfilled, compacted and the roadway opened to the public.

At the end of each week, all trenches, including manhole excavations, shall be backfilled, compacted and the roadway opened to the public on Saturday, Sunday, and holidays.

The Contractor shall make the necessary arrangements for, and shall remove and dispose of, all excess of waste material from the site of the Work as portions of the pipeline and appurtenances are installed.

- c. Tunneling - Tunneling will be permitted only when the Contractor has applied and obtained a permit from the regulatory agency, State of California Department of Mines.
- d. Trench Width - Banks of cut trenches shall be kept as nearly vertical as possible. Where necessary in order to maintain the banks nearly vertical, the trench shall be properly sheeted and braced. The overall trench width shall not be more than sixteen (16) inches or less than twelve (12) inches wider than the largest outside diameter of the pipe to be laid therein, measured at a point twelve (12) inches above the top of the pipe exclusive of branches. Excavation and trenching shall be true to line so that a clear space of not more than eight (8) inches or less than six (6) inches in width is provided on each side of the largest outside diameter of the pipe in place. For the purpose of this article, the largest outside diameter shall be the outside diameter of the coupling.
- e. Correction of Faulty Grades - Should the excavation for the pipeline be carried below grade without instruction from the Engineer, it shall be refilled to proper grade with pipe zone material compacted to ninety percent (90%) or crushed rock, at the expense of the Contractor. If the compaction tests are required, they shall be at the expense of the Contractor.

4.1.10. PIPE FOUNDATION AND/OR PIPE BEDDING

In areas where the pipe trench is in granular material suitable for bedding, the bottom shall be excavated and trimmed so that the pipe will be uniformly bedded on the required grade. In all other materials, the pipe trench shall be over-excavated below the established grade line of the outside bottom of the pipe.

In areas where the pipe trench is in clay or similar non-granular material, the depth of over-excavation shall be three (3) inches.

In areas where the pipe trench excavation is in rock, hardpan, shale or other similar hard and unyielding materials, the trench shall be excavated to a depth of at least four (4) inches below the established grade line of the outside bottom of the pipe.

The over-excavation shall be filled with loose granular bedding material. The Contractor shall prepare a firm but unyielding subgrade which will provide uniform support of the pipe along the full length of each section. In the event the bottom of the excavation is soft, spongy, or unstable, the Contractor shall over-excavate to undisturbed and/or firm ground, to refill to approximately three (3) inches below grade with tamped crushed rock, refill to grade with sand and shape the bottom of the trench to the required section. The Contractor will be reimbursed for all the expenses that are incurred for the over-excavation and backfill that exceed two (2) feet. Crushed rock for backfill of over-excavation shall consist of clean, hard, durable gravel or crushed rock of such a size that one

hundred percent (100%) will pass a sieve having two-inch square openings. The backfill shall be compacted to ninety percent (90%) relative compaction. Instability due to inadequate dewatering shall be corrected at the Contractor's own expense.

For the purpose of this paragraph, granular bedding material is defined as a non-cohesive granular material containing no rocks or other hard materials detrimental to good bedding of the pipe. It shall be free from appreciable amounts of clay or silt and shall be free from stones larger than one inch in diameter. Not more than fifteen percent (15%) shall pass a No. 100 mesh screen and it shall be reasonable uniform graded.

4.1.11. TRENCH BACKFILL

- a. General - All trenches for main line and service laterals shall be backfilled after pipe fittings, service lateral, valves and appurtenances have been installed.

All wood and waste material shall be removed from excavation preparatory to backfilling. Backfill material shall be approved in all cases by the Engineer and shall be free of trash, wood, large rock, or other objectionable debris. Backfilling shall include the refilling and compacting of the fill in trenches or excavations up to the subgrade of the street or to the existing ground surface.

- b. Procedure in Pipe Zone - The pipe zone shall be from pipe invert to twelve (12) inches above top of pipe. Backfill material for pipe zone shall be granular material, clean washed sand or crusher run rock or gravel and shall be placed in the trench simultaneously on each side of the pipe for the full width of the trench in layers of about six (6) inches in depth. No stone, gravel or crush rock larger than one (1) inch in diameter or largest dimension shall be allowed in pipe zone. Granular backfill with a minimum sand equivalent of thirty (30), when tested in accordance with the California Department of Transportation, Test Method No. California 217 shall be required in the pipe zone when the water densification method is used to densify the material in the pipe zone. When the excavated material is not granular as mentioned above, the Contractor shall import, at his own expense, and place a suitable backfill material. Particular attention is to be given to the underside of the pipe and fittings to provide a firm bedding support along the full length of the pipe. Care shall be exercised in backfilling to avoid damage to the pipe. Care shall be taken so that the pipe is not floated or displaced. Trench backfill above the pipe zone shall not be place until conformance with specified compaction requirements has been confirmed for the pipe zone.

Pipe zone material shall be compacted to not less than ninety percent (90%) of maximum density in accordance with American Society for Testing and Materials Standard D1557 (ASTM D1557).

When the crusher run rock or gravel is used for pipe zone backfill, the following method of placing the bedding and pipe zone backfill may be used:

The trench shall be over-excavated a depth of two (2) inches and backfilled to grade with crusher run rock. The pipe shall be bedded on this base. The pipe shall then be backfilled to a depth of three (3) inches over the top of the pipe with the crusher run rock. No further compaction will then be required. The crusher run rock shall be unwashed crushed rock conforming to the following graduation:

Sieve	Percent Passing
1/2 - inch	100
3/8 - inch	85-100
No. 15	15-40
No. 8	0-10
No. 16	0-5

- c. Procedure above Pipe Zone - From the top of the pipe zone backfill to ground surface, the material for backfill may contain stones ranging in size up to three (3) inches in diameter, in quantity not exceeding forty percent (40%) of the volume when said coarse materials are well distributed throughout the finer materials and the specified compaction may be attained. If the native materials contain large rocks and boulders, it shall be Contractor's responsibility to remove and dispose all rocks larger than six (6) inches in diameter off project area prior to trench backfill operation.
- d. Compaction Above Pipe Zone - The Contractor shall not permit hauling or rolling equipment to operate above the pipe zone until sufficient backfill is in place to prohibit damage to the pipe. Unless otherwise required by these Contract Documents or by permit requirements of any agencies having jurisdiction, compaction shall conform to the following requirements.
 - 1. Under areas which will be subject to vehicular traffic or support for surfacing or structures, the backfill shall be compacted to a not less than ninety percent (90%) of maximum density in accordance with ASTM D1557.
 - 2. In easements and open terrain where the degree of compaction is less important, the backfill, if sufficiently granular in nature (sand equivalent of twenty (20) or greater), may be consolidated by a water densification method. If the backfill is not sufficiently granular in nature, the backfill shall be consolidated by a method approved by the Engineer. Backfill in easements and open terrain shall be

consolidated to such an extent so as to preclude potential damages due to erosion, settling, or other lack of structural stability in the opinion of the Engineer.

Although lesser degrees of consolidation may be allowed by the Engineer, a relative compaction of eighty five percent (85%) in accordance with ASTM D1557 is to be deemed satisfactory in these areas.

- e. Mechanically Compacted Backfill - Mechanically compacted backfill shall be placed in horizontal layers of such depths compatible to the material being placed and the type of equipment being used. All such equipment shall be of a size and type approved by the Engineer. Each layer shall be evenly spread, moistened (or dried, if necessary), and then tamped or rolled until the specified relative compaction has been attained. Permission to use specific compaction equipment shall not be construed as guarantying or implying that the use of such equipment will not result in damage to adjacent ground, existing improvements or improvements installed under the contract. The Contractor shall make his own determination in this regard. Any damage which results shall be the responsibility of the Contractor and repaired or replaced at the Contractor's expense. Each layer shall be limited to 8-inches maximum before compaction.
- f. Water Densified Backfill (Jetting) - As used in these Detailed Technical Provisions, flooding shall mean the inundation of backfill with water, puddles with poles or bars to insure saturation of the backfill material for its full depth. Jetting shall be accomplished by the use of a jet pipe to which a hose is attached carrying a continuous supply of water under pressure.
- g. Requirements for Densification by Jetting - Densification by jetting shall be subject to all of the following requirements:
 - 1. Application of Water - The Contractor shall apply water in a quantity and at a rate sufficient to thoroughly saturate the entire thickness of the lift being densified. Water for jetting shall be from a continuous supply of water under pressure.
 - 2. Use of Vibration - Where densities are required which cannot be attained by jetting alone, the Engineer may direct the Contractor to supplement the jetting process with the application of vibrating compacting equipment to the backfill.
 - 3. Lift Thickness - The lift of backfill shall not exceed that which can be readily densified by the jetting procedure, but in no case shall the undensified lift exceed ten (10) feet for jetting.

4. Character of Material - The material being used with the water settling methods to backfill the trenches in street rights-of-way shall have a sand equivalent of at least thirty (30) when tested in accordance with the State of California Department of Transportation Test Method No. California 217. Where the nature of the material excavated from the trench is generally unsuitable for densification with water, the Contractor may, at no cost to the District, import suitable material for jetting, or densify the excavated material by other methods. If water densification methods are employed, the Contractor shall, at his expense, provide a sump and pump to remove the accumulated water from the downstream end of the construction.

5. Damage to Adjacent Improvements - The Contractor shall make their own determination that the use of flooding or jetting methods will not result in damage to existing improvements. Permission to use such methods in densifying backfill shall not be construed as guarantying or implying that adjacent ground and improvements will be unaffected.

h. Compaction Test - Compaction shall be tested in accordance with the methods specified by the State of California Department of Transportation Method No. California 216, or ASTM D1557.

Compaction test of the backfill will be required approximately every two hundred and fifty (250) feet, or more often if tests indicate the need, along the alignment on the main pipeline and, in addition, approximately twenty percent (20%) of all laterals within the street rights-of-way. The tests shall be made at varying depths with the density as shown on Standard Drawing No. W-20.

The Contractor at his expense shall excavate the holes for all of the tests, backfill the holes and compact this backfill, and pave the surface, if required, after the test.

Compaction tests of the backfill shall be at the Contractor's expense except where otherwise specified in the Contract Document. All compaction tests which do not meet the specified requirements shall be at the Contractor's expense without any compensation therefore. These latter costs will be paid by the District and deducted from the progress payments to the Contractor.

i. Excess Excavated Material - The Contractor shall make the necessary arrangements for and shall remove and dispose of all excess or waste material. All costs for the disposal of excess or waste material shall be borne by the Contractor.

It is the intent of these Detailed Technical Provisions that all surplus material not required for backfill shall be disposed of by the Contractor outside the limits of the public

rights-of-way and in accordance with the requirement of the County grading ordinance or ordinance of any other agencies having jurisdiction at no cost to the District.

Excavated material shall not be deposited on private property unless written permission from the District thereof is secured by the Contractor. Copies of said written permission, duly signed by the District of the private property involved, shall be furnished to the Engineer by the Contractor before such material is placed on private property.

- j. Imported Backfill Material - Whenever the excavated material is unsuitable for backfill, the Contractor shall arrange for the furnishing of imported backfill material (per Sections 4.1.11b. and 4.1.11g4) at his own expense; Sand Equivalent Factor (SE) shall be a minimum of 30 (SE = 30 or better). He shall dispose of the excess trench excavation as specified in the preceding paragraph. The backfilling with imported material shall be done in accordance with the methods described.
- k. Completion of Cleanup - The Contractor shall restore all areas and objects that were damaged or disrupted due to construction activities to a condition equal to that prior to construction. All fences, walls, shrubs, sprinkler systems, substructures or any other improvement removed or disturbed by the Contractor during construction shall be replaced and/or repaired to the satisfaction of the Engineer immediately as that portion of the pipeline is installed at the Contractor's expense. Said restoration shall be completed by the Contractor as an immediate follow-up of any portion of the pipeline installation.

4.1.12. STRUCTURAL EARTHWORK

- a. Structural Excavation - The site shall be cleared of all natural obstructions, pavements, Utilities and other items which will interfere with construction. Any method of excavation may be employed which, in the opinion of the Contractor, is considered best. Ground shall not be dug by machinery nearer than three (3) inches from any finished subgrade without the express approval of the Engineer. The last three (3) inches shall be removed without disturbing the subgrade. Should the excavation be carried below the lines and grades indicated on the Plans, the Contractor shall, at his own expense, refill such excavated space to the proper elevation in accordance with the procedures specified for backfill, or, if under footings, the space shall be filled with concrete.

Excavation shall extend a sufficient distance from walls and footing to allow for placing and removal of forms, installation of services, and for inspection, except where concrete is authorized to be deposited directly against excavated surfaces.

- b. Backfilling - After completion of foundation footings and walls, and of other construction below the elevation of the final grade, and prior to backfilling, all forms shall be removed and

the excavation shall be cleaned of all debris. Unless otherwise shown, material for backfilling shall consist of excavated material, or imported sand, gravel or other material approved by the Engineer and shall be free of lumps, hard material exceeding six (6) inches in greatest dimension, trash, lumber or other debris. Backfill shall be placed in horizontal layers not exceeding nine (9) inches in thickness, and shall have a moisture content such that the required degree of compaction may be obtained. Each layer shall be compacted by hand or machine tampers or by other suitable equipment or means to a relative compaction of a least ninety percent (90%). Dewatering shall be maintained during the placement of compacted clayey backfill.

- c. Stripping - All vegetation, such as roots, brush, heavy sods, heavy growths of grass and all decayed vegetable matter, rubbish, and other unsuitable material within the area of the Work, shall be stripped or otherwise removed before fill is started.
- d. Grading - After stripping has been done, excavation of every description and of whatever substance encountered within the grading limits of the Work shall be performed to the lines and grades indicated on the Drawings. All suitable excavated material shall be transported to and placed in the fill area within the limits of the Work. All excavated materials which are considered unsuitable by the Engineer, and any surplus of excavated material which is not required for fill shall be known as waste and shall be disposed of as directed in Section 4.1.11i. During construction and excavation filling shall be performed in a manner and sequence that will provide drainage at all times.

Ditches shall be cut accurately to the cross sections and grade indicated. Any excessive ditch excavation shall be backfilled to grade either with suitable, thoroughly compacted material, or with suitable stone or cobble to form and adequate paving.

Surfaces under paved areas, dikes and elsewhere as directed by the Engineer shall be wetted and compacted prior to placing fill.

- e. Fills or Embankments - Fills or embankments shall be constructed at the locations and to the lines and grades indicated on the Plans. Suitable material from excavations may be used for fill. Material shall be placed in horizontal layers of from eight (8) to twelve (12) inches in loose depth for the full width of the cross section and compacted as specified. Embankment Fill shall be placed in a stepped pattern where the width is five times (5x) greater than the depth of the fill; stepped pattern shall start at the bottom of the embankment. Compaction shall be ninety percent (90%) for each fill layer. A geotechnical fabric shall be placed in the upper three (3) inches of the embankment; overlap seams two-foot (2-ft) minimum.

For general fill areas, the fill shall be compacted to ninety percent (90%) relative compactions.

For roadways and all areas to be paved, the fill shall be compacted, by means of a tamping roller or three-wheel power roller, to at least ninety percent (90%) relative compaction.

Dikes and embankments shall be compacted by the use of compaction rollers or three-wheel power rollers to ninety percent (90%) relative compaction.

Relative compaction shall be as determined in accordance with the State of California Department of Transportation, Test Method No. California 216, or ASTM D1557.

- f. Finish Grading - All areas covered by the Work, including excavated and filled section and transition areas, shall be graded uniformly to the elevations shown on the Plans. The finished surface shall be reasonably smooth, compacted, and free from any irregular surface changes. The degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations. The finished surface shall be not more than five-hundredths of a foot (0.05-ft) above or below the established grade. Ditches shall be paved with concrete or shotcrete to drain readily. The surface of areas to be paved, on which a surface course is to be placed, shall not vary more than five-hundredths (0.05) foot from established grade and approved cross section.
- g. County and Local Grading Ordinances - In addition to the requirements herein set forth for structural earthwork, all work shall be in accordance with the requirements of the County grading ordinance or ordinance of any other agencies having jurisdiction.

4.1.13. DRILLING AND BLASTING

- a. Use of Explosives - All operations, storage and handling of explosives shall be according to provisions of Division II, Part I, of the Health and Safety Code, State of California, and shall comply with all State, County and local laws.
- b. Skilled Workmen - Drilling and blasting are to be done only by personnel skilled in these techniques.
- c. Safety - All necessary precautions shall be taken for protection of life and property. Warnings shall be given to nearby property owners that blasting is in progress. Safety mats shall be used to restrict flying particles. The Contractor shall size each "shot" to minimize nuisance and reduce the possibility of damage to local structures.
- d. Blasting shall have prior written approval from the District.

4.1.14. FINAL CLEANUP

After all earthwork operations have been completed, the right-of-way and all other areas shall be dressed smooth and left in a neat and presentable condition to the satisfaction of the Engineer and District.

4.1.15. SHOP DRAWINGS

The Contractor shall submit six (6) copies of Shop Drawings for shoring and bracing system for review and approval. Digital submittals shall conform to the requirements stated elsewhere in this document.

SECTION 4.2. CONCRETE CONSTRUCTION

4.2.01. SCOPE

The Contractor shall furnish all labor, equipment, materials and appliances necessary to complete construction of Portland cement concrete as shown on the Plans and as specified herein.

4.2.02. COMPOSITION

Concrete shall be composed of Portland cement, sand, coarse aggregate, water, and admixtures as specified or approved, all well mixed and brought to the proper consistency suitable for the specific conditions of placement and in accordance with the requirements of these Detailed Technical Provisions.

4.2.03. CLASSES OF CONCRETE

All Portland cement concrete used on the Work shall be one of the classes described below. Unless otherwise stated, each class shall be used in the locations as listed:

- a. Class I
Compressive Strength - 3,000 psi minimum at 28-day
Mix - 6 sacks minimum, test required - 7 sacks, test not required.
Use - walls, beams, slabs, footings.
Equivalent California State Highway Designation - Class D (for 7 sack mix), or Section 201 of the Greenbook, Table 201-1-1.2(A).
Maximum water - cement (w/c) ratio: 0.45

- b. Class IV
Compressive Strength - 2,500 psi minimum at 28-day
Mix - 6 sack, test not required.
Use - Paving, cradles, curbs, gutters, sidewalks, thrust blocks, manhole bases, pipe encasement, or where specified.
Equivalent California State Highway Designation - Class B or Section 201 of the Greenbook, Table 201-1-1.2(A).
Maximum water - cement (w/c) ratio: 0.45

4.2.04. PORTLAND CEMENT

Unless otherwise specified by a soils report or the District Engineer, Portland cement, shall be Type II, complying with ASTM C150, and shall have a total alkali content not exceeding 0.6 percent when calculated as sodium oxide as determined by methods given in ASTM C114.

4.2.05. SAND

Sand shall be washed natural sand having hard, strong and durable particles and which does not contain more than two percent (2%) by weight of such deleterious substances as clay lumps, shale, schist, alkali, mica, coated grains, or soft and flaky particles. Sand shall be graded uniformly from fine to coarse such that the combined grading of coarse aggregate and sand set forth in Section 4.2.06 will be met. Not more than three percent (3%) shall pass the No. 200 screen as determined by ASTM C117.

4.2.06. COARSE AGGREGATE

Coarse aggregate shall be a clean, hard, fine-grained, uncoated sound crushed rock, or washed gravel or combination of both. It shall be free from oil, organic matter or other deleterious substances and shall not contain more than two percent (2%) by weight of shale or cherty material; and shall show a loss of not more than ten (10) percent when tested for soundness in sodium sulfated solution in accordance with ASTM C88. Coarse aggregate shall be graded uniformly from one-quarter (1/4) inch size to maximum size. The combined grading of coarse and fine aggregate shall fall within the following percentage by weight:

Sieve Size	Percentage Passing Sieves		
	1-1/2" Max	1" Max	3/4" Max
2"	100		
1-1/2"	90-100	100	
1"	50-86	90-100	100
3/4"	45-75	55-100	90-100
3/8"	38-55	45-75	60-80
No. 4	30-45	35-50	40-60
No. 8	23-38	27-45	30-45
No. 16	17-33	20-35	20-35
No. 30	10-17	12-20	13-23
No. 50	4-9	5-10	5-15
No. 100	1-3	1-4	1-5
No. 200	0-2	0-2	0-2

4.2.07. MIXING WATER

Mixing water shall be clean and free from deleterious amounts of acids, alkalis, salts or organic materials.

4.2.08. ADMIXTURES

No admixtures shall be used without the District or Engineer's approval and any ready-mix concrete with admixtures indicated found on the job site will be rejected.

4.2.09. REINFORCING STEEL

Reinforcing steel shall consist of deformed bars of the size called for on the Plans. Steel shall conform to ASTM A615; longitudinal reinforcing steel for columns shall be hard grade; all other reinforcing steel shall be either intermediate or hard grade. Deformations shall conform to ASTM A615, A 616, and A 617. If specified, mill certificates showing conformity with these requirements shall be furnished to the Engineer for each melt if so requested. Wire reinforcement shall conform to ASTM A82.

4.2.10. MIXING

Job mixing of structural concrete shall not be permitted.

Transit mix concrete shall be batched, mixed and delivered in accordance with ASTM C94, except that truck agitators may not be used. All concrete shall be deposited in place not more than forty five (45) minutes after water is added when the temperature of the concrete exceeds 85 °F, and not more than one and one-half (1-1/2) hours after water is added when the temperature of the concrete is less than 85 °F. Certified public weighmaster tickets shall be delivered to the Engineer or his representative in the field prior to placing the concrete to which the ticket applies. **Water shall not be added to the concrete at the job site.**

4.2.11. RETEMPERING

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

4.2.12. COMPACTING

Concrete, during and immediately after depositing, shall be thoroughly worked around the reinforcement and embedded fixtures and into corners of the forms. Internal vibrators shall be used for all walls, and self-supporting beams or slabs. Vibrators shall be handled by experienced workmen and care shall be taken to avoid separation of aggregate due to over vibration. At least one (1) vibrator shall be used for each fifteen (15) cubic yards per hour of concrete placed. Standby vibrators shall be kept on hand.

4.2.13. CURING

All concrete and grout shall receive a curing compound, or other approved method, as soon as the concrete or grout has sufficiently set.

Curing compound shall be of a nature and composition not deleterious to concrete, and thinned to a working consistency either with a volatile solvent or by emulsification with water. The curing compound shall be of a standard and uniform quality ready for use as shipped by the Manufacturer. Curing compound shall form a continuous, unbroken membrane which shall adhere to moist concrete and which will not disintegrate, check, peel from the surface, nor show signs of such deterioration within thirty (30) days after application under actual working conditions. The compound shall be sufficiently transparent and free from color that there will be no permanent change in the color of the concrete. The compound shall contain, however, a temporary dye of sufficient color to make the membrane clearly visible for a period of at least four (4) hours after application. If the Contractor applies a deleterious compound to paint, plaster, gunite, or other surface treatment, he shall thoroughly sandblast the surface to remove all vestiges of the compound. This sandblasting shall be at the Contractor's expense.

4.2.14. COLD WEATHER REQUIREMENTS

Adequate equipment shall be provided for heating the concrete during freezing or near freezing weather. No frozen materials or materials containing ice shall be used.

All concrete materials and reinforcement, forms, fillers and ground which the concrete is to come in contact with shall be free from ice and frost. Whenever the temperature of the surrounding air is below 40 °F, all concrete placed shall have a temperature of between 70 °F and 80 °F and an adequate means shall be provided for maintaining a temperature of between 50 °F and 80 °F during the curing period.

The housing, covering or other protection used in connection with curing, shall remain in place and intact at least twenty four (24) hours after the artificial heating is discontinued. **The use of salt or chemicals for the prevention of freezing is prohibited.**

When heating of concrete materials is required, the mixing of water and aggregate shall be heated to not more than 90 °F prior to being placed in the mixer, so that the temperature of the mixed concrete shall not be less than 70 °F nor more than 80 °F. Aggregates shall be heated either by steam or by dry heat, and the heating apparatus shall be of a type which will heat the mass uniformly and in such a manner as to preclude the possible occurrence of overheated areas, or hot spots, which will burn the material. Flame throwers, or others, similar direct heating devices will not be allowed.

4.2.15. HOT WEATHER REQUIREMENTS

Concrete shall not be deposited when the atmospheric temperature is above 85 °F unless the Contractor follows the requirements as specified in this section of the Specification.

1. Use Cool Materials - Coarse aggregates shall be sprayed with water at least two (2) hours before mixing.
2. Subgrade and forms shall be thoroughly soaked the night before, then sprinkled again shortly before placement. There should be no standing water when concrete is deposited.
3. Protection Against Evaporation - Freshly poured concrete surfaces and exposed wall form shall be covered or screened. Spray shall be provided upwind of concrete.
4. Start the curing process as soon as possible. The Contractor shall refer to Section 4.2.13 for curing method.

SECTION 4.3. CONDUCTOR PIPE

4.3.01. STEEL CONDUCTOR TUBE

- a. Materials - Steel conductor tube shall be butt welded of sheets conforming to ASTM A283. Conductor tube used shall not have a thickness of less than one-fourth (1/4) inch with a minimum diameter of twenty four (24) inches. All field joints shall be butt welded in full circumference in accordance with Standard Drawing No. W-18.
- b. Installation - Steel conductor tube of the size and thickness specified on the Plans shall be installed in place by jacking methods without the use of water or air, at the locations shown on the Plans and to grades required to install the pipelines. Should voids or loss of ground occur during jacking operations, said voids shall be filled with grout consisting of a lean mixture of cement and sand.

Pipelines shall be installed within the conductor tube to the lines and grades shown on the Plans. The pipe shall be supported on wood skids in such a manner as to relieve the pipe joints from all load and bearing. The annular space between the conductor tube and pipe shall be filled with washed sand.

SECTION 4.4. EROSION CONTROL

4.4.01. GENERAL

The Contractor shall provide erosion control measures as defined herewith on all areas where the natural vegetation has been disturbed by the installation of water facilities and in accordance with the Storm Water Pollution Prevention Plan (SWPPP), whichever is more stringent. If a ground cover other than natural vegetation has been disturbed, this section does not apply and the Contractor shall replace said ground cover in kind.

4.4.02. PREPARATION

After the backfill has been compacted and the pipeline tested, the Contractor shall remove and dispose of rocks and debris from the area to be reseeded. No seeding shall be performed during windy weather or when the ground is too wet or in an untillable condition. The fertilizer and seed shall be spread before the straw cover material is applied. Commercial fertilizer shall not be applied until after the seed has been sown.

4.4.03. MATERIAL

Materials shall consist of the following:

- a. Seed - The seed shall consist of the following mixture: Crested Wheatgrass, forty-seven percent (47%); Intermediate Wheatgrass, twenty-seven percent (27%); Wimmera Ryegrass, thirteen percent (13%); Blando Ryegrass, thirteen percent (13%). The seed shall be spread at the rate of one hundred (100) pounds per acre and shall be applied by the use of a “Cyclone Seed Sower” or equal.
- b. Fertilizer - The fertilizer shall be Ammonium Phosphate (16-20-0) spread at the rate of three hundred (300) pounds per acre and shall be applied by the use of a “Cyclone Seed Sower” or equal.
- c. Mulch - After the application of the seed and fertilizer, new straw (stable bedding straw shall not be used) shall be uniformly spread at the approximate rate of four (4) tons per acre. The straw shall then be “mulched” into the ground by the use of a “wire” roller or other approved equipment.

4.4.04. PROTECTION FOR STEEP SLOPES

In cases where the grade over the pipe line exceeds twenty-five percent (25%) slope, the Contractor shall provide additional erosion control measures to stabilize the backfill material. The Contractor shall submit to the District for its approval, special engineering details of the method to be used.

SECTION 4.5. REMOVAL AND REPLACEMENT OF PAVED SURFACES

4.5.01. GENERAL

Street pavement and surfaces shall be removed and replaced in all areas of construction excavation in conformance with the various encroachment permits or where not covered by an encroachment permit as specified herein. Resurfacing of existing pavement and surfaces damaged or removed in connection with construction of the improvements, including all appurtenances, shall conform to the provisions of permits issued by the State of California Department of Transportation or the County Transportation Department or local Street Department under whose jurisdiction the road falls, for the work within the rights-of-way of these respective agencies.

4.5.02. EXCAVATION AND BACKFILL

The Contractor shall refer to Section 4.1 “Earthwork” of these Detailed Technical Provisions for all requirements relating trench excavation and backfill.

4.5.03. PAVEMENT REMOVAL

- a. General - Street pavement, existing road surfacing or other surfaced areas shall be removed within the limits of all construction excavations prior to proceeding with excavation operations of any nature. Surplus material shall be removed as provided in Section 4.1 “Earthwork” of these Detailed Technical Provisions. Prior to removal of existing surfacing, pavement cuts shall be made as specified here. All pavement cuts shall be neat and straight along both sides of the trench, and approximately parallel to the alignment of the pipe, to provide an unfractured and level pavement replacement. Where large irregular surfaces are removed, such trimming or cutting as hereinafter provided shall be parallel with roadway centerline or at right angles to the same. All cut edges shall provide clean, solid, vertical faces, free from all loose material.
- b. Plant-Mix Surfacing (Asphalt Concrete Pavement) - Street surfaced with asphalt concrete pavement shall be cut at the limits of the trench and/or excavation prior to removal of existing surfacing. Cuts shall be made by sawing, disk or other approved equipment.

4.5.04. REPLACEMENT

- a. In all streets or areas in which the surface is removed, broken or damaged by equipment, or in which the ground has caved in or settled due to the installation of the improvements, the surface shall be restored to the original grade and crown section by the Contractor. In the absence of specific designation on the Plans, and where the street has been improved with

roadway surface, base course, curb, sidewalk or gutter, trenches or damaged sections shall be restored with the type of improvement conforming to that which existed at the time the Contractor entered upon the work.

Prior to resurfacing, the existing surfacing shall be removed as provided above. All work shall match the appearance of the existing improvements and finished pavement shall not deviate from existing grade by more than one-eighth (1/8) inch in ten (10) feet and shall be free from ruts, depressions and irregularities.

- b. State Highway Rights-of-Way - Construction of water or sewer lines within State highway rights-of-way shall be subject to Department of Transportation utility encroachment permit. All work done within highway rights-of-way shall conform to the "Terms and Conditions Relating to Utility Encroachments", as issued by the State Department of Transportation, and as to details as indicated on the Plans.
- c. County and Local Roads - The Contractor's attention is directed to the requirements of the County or Local Transportation Department regarding resurfacing of excavations in County or local roads. The specifications, policies and procedures of said County or Local Transportation Department shall supersede all other provisions of this section within the jurisdiction of the County or local Road Department, but only if such specifications exceed the requirements of these Specifications.
- d. Base Material - Base material shall be furnished, placed and compacted in the trench excavation when required by the agency having jurisdiction or to replace existing base course.
- e. Plant - Mix Surfacing (Asphalt Concrete Pavement) - All asphalt concrete surfaces, including but not limited to pavements, curbs, driveways, and sidewalks, which are removed, damaged or broken by the Contractor's installation or improvements under this Contract, shall be replaced and/or reconstructed. All asphalt concrete shall be placed on compacted fills or base material as hereinbefore specified, and replacement and/or reconstruction shall be to the same dimensions as existing surfaces unless otherwise stated herein or required by the agency having jurisdiction over the road.

Materials and workmanship for asphalt concrete replacement and/or reconstruction shall conform to the requirements of Section 39 of the latest edition of the State of California Departments of Transportation Standard Specifications for State Highways and Section 203 of the latest edition of the Greenbook, or as directed, for County and Local Streets.

Plant-mix surfacing shall be Type B3 PR70-10 asphalt concrete conforming to the above mentioned specifications for the base course and Type C2 PR 70-1 for surface wearing course.

Mineral aggregate for Type C and Type B asphalt concrete shall be steam refined asphalt and shall conform to the provisions in Section 203 or Section 92 as stated in the previously named specifications.

- f. Road - Mix Surfacing - Not permitted without prior approval of the District.
- g. Temporary Resurfacing - The Contractor shall furnish, place, and maintain temporary resurfacing as herein specified, over backfill in paved streets or driveways.

Temporary resurfacing shall be placed at the locations and of the thickness required by the permit and/or by the Engineer and shall consist of cold-mix asphalt concrete. Binder shall be liquid, grade SC-800 or approved equal.

Temporary resurfacing shall be placed to the grade of existing surfaces and rolled and compacted no later than five (5) calendar days after the pipe has been laid. The Contractor shall maintain all temporary resurfacing in proper, usable condition until the permanent resurfacing operations are to be commenced. Temporary resurfacing shall be removed and disposed of by the Contractor before permanent resurfacing is placed in conformance with the Plans and Specifications.

SECTION 4.6.
CRITERIA FOR THE SEPARATION OF WATER MAINS AND
NON-POTABLE PIPELINES

4.6.01. APPLICABILITY

The construction criteria presented in this section apply to sewer laterals that cross above a water main, but not to those house laterals that cross below a water main.

Water mains or non-potable pipelines that are twenty four (24) inches in diameter or larger may pose a higher degree of public health concern because of the large volumes of flow involved. Therefore, installation of water mains or non-potable pipelines twenty four (24) inches in diameter or larger should be reviewed and approved in writing by the Division of Drinking Water (DDW) of the State of California on a case-by-case basis prior to construction.

In no case, should water mains and non-potable pipelines conveying sewage or other liquids be installed in the same trench.

4.6.02. REGULATORY REQUIREMENTS FOR WATER MAIN SEPERATION

Unless otherwise specified in these Specifications, any new development project in which all the underground facilities are being constructed for the first time must comply with the following regulatory requirements (existing Section 64630 and proposed Section 64572, Title 22 of California Code of Regulations):

Section 64630, Title 22 of California Code of Regulations

- (a) Water mains shall be installed at least:
 - (1) Ten (10) feet horizontally from and one (1) foot higher than sanitary sewer mains located parallel to the main.
 - (2) One (1) foot higher than sanitary sewer mains crossing the main.
 - (3) Ten (10) feet, and preferably twenty-five (25) feet, horizontally from sewage leach fields, cesspools, seepage pits and septic tanks.
- (b) Separation distances specified in (a) shall be measured from the nearest outside edges of the facilities.
- (c) Where the requirements of (a) and (b) cannot be met due to topography, inadequate right-of-way easements, or conflicts with other provisions of these regulations, lesser separation is permissible if:

- (1) The water main and the sewer are located as far apart as feasible within the conditions listed above; but no closer than four (4) horizontal feet with special construction pursuant to DDW requirements.
 - (2) The water main and the sewer are not installed within the same trench.
 - (3) The water main is appropriately constructed to prevent contamination of the water in the main by sewer leakage.
- (d) Water mains shall be disinfected according to AWWA C-601 before being placed in service.
- (e) Installation of water mains near the following sources of potential contamination shall be subject to written approval by the DDW on a case-by-case basis:
- (1) Storage ponds or land disposal sites for wastewater or industrial process water containing toxic materials or pathogenic organisms.
 - (2) Solid waste disposal sites.
 - (3) Facilities such as storage tanks and pipe mains where malfunction of the facility would subject the water in the main to toxic or pathogenic contamination.

Proposed Section 64572, Title 22 of California Code of Regulations

- (a) New water mains and new water supply lines shall not be installed in the same trench as, and shall be at least ten (10) feet horizontally from, and one (1) foot vertically above, any parallel pipeline conveying:
- (1) Untreated sewage,
 - (2) Primary or secondary treated sewage,
 - (3) Disinfected secondary-2.2 recycled water (defined in Section 60301.220, Title 22 of California Code of Regulations),
 - (4) Disinfected secondary-23 recycled water (defined in Section 60301.225, Title 22 of California Code of Regulations), and
 - (5) Hazardous fluids such as fuels, industrial wastes, and wastewater sludge.
- (b) New water mains and new water supply lines shall be installed at least four (4) feet horizontally from, and one (1) foot vertically above, any parallel pipeline conveying:

- (1) Disinfected tertiary recycled water (defined in Section 60301.230, Title 22 of California Code of Regulations), and
- (2) Storm drainage.
- (c) New water supply lines conveying raw water to be treated for drinking purposes shall be installed at least four (4) feet horizontally from, and one (1) foot vertically below, any water main.
- (d) If crossing a pipeline conveying a fluid listed in subsection (a) or (b), a new water main shall be constructed perpendicular to and at least one (1) foot above that pipeline. No connection joints shall be made in the water main within eight (8) horizontal feet of fluid pipeline.
- (e) The vertical separation specified in subsections (a), (b), and (c) is required only when the horizontal distance between a water main and pipeline is ten (10) feet or less.
- (f) New water mains shall not be installed within one-hundred (100) horizontal feet of any sanitary landfill, wastewater disposal pond, or hazardous waste disposal site, or within twenty-five (25) feet of any cesspool, septic tank, sewage leach field, seepage pit, or groundwater recharge project site.
- (g) The minimum separation distances set forth in this section shall be measured from the nearest outside edge of each pipe barrel.

4.6.03. ALTERNATIVE CRITERIA FOR CONSTRUCTION

4.6.03.01. Water Mains, and Sewers and Other Non-Potable Fluid-Carrying Pipelines

When new water mains, new sanitary sewer mains, or other non-potable fluid-carrying pipelines are being installed in existing developed areas, local conditions (e.g., available space, limited slope, existing structures) may create a situation in which there is no alternative but to install water mains, sanitary sewer mains, or other non-potable pipelines at a distance less than that required by the regulations [existing Section 64630 (proposed Section 64572) of Title 22 of California Code of Regulations]. In such cases, through permit action, DDW may approve alternative construction criteria. The alternative approach is allowed under the proposed regulation Section 64551(c), Title 22 of California Code of Regulations:

“A water system that proposes to use an alternative to the requirements in this chapter shall demonstrate to the Department how it will institute additional mitigation measures to ensure that the proposed alternative would not result in an increased risk to public health.”

Appropriate alternative construction criteria for two different cases in which the regulatory criteria for sanitary sewer main and water main separation cannot be met are shown in Figures 1 and 2 of Standard Drawing No. S-1 in these Specifications.

1. **Case 1** - New sanitary sewer main and a new or existing water main; alternative construction criteria apply to the sanitary sewer main.
2. **Case 2** - New water main and an existing sanitary sewer main; alternative construction criteria may apply to either or both the water main and sanitary sewer main.

Case 1: New Sanitary Sewer Main Installation (Figures 1 and 2 of Standard Drawing No. S-1)

Zone Special Construction Required for Sanitary Sewer Main

- A Sanitary sewer mains parallel to water mains shall not be permitted in this zone without prior written approval from the DDW and the District.
- B If the water main paralleling the sanitary sewer main does not meet the Case 2 Zone B requirements, the sanitary sewer main should be constructed of one of the following:
 1. High density polyethylene (HDPE) pipe with fusion welded joints (per AWWA C-906);
 2. Spirally-reinforced HDPE pipe with gasketed joints (per ASTM F894);
 3. Extra strength vitrified clay pipe with compression joints;
 4. PVC sewer pipe with rubber ring joints (per ASTM D3034) or equivalent;
 5. Cast or ductile iron pipe with compression joints; or
 6. Reinforced concrete pressure pipe with compression joints (per AWWA C-302).
- C If the water main crossing below the sanitary sewer main does not meet the requirements for Case 2 Zone C, the sanitary sewer main should have no joints within ten (10) feet from either side of the water main (in Zone C) and should be constructed of one of the following:
 1. A continuous section of ductile iron pipe with hot dip bituminous coating; or
 2. One of the Zone D options 1, 3, 4, or 5 below.
- D If the water main crossing above the sanitary sewer main does not meet the Case 2 Zone D requirements, the sanitary sewer main should have no joints within four (4) feet from either side of the water main (in Zone D) and be constructed of one of the following:

1. HDPE pipe with fusion-welded joints (per AWWA C-906);
2. Ductile iron pipe with hot dip bituminous coating and mechanical joints (gasketed, bolted joints);
3. A continuous section of DR 14 PVC pipe (per AWWA C-900) or equivalent, centered over the pipe being crossed;
4. Any sanitary sewer main within a continuous sleeve.

Case 2: New water mains Installation (Figures 1 and 2 of Standard Drawing No. S-1)

Zone Special Construction Required for Water Main

- A No water mains parallel to sanitary sewer mains shall be constructed without prior written approval from the DDW.
- B If the sanitary sewer main paralleling the water main does not meet the Case 1 Zone B requirements, the water main should be constructed of one of the following:
1. HDPE pipe with fusion welded joints (per AWWA C-906);
 2. Ductile iron pipe with hot dip bituminous coating;
 3. Dipped and wrapped one-fourth-inch-thick welded steel pipe;
 4. DR 14 PVC water pipe (per AWWA C-900 & C-905) or equivalent; or
- C If the sanitary sewer main crossing above the water main does not meet the Case 1 Zone C requirements, the water main should have no joints within ten (10) feet from either side of the sanitary sewer main (in Zone C) and be constructed of one of the following:
1. HDPE pipe with fusion-welded joints (per AWWA C-906);
 2. Ductile iron pipe with hot dip bituminous coating;
 3. Dipped and wrapped one-fourth-inch-thick welded steel pipe;
 4. DR 14 PVC water pipe (per AWWA C-900 & C-905); or
- D If the sanitary sewer main crossing below the water main does not meet the requirements for Case 1 Zone D, the water main should have no joints within eight feet from either side of the sanitary sewer main (in Zone D) and should be constructed as for Zone C.

4.6.03.02. Water Mains and Pipelines Conveying Non-Potable Fluids

When the basic separation criteria cannot be met between water mains and pipelines conveying non-potable fluids, the requirements described above for sanitary sewer mains should apply. This includes the requirements for selecting special construction materials and the separation requirements shown in Figures 1 and 2 of Standard Drawing No. S-1. Note that not all construction materials allowed for sanitary sewer mains will be appropriate for other non-potable fluid lines. For example, certain plastic lines may not be appropriate for the transport of some fuel products. The selection of compatible materials of construction for non-potable fluids is a decision to be made by the project engineer.

4.6.03.03. Water Mains and Sewage Force Mains

- a. Sewage force mains shall not be installed within ten (10) feet (horizontally) of a water main regardless of construction methods or materials.
- b. When a sewage force main must cross a water main, the crossing should be as close as practical to the perpendicular. The sewage force main should be at least one foot below the water main; support the water main during construction to prevent separation of joints.
- c. When a new sewage force main crosses under an existing water main, and a one-foot (1') vertical separation cannot be provided, all portions of the sewage force main within eight (8) feet (horizontally) of the outside walls of the water main should be enclosed in a continuous sleeve. In these cases, a minimum vertical separation distance of four (4) inches should be maintained between the outside edge of the bottom of the water main and the top of the continuous sleeve.
- d. When a new water main crosses over an existing sewage force main, the water main should be constructed of pipe materials with a minimum rated working pressure of 200 psi or the equivalent.

4.6.03.03. Water Mains and Tertiary Treated Recycled Water or Storm Drainage

The basic separation criteria for water mains and pipelines conveying tertiary treated recycled water or storm drainage lines are a four (4) foot horizontal separation where lines are running parallel and a one (1) foot vertical separation (water line above recycled or storm drainage) where the lines cross each other.

When these criteria cannot be met, the Zone A criteria apply where lines are running parallel, and the Zone C and Zone D criteria apply where the lines cross each other as shown on Figures 1 and 2 of Standard Drawing No. S-1. For these situations, the Zone "P" criteria are in effect and prohibit construction less than one (1) foot in parallel installations and less than four (4) inches in vertical (crossing) situations.

For tertiary treated recycled water and storm drainage lines, the Zone B criteria (requirements for special pipe) do not apply as the basic separation criteria is a four (4) foot horizontal separation criteria for parallel lines. The tertiary treated recycled water lines should be constructed in accordance with the color-coding, and labeling requirements per Section 116815, California Health and Safety Code of Regulations.

4.6.04. MISCELLANEOUS GUIDANCE

- a. More stringent requirements may be necessary if conditions such as high groundwater exist. HDPE or similar pipe may be required to provide flexibility to move without potential joint leaks.
- b. Sanitary sewer mains should not be installed within twenty five (25) horizontal feet of a low head (5 psi or less pressure) water main.
- c. New water mains and sanitary sewer mains should be pressure tested in accordance with Manufacturer's Specifications during manufacture, and the Standard Drawings during construction.
- d. When installing water mains, sewers, or other pipelines, measures should be taken to prevent or minimize disturbances of existing pipelines. Disturbance of the conduit's supporting base could eventually result in pipeline failure.
- e. Special consideration should be given to the selection of pipe materials if corrosive conditions are likely to exist; refer to soils report for the project. These conditions may be due to soil type and/or the nature of the fluid conveyed in the conduit, such as a septic sewage producing corrosive hydrogen sulfide.

NOTE: Dimensions are from the outside of the water main to the outside of the other pipeline, manhole, or sleeve.

SECTION 4.7. WATER QUALITY SAMPLE STATION

4.7.01. GENERAL

Water quality sample station shall be installed as called for on the Drawings and in accordance with Standard Drawing No. W-9, and as specified herein. Service lateral shall be installed in accordance with Standard Drawing No. W-5.

4.7.02. MATERIALS

Water quality sample station shall be Koraleen Station Guard XLT for Cold Climates or approved equal, per Standard Drawing No. W-9.

4.7.03. EARTHWORK

The Contractor shall refer to Section 4.1 "Earthwork" of these Detailed Technical Provisions for all requirements relating trench excavation and backfill.

4.7.04. SERVICE LATERAL

Each water quality sample station shall be connected to the water main with one-inch (1") water service lateral per Standard Drawing No. W-5. The corporation stop, copper tubing, angle meter stop and valve box shall be furnished and installed in accordance with the applicable specification as specified on Section 4.8. of these Detailed Technical Provisions.

SECTION 4.8. WATER SERVICE

4.8.01 GENERAL

Services shall be installed at the locations shown on the Plans, at right angles to the centerline of the main (unless otherwise shown) and shall be spaced a minimum of four (4) feet from any sewer lateral. No services will be permitted in driveway areas or under any structure (wall, retaining wall, garden wall, footing, residence/commercial, or out-building).

All pipes, valves and fittings shall have a minimum working pressure rating of one hundred sixty (160) psi.

Water service connections shall be installed in conformance with Standard Drawing No. W-5 and other applicable Standard Drawings.

The area designated on Standard Drawing No. W-5 as Future Meter Box shall be backfilled after covering the angle meter stop with an inverted polyethylene bag securely tied or taped below said stop. The bag shall be of a size to adequately enclose the entire angle meter stop and shall be black, four (4) to six (6) mils in thickness as manufactured by Transparent Products Corp., 1727 West Pico Blvd., Los Angeles, CA 90015, or approved equal. Care shall be taken not to puncture or tear the bag during backfilling of the future meter box area.

An electronic mini-marker manufactured by 3M Corp., or approved equal, shall be placed twelve (12) inches in front of the meter box in accordance with the manufacturer's recommendations.

4.8.02. EARTHWORK

The Contractor shall refer to Section 4.1 "Earthwork" of these Detailed Technical Provisions for all requirements relating trench excavation and backfill.

4.8.03. SERVICE SADDLES

Wide body strap service saddles shall be furnished and installed for water services. The saddle shall be as manufactured by Smith-Blair or approved equal sized to fit 9.05-inch C-900 PVC pressure pipe (eight-inch diameter.), or size appropriately for the main to be tapped. Casting shall be tapped with fully formed threads, iron pipe size. Strap shall be Type 304 stainless steel. Bolts, nuts and washers to be 5/8-inch N.C. roll thread Teflon coated.

Taps for pressure pipe shall be iron pipe thread sized for the diameter of service to be used and shall be welded to steel pressure pipe in the field. Ductile iron pipe shall be tapped to receive threaded corporation stops.

4.8.04. CORPORATION STOP

A corporation stop shall be provided at the main for each service pipeline indicated on the Drawings. Corporation stop shall be bronze body conforming to ASTM B62-63 with iron pipe size threads and compression-type coupling for copper pipe size polyethylene pipe. Corporation stops shall be Ford F-1100, or approved equal.

4.8.05. SERVICE LINES

Service lines shall be constructed as shown on the Drawings using one-inch (1") or larger polyethylene pressure pipe PE 3406 conforming to AWWA C-901. The pipe shall be copper pipe size one inch (1") or larger, nominal size as indicated on the Drawings, with a dimension ratio of not more than 9.3.

4.8.06. ANGLE METER STOP

Meter stops shall be provided at the water meter locations of each new service as indicated on the construction Drawings. For water meters placed on level area, use James Jones J-182 or approved equal. For water meters placed on steep hillsides or bank, use Ford KV13-332W or approved equal for dual service and KV43-332W or approved equal for single service. Standard Drawings No. W-5A and W-5B shall be referred for details.

SECTION 4.9. PIPE, FITTINGS AND INSTALLATION FOR WATER SYSTEM

4.9.01. GENERAL

The Contractor shall furnish all labor, materials and equipment and perform all the Work to furnish, install and test all pipe, pipe supports, valves, fittings, pipe thrust restraints and all required appurtenances as shown on the Drawings and as required to make the entire piping system operable. Piping runs shown on the Drawings shall be followed as closely as possible, except for minor adjustments to avoid architectural and structural features. If major relocations are required they shall be approved by the District. Piping around all equipment shall be arranged to permit ready access to and removal of equipment or parts. Parallel runs of pipe shall be grouped and kept uniformly parallel.

Ductile iron pipe, PVC pipe or cement mortar lined and coated steel (CML&C STL) pipe shall be used for twelve-inch (12") diameter and smaller pipe.

Ductile iron pipe or CML&C STL pipe shall be used for fourteen-inch (14") diameter and larger pipe.

C-900 PVC pipe may alternately be used based on the appropriate pressure rating noted in the Feasibility Study.

The Contractor shall submit Shop Drawings showing the pipe material specifications, dimension, joint detail, piping laying diagram to the District for approval prior to the manufacturing of any piping.

The appropriate AWWA Standards and Specifications shall be used as minimum standards or specifications for the manufacture, installation or construction of all of the District's water transmission and distribution pipelines.

4.9.02. CAST IRON OR DUCTILE IRON PIPE AND FITTING

- a. Where cast iron (CI) pipe is called for on the Plans, it shall be the Contractor's option to use either cast iron or ductile iron (DI) pipe.
- b. All cast iron pipes shall be manufactured in accordance with American National Standard Institution Standard A21.8 (ANSI A21.8) and AWWA C-106 and shall be rated for minimum 150 psi internal working pressure.

- c. All ductile iron pipes shall be manufactured in accordance with ANSI A21.51 and AWWA C-151 and shall be Class 51 thickness for pipe up to twelve-inch (12") diameter, and Class 52 for pipe larger than fourteen-inch (14") diameter.
- d. All cast iron or ductile iron pipe fittings shall be manufactured in accordance with ANSI A21.10 and AWWA C-110 or ANSI A21.53 and AWWA C-153.
- e. All cast iron or ductile iron pipe and fittings shall have cement-mortar lining per ANSI A21.4 and AWWA C-104. Cement shall be of Type II Cement.
- f. Bolts, nuts and washers for flanged joints shall conform to the recommendations of the pipe Manufacturer and shall be uniformly tightened. Ring gaskets shall be lubricated and installed in accordance with the Manufacturer's recommendations.
- g. Ductile iron pipe may, at the Contractor's option (if not noted on the Plans), have push-on, mechanical or 125-pound. flanged joints. Where flexibility of joints is a factor, such as where piping enters or exits a structure a flexible coupling shall be used. Pipe with flange joint shall not be used for underground installation.
- h. Mechanical joints shall consist of a stuffing box into which an endless rubber ring is compressed by a follower gland. The gasket must be fully confined and under constant compression. Mechanical joint pipe shall be installed in accordance with Manufacturer's recommendations.
- i. DI fitting adjacent to a valve shall have flanged ends. Flanged coupling adapter shall be provided with the pipe and fittings furnished.
- j. All ductile iron pipe and fitting shall be installed with an eight (8) mils thick polyethylene tube for all underground installation.

4.9.03. CEMENT MORTAR LINED AND COATED STEEL (CML&C STL) PIPE

Cement mortar lined and coated or painted steel (CML&C STL) pipe and fittings shall be manufactured in accordance with AWWA C-200 except as further noted in these Specifications. Minimum thickness of steel plate shall be 10 gauges, or as determined the formula specified in AWWA C-200. The pipe shall be rated for the minimum 150 psi working pressure or class as indicated on the Drawing.

- a. Pipe - Pipe shall consist of the following component parts - A welded sheet steel or plate steel cylinder with joints formed integrally with the steel cylinder or with steel joints rings welded to the ends; a dense cement-mortar lining; a dense, concentric, steel reinforced

exterior mortar coating or shop primed, as specified; a self-centering bell and spigot joint with a circular pre-formed rubber gasket, so designed that the joint will be watertight under all conditions of service or welded lap joints, or plain end as required.

- b. Steel for Cylinders - The steel for cylinders shall be hotrolled low carbon steel sheets conforming to ASTM A283, Class B or C, or A570, Class C. The minimum acceptable yield strength of the steel shall be 33,000 psi. Design stress shall not exceed 15,000 psi in any case.
- c. Exterior of Pipe - The exterior of pipe shall be either cement mortar coated or shop primed and in accordance with the following:
 - 1. Cement mortar coating shall be applied in accordance with AWWA C-205. All buried pipe shall be cement mortar coated. Type II cement shall be used for all mortar coating.
 - 2. Shop coating for exterior of pipe above ground or in structure shall conform to painting specifications.
 - 3. Marking - The following information shall be clearly stenciled on each section of pipe; pressure class; inside diameter in inches; name of manufacture; date of manufacture.
- d. Interior of Pipe - The interior of pipe shall be cement mortar lined. Lining may be placed by the centrifugal, pneumatic, or hand method, in order, whichever is applicable as determined by the pipe Manufacturer. Cement shall be Type II cement.
- e. Bell and Spigot Joints - Bell and spigot joints shall be made with rubber gaskets restrained or confined to an annular space in such manner that movement of the pipe or hydrostatic pressure cannot displace the gasket. Spigot and bell ends shall be formed by cold rolling or swaging or hot die and mandrel process. The deformation of the gasket in the joints of the installed pipe shall not exceed forty five percent (45%) nor be less than twenty percent (20%) of the stretched gasket diameter.
- f. Welded Field Joints - Welded field joints shall meet the requirements of AWWA C-206.
- g. Flange Joints - Flanged joints shall meet the requirements of AWWA C-207.

h. Diameters - Diameters shown for steel pipe larger than twelve (12) inches indicate required inside diameter after lining. Steel pipe twelve (12) inches in diameter and smaller shall be standard mill diameters.

i. Special Fitting

1. Wherever a bend exceeds the allowable deflection, a special fitting is required and shall be fabricated in accordance with this section. Special fittings shall extend a minimum distance back from the last weld equal to half of the diameter of the pipe, but not less than twelve (12) inches. The Contractor shall furnish and install specially fabricated special fittings and bends for closures, curves, bends, reducer, and connections to valves. The special fittings and bends shall have a minimum design equal to the adjoining pipe. Steel plates used in the fabrication shall conform to ASTM A283, Grade B or C, and shall not be stressed more than 13,500 psi at the design pressure.

Fittings shall conform to applicable sections of AWWA C-208 and C-206. Fittings adjacent to a valve or a blind flange shall be contain flanged ends.

2. The minimum wall thickness of all special fittings shall be 0.1875 inch unless otherwise noted.
3. All piping special fittings shall have a minimum wall thickness of the largest class pipe which it joins. Wire reinforcement, either Spiral Wire Reinforcement or Wire Fabric Reinforcement shall conform to either ASTM A82 or A185. Fabric shall be sufficiently lapped to secure the full strength of the mesh.
4. Cast Iron Fittings (Alternate) - In lieu of fabricated fittings the Contractor may choose to use cast iron in the installation of welded steel pipe. In this case the cast iron fittings shall be the mechanical joint type with cement linings conforming to AWWA C-110 (ASA A21.10). The class of each fitting shall conform to the class of welded pipe to be used. Only one (1) field cut of the welded steel pipe will be permitted at each cast iron fitting location. Protection of all inside joint recesses and outside joints shall be as hereafter specified.

j. Testing - Testing of fittings shall be by a hydrostatic test equal to one hundred fifty percent (150%) of the design working pressure.

- k. Bends - Unless otherwise indicated, bends shall have minimum centerline radius of two and one-third (2-1/3) times its diameter. The maximum deflection at a mitered girth seam shall be twenty two and one-half (22-1/2) degrees.
- l. Outlets - Collars and wrappers on outlets shall have a minimum thickness determined by the following:

$$T = \frac{P \times D_p \times D_o}{36,000 \times W}$$

T = Thickness of the collar or wrapper in inches.

P= Design pressure in psi.

D_p = Inside diameter of pipe cylinder in inches.

D_o = Diameter of opening (major axis in ellipse) in inches.

W = Width of collar or wrapper in inches.

The width of the collars or wrappers shall be not less than one-third (1/3) or more than one-half (1/2) of the inside diameter of the outlet, measured on the surface of the cylinder. Outlets three (3) inches in diameter or less may be installed without collars. Where specifically called for in lieu of collars or wrappers, crotch plates may be used on outlets larger than twelve (12) inches in diameter. The design of crotch plates shall be based on AWWA Manual No. 11.

- m. Long Radius Curves - Horizontal and vertical long radius curves may be formed of straight pipe by taking small angular deflections at the bell and spigot joints, not exceeding the published allowable deflections.
- n. Rubber Gaskets - The gaskets for joints shall be circular, free from imperfections, dense, and consist of first grade natural rubber or synthetic rubber, or a suitable combination of both. Gaskets shall conform to the following physical requirements when tested in accordance with Federal Test Methods Standard No. 601.

Tensile Strength, Natural Rubber.....	2,700 psi
Tensile Strength, Synthetic Rubber.....	2,300 psi
Elongation at Rapture, Minimum.....	4.75%
Specific Gravity.....	1.15 to 1.25
Compression Set Test, Maximum.....	15%
Shore Durometer, Type A.....	50 - 60
Tensile Strength after Aging, Minimum of Original.....	80%

- o. Bond Clip - bond clip or jumpers shall be furnished and installed as recommended by the pipe manufacture. Minimum three (3) clips per joint.
- p. Drawings - Prior to the manufacture of any pipe, the Contractor shall submit for approval detailed drawings of the pipe layout, including the required pull at each pipe joint which may be necessary to construct the pipeline in accordance with the Drawings.

4.9.04. POLYVINYL CHLORIDE (PVC) WATER PIPE

This specification covers the furnishing of polyvinyl chloride (PVC) pressure pipe in nominal diameters four (4) inches through twelve (12) inches for potable water distribution projects as designated on project drawings.

- a. Pipe - The pipe shall be fabricated in accordance with AWWA C-900 for “Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inch through 12 Inch for Water” and shall be rated for operating pressure as noted on the Plans.
- b. Joints - Shall be gasket, push-on type conforming to AWWA C-900. Since each pipe Manufacturer has a different design for push-on joints, gaskets shall be part of a complete pipe section and purchased as such. Lubricant shall be as recommended by the pipe Manufacturer and shall not adversely affect the potable qualities of the water to be transported.
- c. Markings - All PVC pipe shall be clearly marked in accordance with AWWA C-900. Intervals shall not exceed five (5) feet.
- d. Approvals - PVC water pipe shall be approved by the Underwriters Laboratory (UL) and by Factory Mutual (FM).
- e. Tests and Reports - The Contractor shall provide test reports duly certified by the Manufacturer’s testing facility or an approved testing laboratory of full compliance with AWWA C-900. Pipe shall be rejected for failure to comply with any requirement of this specification.
- f. Fittings - All elbows, tees, crosses, reducers, and other special fittings in PVC pipeline shall be either cast iron or ductile iron pipe fitting per Section 4.9.2 with AWWA C-104 Type II cement mortar lining. All fittings adjacent to a valve shall have flanged ends. Flanged coupling adaptor shall be provided with pipe and fitting supplied.

- g. Deflection - Deflections shall not exceed the pipe Manufacturer's printed recommendations. On factory installed couplings no deflection shall be allowed for the factory joint unless the coupling is "broken loose" by the Contractor prior to installing.
- h. End Separation - Ends of pipe sections shall be so manufactured that in conjunction with couplings and rings they shall provide, when assembled, automatic separation of pipe ends.
- i. Pipe Ends - PVC pipe shall be of a design for which there is available, from local stock, cast iron fittings and gate valves having bells with sealing ring grooves of the same design as the ring groove of the couplings with which the pipe sections are joined.
- j. Locator Wire - In continuous runs of PVC pipeline, a 12 gauge TW solid copper wire shall be taped to the pipeline in accordance with Standard Drawing No. W-14. The wire shall be attached to all gate valves. Copper wire shall be continuous. Purpose of this wire to aid in locating the pipe.
- k. Shop Drawings - Shop Drawings of all pipe and fittings shall be submitted to the Engineer and shall be approved by him prior to fabrication of the pipe and fittings.

4.9.05. GALVANIZED IRON PIPE AND FITTINGS

Galvanized iron pipe shall conform to ASTM A53 or ANSI B36.10 welded Schedule 40 galvanized. The fittings shall be ANSI B16.3 screwed, banded and galvanized for a working pressure of 150 psi.

4.9.06. TAPPING OUTLET

Tapping outlet for PVC pipe and ductile iron pipe lines shall be Mueller Catalog No. H-615, Class 150 mechanical joint tapping sleeve or approved equal. Tapping out for steel pipe shall be of weld-on outlet per Standard Drawing No. W-10.

4.9.07. FLANGES, GASKETS, AND BOLTS

Flanges shall conform to dimensions and drilling of ANSI B16.1, Class 125, or as called for on the Drawings. Flange gaskets shall be ring type, Johns-Manville Style 60S, Granite, or approved equal. Thickness shall be one-sixteenth (1/16) inch for pipe eighteen (18) inches and smaller, and one-eighth (1/8) inch for larger pipes. Flange assembly bolts shall be standard hexagon head machine bolts with heavy hot pressed hexagon nuts. Threads shall conform to ANSI B1.1, coarse thread series, Class 2 fit. Bolt length shall be such that after the joints are made up, the bolts shall protrude through the nut, but not more than two (2) inches. Flanges on steel pipe shall be welded to the pipe in accordance with AWWA C-207.

4.9.08. FLEXIBLE COUPLINGS AND FLANGED COUPLING ADAPTORS

Flexible couplings shall be Romac Style 501, Smith-Blair Type 442, long barrel, or approved equal. Flanged coupling adapters shall be Smith-Blair Type 912, Romac Style FCA501, or approved equal. Flexible coupling and flanged coupling adaptors for underground use shall be epoxy coated.

4.9.09. TEMPORARY BULKHEADS

The Contractor shall furnish and install complete, all the necessary temporary bulkheads or steel boilerheads and appurtenances thereto in the pipeline used for water line pressure and leakage test and for backfilling purpose and shall remove such bulkheads upon completion of the line.

4.9.10. INSTALLATION OF UNDERGROUND PIPE

The Contractor shall, after excavating the trench and preparing the proper bedding for the pipe, furnish all necessary facilities for properly lowering and placing sections of the pipe in the trench without damage and shall properly install the pipe. The section of the pipe shall be fitted together correctly and shall be laid true to line and grade in accordance with survey control. The full length of the barrel of the pipe shall have a uniform bearing upon the bedding material, but if the pipe has a projecting bell, suitable excavation shall be made to receive the bell which shall not bear on the subgrade. The bottom of the pipe shall be closely fitted to the bedding material for the specified width. Pipe shall be laid upgrade. Any pipe which is not in true alignment, both vertical and horizontal, or shows any undue settlement after laying, shall be taken up and re-laid correctly by the Contractor at his own expense, when so ordered by the District. No pipe shall be laid which is damaged, cracked, checked, or spalled or has any other defect deemed by the District to make it unacceptable, and all such sections shall be permanently removed from the Work.

4.9.11. INSTALLATION OF DUCTILE IRON AND CAST IRON PIPE

- a. Pipe Laying - All pipes shall be carefully inspected for defects before installation. Such inspection shall include light tapping with a hammer while the pipe is suspended in the air. No pipe or fitting which is cracked or which shows defects excluded by the Specifications for such fittings shall be used. Any injuries to the protective coating of the pipe or fittings shall be carefully repaired by the Contractor with coal tar pitch varnish. The pipes, valves, and fittings shall be carefully cleaned immediately before installation. Every open end of a pipe shall be carefully plugged or capped before leaving the Work. For bell and spigot pipe, the position or direction of bells, which shall normally face the direction of flow, may be altered from the positions shown on the Plans with the permission of the District. Bells and spigots must be thoroughly cleaned and free from oil, grease, blisters, or excess coating before spigots are inserted into bells. The spigot end of the pipe shall be brought to true line and grade and be inserted to the full depth of the socket before the joints are made. The inner surface of the pipe shall conform at the joints, and the annular space for the

jointing materials shall be of uniform width and depth. If any pipe does not allow sufficient space for jointing material, it shall be replaced by one of the proper dimensions. The maximum deflection angle in bell and spigot cast iron pipe joints shall be no more than three (3) degrees. Laying of cast iron pipe shall conform to line and grade as shown on the Drawings.

- b. Piping Through Walls - Piping through walls shall be installed in accordance with the Drawing and shall be accomplished by the installation of a wall insert of the same size as the pipe penetrating the wall. Care shall be exercised to insure a watertight installation.
- c. Neoprene-Ring Joints - Between lengths of cast iron pipe, neoprene gasket joints can be used. Joints shall be "Tyton" or approved equal. Installation shall be in accordance with the Manufacturer's recommendations. Gasket seats and neoprene gaskets shall be thoroughly cleaned before assembly. The completed joint shall have a uniform contact by the gasket between the outer surface of the spigot and the gasket seat of the bell.
- d. Flanged Joints - Flanged pipe shall be cut true to length. Joints shall be made up square, with even pressure upon the gaskets and shall be perfectly watertight.

Gaskets shall be full faced and shall fit the inside dimension of the pipe accurately, so that no surplus material projects out into the flow area. The completed joint shall be smooth and properly aligned. Flanged pipe shall not generally be allowed for underground installation.

4.9.12. INSTALLATION - CEMENT MORTAR LINED AND COATED STEEL (CML&C STL) PIPE

While pipe is being transported or handled during construction operations, every reasonable precaution shall be taken to prevent damage thereto. Pipe shall be handled with suitable equipment approved by the Manufacturer, such as multiple padded slings, designed to prevent scuffing and denting of the pipe. Pipe sections shall be supported on padded bolsters or cradles and separated so that they do not bear against each other during transporting. The pipe shall not be placed directly on rough ground, but shall be supported in a manner which will protect that pipe against injury, wherever stored.

Any pipe section that is damaged shall be repaired as prescribed by the Engineer, if in his opinion, a satisfactory repair can be made; otherwise, the pipe section shall be replaced with the undamaged section at the Contractor's expense.

Immediately in advance of placing any pipe or fittings in the trench, all loose rocks or other material which would interfere with the proper laying of the pipe shall be removed from the trench. The bottom of the trench must be trimmed so that the barrel of the pipe shall be supported throughout

its entire length. Bell holes shall be provided at pipe joints of sufficient depth so that each joint can be made as required by the type of pipe being used.

When the trench has been properly prepared, the pipe and fittings shall be lowered therein, singly, without undue jar or strain and assembled piece by piece inside the trench. Proper slings shall be used in lowering pipe to prevent damage to pipe surfaces. Before lowering, and while suspended, each joint of pipe shall be inspected for defects. Any damaged, defective or unsound pipe shall be immediately removed. All foreign matter or dirt shall be removed from the inside of the pipe and the outer surface of the spigot ends and the inner surface of the bell before it is lowered into position inside the trench and pipe shall be kept clean during pipe-laying operations. All valves, fittings, and specials shall likewise be cleaned thoroughly before being placed the pipeline.

Each length of pipe shall be accurately adjusted to line and grade and held in position by earth packed on each side. No blocking of any kind shall be used to support the pipe or hold it in position. The pipe shall be installed in accordance with Manufacturer's recommendations. Departure from and return to established alignment and grade shall not exceed 1/16 inch per linear foot of pipe and at no point shall the maximum departure from established line and grade be greater than one-inch. Accumulation of departure from the design stationing shall be avoided insofar as practicable.

Where long-radius curves or bends are allowed to be made by deflecting the pipe sections, the deflection shall be limited to that recommended by the Manufacturer of the pipe. Deflection in steel pipe may be made by the use of bevel end pipe with a bevel not to exceed five degrees. Where changes in grade or alignment cannot be made by the above means, or where specifically indicated by the Drawings, shop fabricated or mitered pipe bends shall be used.

No pipe shall be laid in water nor shall water be permitted to enter the pipe. Pipe ends shall be closed when pipe laying is not in progress. Pipe shall be laid uphill with bells upgrade and with identification marks on top unless otherwise approved by the Engineer.

The joining of pipe sections shall be such as to produce watertight lines for the conveyance of water. When laying pipelines, the pipe shall be carried by multiple padded slings, unless otherwise approved by the Engineer, which should be located around the pipe in such a manner as to prevent vibration and deflection of the pipe. The pipe shall not be dragged on the bottom of the trench, but shall be supported by the slings while being fitted into the adjacent section. Any disbondment of the mortar coating from the steel cylinder will not be allowed. When rubber gasket joint pipe is being laid, ends of the pipe shall be thoroughly cleaned with wire brushes or the equivalent to remove all foreign materials, including sealing compound, if any, from surfaces which are to be incorporated in the joint. The spigot recess, the rubber gasket, and the bell shall be lubricated with a soft, vegetable soap compound.

After lubrication, the gasket shall be thoroughly stretched when placing in the spigot groove so that there is a uniform volume of rubber distributed around the circumference. The gasket shall not be twisted, rolled, cut, crimped or otherwise injured or forced out of position during closure of the joint. After the joint is assembled, a thin metal feeler gauge shall be inserted between the bell and the spigot and the position of the rubber gasket and checked around the complete circumference of the pipe. If the gasket is not in the proper position, the pipe shall be withdrawn, the gasket checked to see that it is not cut or damaged, the pipe re-laid, and the gasket position again checked.

The edge of the lining of the bell end shall be "buttered" with cement mortar prior to assembly. The lining in both the bell and spigot ends shall be dampened prior to application of the mortar. The joint shall then be closed and a rubber sewer ball or squeegee shall be pulled through the pipe to remove excess mortar extruded on the inside surface of the pipe. The mortar shall be mixed in proportion of not richer than one part, by weight, of cement to two parts, by weight, of clean, well-graded sand, and just sufficient water to obtain the proper consistency. To improve workability of the mortar, the Contractor, with the Engineer's approval, may replace not more than seven percent, by weight, of cement with approved pozzolan, or may add an approved air-entrained agent in the mortar, or may use any combination of these. Any mortar which has become so stiff that proper placement without retempering cannot be assured shall be wasted. The Contractor shall prepare the mortar in small batches so as to avoid stiffening of the mortar prior to its application. The finished joint shall be smooth and flush with the adjacent pipe surfaces. For pipe 24-inches in diameter and larger, after the pipe zone bedding and backfill have been densified, the inside joint recess shall first be moistened, then filled and painted with a stiff cement mortar consisting of 1 part cement to 1-1/2 parts of sand. The finished joint shall be smooth and flush with the adjacent pipe surfaces. Interior joint painting operations shall not be conducted within two joints of pipe laying operations.

After laying, the exterior joint recesses shall be filled with grout. Grout used for filling the outside joints by the pouring method shall be mixed in proportions of one part cement, by weight, to not more than two parts, by weight, of sand passing a No. 16 mesh screen and thoroughly mixed with water to the consistency of rich cream. A cloth band 9 inches wide shall be placed around the outside of the pipes and centered over the joint. The joint band shall be bound to each pipe by use of steel box strapping. The band shall completely and snugly encase the joint except for an opening at the top through which to pour the grout. The outside grout space, prior to filling with grout, shall be flushed with water so that the surfaces of the joint to be in contact with the grout filling will be thoroughly moistened when the grout is poured. Fluid grout shall be poured in only one opening in this joint and pouring shall be continuous until grout appears at the other side. The grout shall be rodded on both sides of the pipe, if necessary, to settle the grout and more grout added to fill the joint completely. The bands shall not be removed from about the joint. Exposed portions of the joint, after filling, shall be covered with wet burlap or moist earth. If backfill material is to be hydraulically consolidated, outside joint grout shall be poured and allowed to set before consolidation of the backfill material.

Field joints shall be welded at the locations shown on the Drawings and at locations where make-up field joints are required, as approved by the Engineer. The welded joints shall be by means of lap welding with ends shop-formed for lap welding or by means of a 6-inch butt strap. Hand holes shall be provided for the placement of mortar lining, in butt strap connections. All preparations of ends of pipe and all welding of joints shall be in accordance with AWWA C-206.

All flanged joints shall be installed complete with bolts in accordance with American Standards Association requirement and with full-face gaskets fabricated from 1/16-inch cloth inserted rubber gasket material. Gasket shall have bolt holes punched. All bolts and nuts and all gaskets shall be lubricated before assembly with Dearborn No-Oxide Grease No. 2 or approved equal.

Flexible couplings shall be sleeve type as manufactured by Dresser, Smith-Blair or approved equal. Prior to installation of sleeve type couplings, the pipe ends shall be thoroughly cleaned of all oil, dust, loose scale, rust and other foreign matter for a distance back from the end of the pipe of at least eight (8) inches. Middle ring, follower, and gaskets shall be assembled on the pipe ends in accordance with the coupling Manufacturer's recommendations. Gaskets, pipe ends, and middle ring flares shall be lubricated with a vegetable soap to facilitate the joining. Middle rings shall be accurately centered over the pipe ends. Bolts shall be tightened to the torque recommended by the coupling Manufacturer.

4.9.13. INSTALLATION - POLYVINYL CHLORIDE (PVC) WATER PIPE

PVC pipe shall be stored, handled and installed in accordance with Manufacturer's instructions.

- a. Embedment Requirements - The embedment requirements for PVC water pipe shall be in accordance with AWWA C-900, Appendix A.6 – "Installation" and Section 4.1 "Earth Work" of these Detailed Technical Provisions.
- b. Service Connections - All service line connections to PVC water pipe shall be made in accordance with the recommendations of AWWA Manual No. M23, "PVC Pipe - Design and Installation", Chapter 9 and Standard Drawings No. W-5A and W-5B of these Specifications. There shall be no direct taps made on PVC pipe.

4.9.14. CONCRETE THRUST BLOCK, CRADLE AND PIPE ENCASEMENT

The Contractor shall refer to AWWA Manual No. M23 and Section 4.15, "Concrete Thrust Block, and Blankets", of these Detailed Technical Provisions for all requirements relating concrete thrust block, cradle and pipe encasement

4.9.15. TESTING AND DISINFECTION OF WATER LINES

The Contractor shall refer to Section 4.10, "Water Pipeline Testing and Disinfection", of these Detailed Technical Provisions for all requirements relating testing and disinfection of water lines.

SECTION 4.10. WATER PIPELINE TESTING AND DISINFECTION

4.10.01. GENERAL

All water facilities including water pipes, service laterals, valves, blow-offs, flush-outs, hydrants and any other appurtenances shall be water tight, cleaned and disinfected before they are placed in services. Testing and disinfection, as a minimum, shall meet appropriate AWWA specifications unless otherwise specified.

4.10.02. TESTING

Pressure and leakage tests shall be performed in accordance with the AWWA standard procedures for Pressure and Leakage Test (Section 7 of AWWA C-605), except as herein modified.

Separate tests shall be performed for pressure test and leakage test.

Upon the completion of the lying, jointing, and backfilling, and the proper curing of the joints, the pipeline or portions thereof shall be hydrostatically tested. For convenience of testing, the pipeline may be divided into sections and each section shall not exceed four thousand (4,000) feet. The maximum elevation difference for each test section shall not exceed fifty (50) feet. Bulkheads shall be constructed to safely withstand the hydraulic pressures imposed upon them. No payment will be made expressly for the Work and materials required for the bulkheads and any compensation desired by the Contractor for this Work shall be included in the price quoted for the installation of pipe. The Contractor shall have no claim against the District by reason of required construction due to omission of the installation of any or all main line valves.

- a. Preparation - After the section of pipeline has been bulkheaded and completely filled with water, it shall be allowed to stand under a light pressure a minimum of twenty four (24) hours to allow the concrete to obtain a maximum absorption of water and to allow the escape of air from any pockets. Refer to Section 4.10.3 of these Detailed Technical Provisions for filling and contact requirements.
- b. Pressure Test - After the installed pipeline is properly filled and has been purged of all air, a test pressure equal to the higher of one hundred fifty percent (150%) of working pressure, or pressure rating of pipe plus fifty (50) psi, shall be applied by means of an approved pumping equipment connected to the pipe in a manner satisfactory to the District inspector. The duration of pressure test shall be two (2) hour minimum. The pressure shall be maintained within five (5) psi of the test pressure.

- c. Leakage Test - Leakage that shall be conducted immediately following pressure test. Test pressure shall be one hundred fifty percent (150%) of working pressure and the duration shall be two (2) hours minimum. Leakage shall be defined as the quantity of water that must be supplied into the pipe section being test to maintain the pressure within five (5) psi of the specified test pressure. The allowable leakage shall be smaller than ten and one-half (10.5) gallons per day per miles per inch diameter of the pipe being tested. The Contractor shall determine the points of leakage, make the necessary repairs, and make another test. This procedure shall be continued until the leakage falls below the allowable amount. Leakage shall be determined by metering the water injected into the pipeline while under the required pressure. The Contractor shall submit to the District before and after the test gauge, and the meter used so that the District may test these devices.
- d. Test Equipment - The Contractor shall provide all calibrated meters for measurement of leakage, all bulkheads or boilerheads, piping, calibrated gauges, pumps and other equipment, and all power and labor necessary for the performance of pressure tests satisfactory to the District. The Contractor shall furnish all necessary equipment and labor to fill each section of pipeline tested and for pumping the water from one test section of pipeline tested and for pumping the water from one test section to another as may be necessary for obtaining and maintaining the required water pressure and for filling the entire pipeline with water after the conclusion of the testing, as hereinafter provided.
- e. Corrections - The Contractor at his own expense, shall do any excavation necessary to locate and repair leaks or other defects which may develop under test, including removal of backfill already placed, shall replace such excavated material, and shall make all repairs necessary to meet the required water tightness after which the test shall be repeated until the pipe meets the test requirements. All tests shall be made in the presence of the District. After the pipe has met successfully with the test requirements specified herein, the entire pipeline shall be filled with water and so maintained until the completion of the contract unless otherwise ordered by the District.

4.10.03. DISINFECTION

- a. General - Prior to connecting to existing water lines or putting into service, all water mains, water services and attached appurtenances shall be disinfected in accordance with AWWA C-651, except as specified, modified or supplemented herewith. Tablet method may be used.
- b. Tablet Method - The tablet method consists of placing calcium hypochlorite tablets in the water main as it is being installed and then filling the main with potable water when

installation is completed. This method may be used only if the pipes and appurtenances are kept clean and dry during construction.

Placing of calcium hypochlorite tablets. During construction, five-gram (5-gram) calcium hypochlorite tablet shall be placed in each section of pipe. Also, one such tablet shall be placed in each hydrant, hydrant branch, and other appurtenance. The number of 5-gram tablets required for each pipe section shall be $0.0012 d^2L$ rounded to the next higher integer, where d is the inside pipe diameter, in inches, and L is the length of the pipe section, in feet. Table 1 shows the number of tablets required for commonly used sizes of pipe. The tablets shall be attached by a food-grade adhesive. Such as Permatex Form-A-Gasket No. 2 and Permatex Clear RTV Silicone Adhesive Sealant, which are manufactured by Loctite Corporation, Kansas City, KS 66115 or approved equal. These products have both been approved by the United States Drug Administration (USDA) for uses that may involve contact with edible products. There shall be no adhesive on the tablet except on the broadside attached to the surface of the pipe. Attach all the tablets inside and at the top of the main, with approximately equal numbers of tablets at each end of a given pipe length. If the tablets are attached before the pipe section is placed in the trench, their position shall be marked on the section so it can be readily determined that the pipe is installed with the tablets at the top.

Table. Number of 5-g Calcium Hypochlorite Tablets Required for Dose of 25 mg/L*

Pipe Diameter (inches)	Length of Pipe Section (feet)		
	18	20	40
Number of 5-g Calcium Hypochlorite Tables			
4	1	1	1
6	1	1	2
8	2	2	4
10	3	3	5
12	4	4	7
16	6	7	13

* Based on 3.25-gram available chlorine per tablet; any portion of tablet rounded to next higher integer.

Filling and contact. When installation has been completed, the main shall be filled with water at a rate such that water within the main will flow at a velocity no greater than one (1) foot per second. Precautions shall be taken to ensure that air pockets are eliminated. This water shall remain in the pipe for at least twenty four (24) hours. If the water temperature is less than 41 °F the water shall remain in the pipe for at least 48 hours.

- c. Gas Injection Disinfection - The Contractor shall provide an outlet for the connection of injection chlorination equipment, after which the Contractor shall inject chlorine solution into the main for the necessary disinfection.
- d. Residual Chlorine Test - After 24 hours of retention, the hypochlorite solution shall be tested by the District, and to be acceptable, shall have a minimum of twenty five (25) parts per million (ppm) of residual chlorine.
- e. Additional Disinfection - If the test results are not satisfactory, the Contractor shall provide a two-inch (2") outlet for the connection of injection type chlorination equipment, after which the Contractor shall inject chlorine solution into the main for the necessary additional disinfection.
- f. Final Flushing - Following the period of retention and after testing of residual chlorine by the District, the chlorinated water shall be thoroughly flushed from the line until the replacement water throughout the length of the pipeline is comparable in quality to the water served the public for the existing system.

The Contractor shall be responsible to meet State's National Pollutant Discharge Elimination System (NPDES) permit requirements (Section CAG 998001) prohibiting discharge of chlorinated flush water into natural drainage courses. On a case-by-case base, the District may permit flush water to be discharged into the District's sewer system.

Care shall be taken that the extremities of the main and the services are free of chlorinated water before being placed in service and that all new service connections are thoroughly flushed out before the meters are installed. When a hypochlorite solution has been used for disinfection of the main, the flushing shall be in a direction opposite to that from which the line was filled.

Bacteriological Test - After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least twenty four (24) hours apart, shall be collected from the new main. At least one set of samples shall be collected from every twelve-hundred-foot (1200') of the new water main, plus one set from the end of the line and at least one set from each branch. All samples shall be tested for bacteriological quality in accordance with Standard Methods for the Examination of Water and Wastewater, and shall show the absence of coliform organisms. The District will take water samples for bacteriological test in accordance with the Standards of the DDW of the State of California. If test fails, the Contractor shall re-disinfect and flush the water system for additional bacteriological test as necessary.

- g. Redisinfection - If the initial disinfection fails to produce satisfactory bacteriological results or if other water quality is affected, the new main may be flushed and shall be resampled. If check samples also fail to produce acceptable results, the main shall be rechlorinated by the continuous-feed or slug method until satisfactory results are obtained.

Note: Hit velocities in the existing system, resulting from flushing the new main, may disturb sediment that has accumulated in the existing mains. When check samples are taken, it is advisable to sample water entering the new main to determine the source of turbidity.

- h. Find Connection to Existing Mains - The new pipe, fittings, couplings and valve required for the connection shall be spray-disinfected or swabbed with a minimum 1 percent solution of chlorine just prior to being installed. The maximum length of connection from the end of a new main to the existing main shall be ten (10) feet.

SECTION 4.11. FIRE HYDRANT ASSEMBLIES

4.11.01. GENERAL

Fire hydrant assemblies shall be as called for on Standard Drawing No. W-2, and as specified in the other applicable sections of these Specifications.

Fire Hydrants shall be Mueller A-423 Super Centurion 250 or approved equal with 6-inch hydrant shoe inlet size, five-inch (5") minimum hydrant valve size, and two two-and-one-half-inch (2-1/2") National Standard hose thread outlets, and one four-and-one-half-inch (4-1/2") California Standard thread pumper outlet. Direction to open hydrant shall be counter-clockwise with one-and-one-half-inch (1-1/2") point to flat pentagon operating nut. The hydrants are to be traffic model with O-ring seals on operating stems separating threads from water chamber, having features to oil or grease lubricate threads, or permanent lubrication, and having breakaway features on barrel and shaft. Hydrants shall be installed at the locations shown on the Plans.

4.11.02. EXCAVATION AND BACKFILL

The Contractor shall refer to Section 4.1, "Earthwork", of these Specifications for all requirements relating to excavation and backfill.

4.11.03. FIELD PAINTING

All fire hydrants shall be surface prepared to receive paint by scraping and wire brushing, and shall be painted with one (1) coat of surface primer and two (2) coats of finish paint. The paint shall be Chex-Rust Primer and Safety Yellow Speed Tec 313-02 finish, as manufactured by Fuller Paint Company; or 1069 Heavy Duty Rust Inhibitive Red Primer and 9348 Safety Yellow finish coat, as manufactured by Rust-Oleum, or approved equal paint system using compatible primer and finish supplied by one Manufacturer.

SECTION 4.12. FLUSH-OUT AND BLOW-OFF ASSEMBLIES

4.12.01. FLUSH-OUT ASSEMBLIES

Flush-out assemblies shall be installed in accordance with Standard Drawing No. W-8, and as specified hereon and the other applicable sections of these Specifications.

Flush-Outs shall be constructed of the size and at the locations shown on the Plans.

4.12.02. BLOW-OFF ASSEMBLIES

Blow-off assemblies shall be installed in accordance with Standard Drawing No. W-7, and as specified hereon and the other applicable sections of these Specifications.

Blow-Offs shall be constructed of either 4-inch or 6-inch size at the locations shown on the Plans.

4.12.03. EXCAVATION AND BACKFILL

The Contractor shall refer to Section 4.1, "Earthwork", of these Specifications for all requirements relating to excavation and backfill.

SECTION 4.13. VALVES, VALVE BOXES AND COVERS

4.13.01. SCOPE

The Contractor shall furnish all material, labor, and equipment necessary for the complete installation of all valves as called for on the Drawings, Standard Drawing No. W-11 and as specified herein.

The Contractor shall submit Shop Drawings showing the dimension, construction and material of valves to the District for approval prior to shipment.

4.13.02. GATE VALVES

Gate valves shall be resilient seated (R.S.) valves meeting the requirement of the latest specifications of AWWA C-509.

All gate valves shall be rated for a minimum of one hundred and fifty (150) psi working pressure as manufactured by Mueller Co., CLOW Corporation, Stockham Valve and Fitting Co., or approved equal.

The valves shall have iron body cover and O-ring plate, O-ring pressure seals, high-strength iron wedge with rubber bond that meet ASTM D429, bronze stem. Steel bolts and nuts shall be cadmium-plate, and gland bolts shall have bronze nuts.

Valves two-and-one-half-inch (2-1/2") and smaller shall have tapped American Standard Pipe Threads and handwheel.

Valves three-inch (3") and larger for above ground, indoor installation shall be of the rising stem OS&Y type with handwheels. Valves for above-ground, outdoor installation shall be of non-rising stem (NRS) type with handwheels. All above ground gate valves shall be furnished with flanges conforming to the ASME/ANSI B16.1 (Standard for Class 125 Cast Iron Pipe Flanges and Flanged Fittings).

Valves for underground (buried) installation shall be of non-rising stem (NRS) type with two -inch (2") operation nut and shall be furnished with flanged joint and flanged coupling adaptors.

The valves shall be furnished in the sizes indicated on the Drawings. Valves with welding ends will not be permitted for use in welded steel lines. All valves interior shall be protected with two-part thermosetting epoxy per AWWA C-550.

4.13.03. BUTTERFLY VALVES

Butterfly valves shall be Class 150B and shall conform to the latest specifications of the AWWA C-504. The valves shall be of the rubber seated, tight closing type, furnished with flanged ends, cast iron body and disc, and a molded rubber seat that is recess mounted, bonded, and mechanically secured to the valve body. All valve interior face shall be protected with two-part thermosetting epoxy per AWWA C-550, Tnemec 20, plastic 70, or equal to 8 mils

Valves shall be manufactured by Pratt, Muller or approved equal. Unless otherwise indicated, all butterfly valves shall be furnished with worm and gear type manual operator.

Manual operators shall be of the worm and gear type and shall be self-locking to prevent the valve disc from creeping or fluttering when in any intermediate position between open and closed. The gear operators shall be permanently lubricated, totally enclosed, with adjustable stops for the open and closed position to prevent the valve disc from overtravel in either direction and except on units for buried or submerged service shall have a valve disc positions indicator. The gear ratio and handwheel diameter shall be designed so that a pull of not more than eight (80) pounds on a handwheel or chainwheel (or one hundred and fifty (150) foot pound input on buried applications) will produce an output torque equivalent to 1.5 times of the maximum operating tongue specified in AWWA C-504.

On buried installations, the gear box shall be fixed to the valve and the stem with two-inch (2") square operating nut shall be extended through a slip-type valve box, to the surface. A ground level position indicator, Pratt Diviner, shall be included.

4.13.04. EXCAVATION AND BACKFILL

The Contractor shall refer to Section 4.1, "Earthwork", of these Detailed Technical Provisions for all requirements relating to excavation and backfill.

4.13.05. OPENING DIRECTION

Wrench nut shall turn left (counter-clockwise) to open the valve.

4.13.06. VALVE ENDS

The valve ends shall be of flanged end. Flanged coupling adapters shall be provided with each valve installed below grade. Valves with welding ends will not be permitted for use in welded steel lines.

4.13.07. VALVE BOXES AND COVERS

All valves installed below ground shall be provided with valve box and cover.

Valves boxes and covers shall be as shown on Standard Drawing No. W-11.

SECTION 4.14. AIR VALVES ASSEMBLIES

4.14.01. GENERAL

The air valve assembly shall be a combination air valve consisting of an air and vacuum valve and an air release valve and shall include service lateral, shut-off valves, piping, enclosure etc. and other appurtenances and shall be as called for on the Drawings and the Standard Drawing No. W-6 and other applicable Standard Drawings. Installations shall be made at the locations and sizes as shown on the Plans.

4.14.02. EARTHWORK

The Contractor shall refer to Section 4.1, "Earthwork", of these Detailed Technical Provisions for all requirements relating to excavation and backfill.

4.14.03. CORPORATION STOPS

All corporation stops shall be positioned per Standard Drawings No. W-5A and W-5B.

4.14.04. GATE VALVES

All gate valves shall be per Standard Drawing No. W-6 or approved equal.

4.14.05. AIR AND VACUUM VALVES

All air and vacuum valves shall be manufactured by APCO (Series 140 for 2-inch thru 3 inches, and Series 150 for 4-inches and larger), Crispin Type S, or approved equal.

4.14.06. FIELD PAINTING

All air valve assembly and enclosure shall be surfaced prepared to receive field paint by solvent cleaned in accordance with SSPC-SP 1 (Society for Protective Coatings Surface Preparation Standards- Solvent Cleaning) and shall be painted with one (1) coat of surface primer, 2 mils of Tnemec 32-1200, Kopper 40 or equal and two (2) coats of finish coat, 3 mils of Tnemec Series 2, Kopper Galmortex 501 enamel or approved equal to a total dry film thickness of 8 mils. The color shall be green.

SECTION 4.15. CONCRETE THRUST BLOCKS AND BLANKETS

4.15.01. CONCRETE THRUST BLOCKS

Concrete thrust blocks shall be installed in accordance with Standard Drawings No. W-3A and W-3B and shall be Class IV concrete as specified on Section 4.2 of these Detailed Technical Provisions.

4.15.02. CONCRETE BLANKET

- a. General - Concrete blankets shall be constructed at the locations shown on the Plans and in accordance with Standard Drawing No. S-3. Concrete shall be of Class IV, as specified on Section 4.2 of these Detailed Technical Provisions.
- b. Blanket Type - Concrete blanket is to be used at locations where the pipe is to be protected from wheel loadings.

4.15.03. EXCAVATION AND BACKFILL

The Contractor shall refer to Section 4.1, “Earthwork”, of these Detailed Technical Provisions for all requirements relating to excavation and backfill.

4.15.04. CONCRETE CONSTRUCTION

The Contractor shall refer to Section 4.2, “Concrete Construction”, of these Detailed Technical Provisions for all requirements relating to concrete construction.

SECTION 4.16. BACKFLOW PREVENTERS

4.16.01. GENERAL

Water user shall comply with all orders, instructions, regulations, and notices from the DDW of State of California with respect to the installation, testing and maintenance of backflow prevention devices.

Water user shall be responsible for all costs associated with the installation, testing and maintenance of backflow prevention devices as authorized in Section 116800 and Section 116805 of California Health and Safety Code, Part 12 Drinking Water, Chapter 5 Water Equipment and Control, Article 2 Cross-Connection Control by Water User.

4.16.02. TYPE OF PROTECTION

The type of protection shall be approved by the District and shall be in accordance with California Code of Regulations, Title 17, Division 1, Chapter 5, Group 4, Sections 7583, 7584, 7585, 7586, 7601, 7602, 7603, 7604 and 7605.

As a minimum, all commercial and irrigation water service shall be protected with a reduced pressure principal type backflow prevention assembly in accordance with current District Standards, Policies and Resolutions. All fire service lines shall be protected with a backflow preventer per Standard Drawing No. W-22.

4.16.03. INSTALLATION

Installation of backflow prevention assembly shall be in accordance with Standard Drawing No. W-13 (for reduced pressure principal type backflow prevention assembly) or Standard Drawing No. W-16 (for double check valve with detector check backflow prevention assembly).

4.16.04. MANUFACTURES

Backflow prevention assembly shall be approved by University of Southern California Foundation for Cross Connection Control and Hydraulic Research and shall be manufactured by FEBCO, Wilkin or approved equal.

SECTION 4.17. RESIDENTIAL FIRE SERVICE

4.17.01. GENERAL

The installation of a residential fire sprinkler system should comply to California Fire Code (CFC) Chapter 9, Section 903, NFPA 13D (*Standard for the installation in Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*), California Building Code, International Fire Code and other applicable codes, unless otherwise indicated in these Specifications.

The piping arrangement and the meter location of a residential fire service should be in conformance with Standard Drawing No. W-22.

4.17.02. FIRE SPRINKLER SYSTEM DESIGNER AND INSTALLER

The Plans of the residential fire sprinkler system shall be designed by a C-16 (sprinklers) licensed contractor or be a Registered Professional Engineer (Civil, Mechanical or Fire Protection), licensed by the State of California (Board of Professional Engineers). All copies of the Plans shall be stamped and signed by the licensed individuals.

The design of a fire sprinkler system requires communication with the District so that available water pressures and flow to the residential fire system can be determined and the design can meet the District's requirements. The Plans are subject to approval by the District.

The fire sprinkler system shall be installed by an individual who holds a State of California C-16 (sprinklers) license or, by owner-builder of an owner-occupied, single family dwelling.

4.17.03. EARTHWORK

The Contractor shall refer to Section 4.1, "Earthwork", of these Detailed Technical Provisions for all requirements relating to excavation and backfill.

4.17.04. BACKFLOW PREVENTER

Backflow preventer (reduced pressure backflow preventer assembly) is required for new installed residential fire system. Existing systems do not require additional backflow protection if they already have some form of acceptable directional flow-control protection in place (ex: single check valve or alarm check valve) until the system is substantially altered.

4.17.05. RESIDENTIAL FIRE METER

Per Article 15 of Running Springs Water District Ordinance No. 8, Rules and Regulations for Water Service, Article 15, If the Fire Department requires that a property is to install a fire protection

sprinkler system, a meter or meters of appropriate size for both the fire protection service and potable service line will be required, as well as an appropriate cross connection control device. The fire meter should be Zenner Performance Multi-Jet Type Magnetic Drive Residential Fire Meter or approved equal.

4.17.06. FIRE SPRINKLER SYSTEM MAINTENANCE

It is the responsibility of the building owner for properly maintaining a sprinkler system. A minimum monthly maintenance program should include the following:

- a. Visual inspection of all sprinklers to ensure against obstruction of spray.
- b. Inspection of all valves to ensure that they are open.
- c. Testing of all waterflow devices.
- d. Testing of the alarm system, where installed. (Note that where it appears likely that the test will result in a fire department response, notification to the fire department should be made prior to the test.)
- e. Operation of pumps, where employed.
- f. Checking of the pressure of air used with dry systems.
- g. Checking of water level in tanks, where employed.
- h. Special attention to ensure that sprinklers are not painted either at the time of installation or during subsequent redecoration. When sprinkler piping or areas next to sprinklers are being painted, the sprinklers should be protected by covering them with a bag, which should be removed immediately after painting is finished.

SECTION 4.18. CHAIN-LINK FENCE AND GATE

4.18.01 GENERAL

The Contractor shall furnish all equipment, labor and material necessary to do fencing, all as shown on the Drawings and as necessary for a complete job.

The work shall consist of furnishing and constructing a six-foot (6') high chain-link fence with twelve-inch (12") barbwire extension in accordance with Section 206-6 and Section 304-3 of the Standard Specifications for Public Works Construction (Greenbook) and at the locations shown on the Drawings. All earth, trees, bush, existing fence designed to be removed, and other obstructions which interfere with the proper construction of the fence shall be removed and disposed of and will be considered as part of the fence construction. Refer to Standard Drawing M-1.

4.18.02. MATERIALS

Chain-link fence shall be complete with fabric, end corner, gate and line posts, gate with lockable devices, extension arms with three-strands of barbed wire, post anchors, and other necessary appurtenances.

The fence shall have six feet zero inch (6'-0") fabric above ground when erected. The fabric shall consist of nine-gauge (9-gauge) 6M galvanized wire woven with two-inch (2") mesh fulfilling the requirements of ASTM A392. Barbed wire shall be four-point pattern, composed of two strands of twelve-and-one-half-gauge (12-1/2-gauge) galvanized steel wire with barbs spaced five-inches (5") apart and shall conform to ASTM 121.

The line posts shall be two-inch (2") nominal diameter, 2.375-inch outsider diameter by 3.65 pounds per foot, galvanized steel pipe and spaced not more than ten feet zero inches (10'-0") apart. Top rails shall be one-and-one-quarter-inch (1-1/4") nominal diameter, 1.90-inch outsider diameter by 2.27 pounds per foot galvanized steel pipe. Gate posts and corner posts shall be 3.5-inch nominal diameter, 4.0 inch outsider diameter by 9.11 pounds per foot galvanized steel pipe and shall be strongly and durably attached to the line posts according to the best practice. The posts shall be set in the ground to a depth of three (3) feet and centered in concrete cylindrical footing eight-inch (8") in diameter.

SECTION 4.19. FURNISH AND INSTALL PLASTIC SEWER PIPE SYSTEM

4.19.01. GENERAL

- a. Description - The Contractor shall furnish all labor, material, tools, and equipment required for the complete construction of pipelines, manholes, cleanouts, and other allied structures and appurtenances as stated on the bidding sheets, shown on the Contract Drawings, and specified herein, all within the time as stated in the Contract Documents.

These provisions establish the requirements for the use of PVC pipe for house lateral and main line sewer construction. Use is limited to those projects which specify or indicate PVC sewer pipe as an alternate.

PVC pipe may only be used where indicated on Plans or approved by the District. When pipe and fittings are fabricated by the same Manufacturer, the Contractor will not be allowed to use fittings from other Manufacturers. PVC laterals may be used with clay pipe main except those mains subject to industrial flows, as determined by the District.

- b. Care & Handling - Pipe shall be stored at the jobsite in unit packages provided by the Manufacturer. Caution shall be exercised to avoid compression, damage or deformation to bell ends of the pipe. If pipe is to be exposed to direct sunlight for more than fourteen (14) days, pipe must be covered with an opaque material while permitting adequate air circulation above and around the pipe to prevent excessive heat accumulation.

If pipe is strung along trench prior to installation, string only pipe to be used within a twenty-four-hour (24-hour) period; all pipe is to be laid on a flat surface. The interior as well as all sealing surfaces of pipe, fittings, and other accessories shall be kept free from dirt and foreign matter. Gaskets shall be protected from excessive exposure to heat, direct sunlight, ozone, oil and grease. Solvent cement when used shall be stored in tightly sealed containers away from excessive heat.

- c. Job Conditions - The Contractor shall familiarize himself and comply with all applicable state, county and municipal rules and regulations pertaining to sanitation, fire protection and safety, and all provisions of the Contract Documents.

4.19.02. MATERIALS

- a. PVC solid wall pipe shall meet the requirements of ASTM D-3034, SDR 35.

b. Pipe Jointing shall be as follows:

1. PVC Pipe Gasket Joint Assembly - The assembly of the gasket joint should be performed as recommended by the pipe Manufacturer. The elastomeric gaskets may be supplied separately in cartons or prepositioned in the bell joint or coupling at the factory. When gaskets are color coded, be sure to consult the pipe Manufacturer or its literature for the significance. In all cases, clean the gaskets, the bell or coupling interior, especially the groove area (except when gasket is permanently installed) and the spigot area with a rag, brush or paper towel to remove any dirt or foreign material before the assembling. Inspect the gasket, pipe spigot bevel, gasket groove, and sealing surfaces for damage or deformation. When gaskets are separate, use only gaskets which are designed for and supplied with the pipe. Install them as recommended by the Manufacturer.

Lubricant should be applied as specified by the pipe Manufacturer. Bacterial growth or damage to the gaskets or the pipe, may occur with the use of non-approved lubricants. Use only lubricant supplied by the pipe Manufacturer. After lubrication, the pipe is ready to be joined. Good alignment of the pipe is essential for ease of assembly. Align the spigot to the bell and insert the spigot into the bell until it contacts the gasket uniformly. Do not swing or “stab” the joint; that is, do not suspend the pipe and swing into the bell. When a field-cut is necessary, a square cut is required. Use a factory-finished beveled end as a guide for proper bevel angle and depth of bevel plus distance to the insertion reference mark.

2. PVC Solvent-Cemented Joint Assembly - Solvent-cemented joints should be made in accordance with ASTM D2855 (Standard Recommended Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings).

c. Portland Cement Concrete - All concrete shall meet the requirements of Section 4.2, “Concrete Construction”, of these Detailed Technical Provisions, except that only Type V or Type II Portland cement shall be used.

d. Portland Cement Mortar - All cement mortar used for construction purposes shall consist of one (1) part Portland cement (Type V or Type II) to two (2) parts silica sand by volume and moistened with sufficient water to permit placing, buttering, caulking or coating without crumbling, unless otherwise approved by the District.

- e. Manhole Connections - Connections of PVC sewer pipe to a manhole shall be watertight. Concrete manhole connections shall be “O” ring type produced from elastomeric compound or prefabricated manhole waterstop, grouted or locked into the manhole wall; the type shall be approved by the District prior to use. Additional requirements may be imposed by the District for manhole connections in projects constructed in areas of high or potentially high ground water. Manhole stub-outs shall be included in manhole installations, and shall be of the size designated on the Drawings. All stub-outs shall be plugged for future connection, with neoprene stoppers or approved equal.

4.19.03. INSTALLATION OF PIPE

Shall start at the low end of each section and proceed upgrade. All bell and spigot pipe shall be laid with the bell end upgrade. Assembly of all types of pipe shall be done in strict conformance with the requirements of the pipe Manufacturer. Curved PVC deflection shall not exceed the pipe Manufacturer’s recommendations.

Pipe shall be accurately laid to alignment and grade shown on the Drawings or established by the Engineer. Where grade stakes are provided with which to establish the proper pipeline grade, pipe shall be laid in the field to grade within a tolerance of two-hundredth (0.02) foot, or five-hundredth (0.05) foot cumulative deviation from elevations set at one-hundred-foot (100’) stations.

Sags, or standing water in pipe, shall meet the following criteria:

Pipe Slope	Complies with Specification	Does not Comply w/ Specifications Resulting in No Payment	Does not Comply w/ Specifications & Reconstruction is Required
≤ 0.4%	1/3” or less sag	≥ 1/3”	≥ 1/2”
≤ 0.7%	1/2” or less sag	≥ 1/2”	≥ 1”
≥ 0.7%	3/4” or less sag	≥ 3/4”	≥ 1-1/2”

Sag limits may be increased twenty five percent (25%) for eight-inch (8”) diameter; fifty percent (50%) for ten-inch (10”) diameter; seventy five percent (75%) for twelve-inch (12”) diameter; and one hundred percent (100%) for pipe diameter greater than twelve-inch (12”).

If standing water depth in the sag exceeds the value listed under “No Payment”, then to compensate for anticipated higher than average pipeline operation and maintenance cost, no payment will be made for construction. The nonpayment amount will include all construction costs including such items as excavation, pipe installation, backfilling, resurfacing, etc., for the length of standing water that exceeds the value for “No Payment”. For Developer installed pipeline, the Developer shall pay the district the cash equivalent of three (3) years of maintenance and operation at the current

District rates plus a two percent (2%) increase for the last two (2) years of the payment, or the pipeline shall be replaced as specified at Developer’s cost.

Due to unacceptably high operation and maintenance costs and poor system reliability, pipelines with sag depths exceeding those listed for “Reconstruction is Required” will be rejected. Reconstruction of the entire length of standing water plus twenty (20) feet on each side of the standing water or to the next farthest pipe joint will be required; sawcutting of the pipe to meet the inclusive requirements will not be allowed. Damaged or cut pipe must be removed and not reused.

- a. **Bedding** - All pipes shall be laid in a bed prepared by hand work, dug true to line and grade, to furnish a true and firm bearing for the pipe throughout its entire length. Adjustment of pipes to lines and grade shall be made by scraping away or filling in and tamping material under the body of the pipe throughout its entire length, and **not by blocking or wedging**. Where a hand-shaped trench bottom conforming to barrel of pipe is not available or practical.

The flexibility of plastic pipe may cause a possible problem in maintaining line and grade. Therefore, special care must be taken in the preparation of the subgrade and in the placement of bedding to ensure that the pipe is lade true to line and grade as required in this specification.

PVC pipe shall be bedded as shown in the following table:

Pipe Size	Depth of Cover	Bedding Required
4” to 15”	0’ to 20’	Per Standard Drawing No. S-2
	Greater than 20’	Special Design
Greater than 15”		Special Design

- b. **Bell Holes** – Bell holes shall be provided at the ends of each pipe length, of sufficient size to permit making up the particular type of joint being used.
- c. **Alignment** - Pipes shall be laid in accurate conformity with the prescribed lines and grades, which alignment shall be obtained by plumbing and measuring from a tightly stretched wire or line running parallel with the flow line grade and supported over the centerline of the sewer by batter boards or bars accurately placed and firmly fastened in place across the trench; or by some other comparable method acceptable to the District.

Alternate use of commercial LASER grade setting systems in lieu of string lines specified herein is acceptable when the following requirements and conditions are met:

1. The Contractor shall have the responsibility of providing an instrument operator who is qualified and trained in the operation of the LASER and said operator must adhere to the provisions of the State of California Construction Safety Orders issued by the Division of Industrial Safety. Attention is particularly directed to Sections 1516, and 1800 through 1901, of said Orders for applicable requirements.
 2. All LASER control points shall be established bench marks or construction off-set stakes identified on cut sheets and set in the field for the work. LASER set up points shall be on these control points or on points set directly from them by instrument.
 3. Pipe alignment shall not deviate from that shown on the Plans by more than three-quarter-inch (3/4") pipe diameter, nor shall it change in alignment more than two (2) inches in twenty (20) feet.
 4. After each length of pipe has been laid to line and grade, it shall be jointed to the preceding section as hereinafter specified, and after said jointing procedure has commenced, there shall be no movement of the pipe whatsoever in subsequent operations.
- d. Pipe Cleaning - Before each new length of pipe is placed, the interior of the preceding pipe shall be carefully cleaned of all dirt and debris. At all times when the work of installing pipe is not in progress, all opening into the pipe and the ends of the pipe in the trench shall be tightly closed to prevent entrance of animals and foreign materials.

The Contractor shall take all necessary precaution to prevent the pipe from floating due to water entering the trench from any source, shall assume full responsibility for any damage due to this cause and shall at his own expense restore and replace the pipe to its specified condition and grade if it is displaced due to floating.

- e. Laterals and Cleanouts - shall be constructed at the points indicated on the Plans, and in accordance with the Standard Drawings. Connections of house laterals to sewer mains shall be made with factory-molded wye or tee connections.

Wye or tee branches shall be laid with the axis of the "Y" or "T" entering the main sewer at an angle above the horizontal axis of said main, unless specifically called out otherwise on the Plans or on the Special Conditions. But, unless specifically called out otherwise, this angle shall not exceed forty five degrees (45°).

Whenever any service connection is to be temporarily blanked off, it shall be plugged with a cover or plug recommended by the Manufacturer of the pipe.

Lateral connections to existing mains shall be made pursuant to the provisions of the appropriate Standard Drawing for saddle connection to the existing main pipe material. All sewers of this project are new sewers. Accordingly, laterals installed by saddle connections as shown on Standard Drawing No. S-7 and will be allowed only where unanticipated laterals are added after the sewer main is laid past the point of connection. In such case, the already laid sewer main is laid past the point of connection, and the already laid sewer main is shown on the Standard Drawing as "existing sewer main". **Refer to the beginning of this Document for work on pipelines that do or may contain asbestos material.**

- f. New Sewer Laterals on Existing Plastic Main - The required excavation and cleaning of main surfaces for a tap and saddle shall be performed by the Contractor and when such taps are installed by District forces, the Contractor shall have the additional materials and equipment at the jobsite as follows: barricades, proper pipe, trench shoring for excavations greater than five (5) feet in depth, standard bedding material as specified in these Specifications, and a ladder long enough to extend two-and-one-half (2-1/2) feet above the top of the excavation. The excavation shall provide a minimum clearance of three (3) inches under and six (6) inches on each side of the main sewer for a distance of twelve (12) inches each way along the main from the point of connection. The outer surface of the main in this exposed area shall be thoroughly cleaned.

New sewer laterals on existing vitrified clay pipe mains subject to commercial or industrial flows shall be constructed of vitrified clay pipe in accordance with the requirements for vitrified clay pipes.

The excavation above the main, for the tap working area, shall be a minimum of two (2) feet in width without under-cut sides and shall be properly shored. Before the tap is made, the Contractor shall have sufficient standard bedding material at the site of the work to adequately backfill under the saddle to support it. No backfill shall be placed on the saddle fitting within one-half (1/2) hour after the completion of work by the District forces. If the Contractor breaks or otherwise damages the main while excavating for the tap, he shall notify the District and the District shall make repairs as necessary at the expense of the Contractor.

Manholes shall be constructed in the locations and to the dimensions as shown on the Drawings. Cast-in-place concrete shall conform to the requirements set forth in Section

4.2, “Concrete Construction”, in these Detailed Technical Provisions. Pre-cast units shall be assembled accurately with full-bed mortar joints.

Unless otherwise shown on the Drawings, the sewer pipe shall be laid continuously through out the location of the manhole. After the manhole has been constructed, the open channel shall be formed by cutting the pipe and removing the top half. If the open channel cannot be formed in this manner, it shall be formed of concrete with the depth equal to the diameter of the sewer pipe. The floor of the manhole shall slope at least two (2) inches from the sides of the manhole to the open channel.

When completed, the top of the manhole cover shall be accurately brought to the grade shown for on the Standard Drawings. The manholes shall be constructed so that there is not more than nineteen (19) inches of throat section between the top of the cone and the bottom of the frame.

When located in roadway subgrades, manholes shall be constructed up to the proper elevation preparatory to street paving, and temporarily covered with planks or steel plates. After paving operations have been completed the temporary covers shall be removed and the frames and covers installed to pavement grade per Standard Drawing No. S-5.

- g. Mark of Laterals - Laterals shall be marked on as build plans in the following format:

$$\frac{D_1 - D_2}{L}$$

where D_1 is the distance from downstream manhole in foot; D_2 is the cover depth at the end of lateral in foot; L is the length of the lateral in foot.

4.19.04. CLEANING SEWER LINES AND MANDREL TEST

All sanitary sewer mains and laterals shall be flushed with water and “balled” or cleaned by an acceptable method prior to testing to ensure that all dirt, debris, and obstructions are removed. This work must be performed in the presence of and to the satisfaction of the District; the Contractor shall notify the District at least forty eight (48) hours prior to starting the cleaning work.

Following the placement and densification of backfill and prior to the placing of permanent pavement, all main line pipe shall be cleaned and then mandrel-tested to measure for obstructions (deflections, joint offsets and lateral pipe intrusions). A rigid mandrel approved by the Engineer, with a circular cross section having a diameter of at least ninety-five percent (95%) of the specified average inside diameter, shall be pulled through the pipe by hand.

Ninety-five percent (95%) of the specified average inside diameter for PVC pipe taken from the appropriate ASTM requirements are as follows:

Pipe Nominal Diameter	95% of the Specified Average Inside Diameter
4"	3.77"
6"	5.61"
8"	7.51"
10"	9.39"
12"	11.17"
15"	13.68"

Mandrel test shall be performed between thirty (30) and forty five (45) calendar days after installation and backfill compaction. In the event permanent pavement is placed prior to that time, mandrel test shall be required prior to pavement placement and a second mandrel test must be completed within thirty (30) calendar days after compaction or backfill.

The backfill shall be removed and re-compacted for any section of pipe that fails the mandrel test.

Re-rounders shall not be used to correct excessive pipe deformation.

4.19.05. LEAKAGE TESTS

All sanitary sewers shall be tested for tightness after they and all appurtenances have been completed, backfilled (except for test tees) and compacted, and are ready for service. Tests shall be made on each section, including manholes, from one manhole or test tee to the next, unless grades are flat enough to permit testing two (2) or more sections at one time.

The test method required (water test or air test) shall be determined by the Engineer; all leakage tests shall be made in the presence of the District.

- a. Preparation for Tests - Each section of sewer, including service laterals, between successive manholes shall be tested by closing the lower end of the section to be tested, the inlet sewer of the upper manhole, and the ends of service laterals with stoppers, and filling the pipe and manhole with water to a level of four (4) feet above the invert of the open sewer in the upper terminal. After the section has been filled, it shall be allowed to stand for a sufficient length of time to allow the manhole to absorb what water it will, prior to making the leakage test described in the following paragraphs (Water Test and Air Test). This period of time for absorption of water shall not be less than thirty (30) minutes nor greater than twenty four (24) hours.

b. Test Procedure and Allowable Leakage

1. Water Test - The leakage test shall consist of measuring the quantity of water required to maintain the water level at the elevation prescribed in the above paragraph for a period of one (1) hour. The water used in the test shall be measured through a meter or by other means satisfactory to the District. The allowable leakage shall be computed from the following formula:

$$E = 0.0012 \times L \times D/H$$

Where E = Allowable leakage in gallons
 L = Length of the sewer and house connections tested in feet
 D = Inside diameter of the pipe in inches
 H = Difference in the elevation (in feet) between water surface in the upper manhole and the invert of the pipe at the lower manhole

If the leakage during the test period exceeds the allowable leakage, the sewer line shall be overhauled and, if necessary, relaid until the joints hold satisfactorily under the test.

2. Air Test (including Forcemain Extension) – The length of the line to be air tested at one time shall be limited to the length between adjacent manholes. Air test procedure shall be as follows:

Pressurize the test section to four (4.0) psi and hold at four (4.0) psi for not less than two (2) minutes. Add air if necessary to keep the pressure at four (4.0) psi. Disconnect air supply. When pressure decreases to three and one-half (3.5) psi, start stopwatch. Determine the time in seconds that is required for the internal pressure to reach two and one-half (2.5) psi. This time interval shall be greater than time given in the following table. The section of pipe shall not have passed if the time is less than shown. After the test, the air shall be release from the opposite end of the section.

Sewer Size	Minimum Time
4 inches	113 minutes (1 hr 53 min)
6 inches	170 minutes (2 hrs 50 min)
8 inches	226 minutes (3 hrs 46 min)
10 inches	283 minutes (4 hrs 43 min)
12 inches	340 minutes (5 hrs 40 min)
15 inches	425 minutes (7 hrs 05 min)

Sewer Size	Minimum Time
18" or larger	510 minutes (8 hrs 30 min)

When the prevailing groundwater is above the sewer being tested, air pressure shall be increased forty-three-hundredth (0.43) psi for each foot the water table is above the flow line of the sewer.

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

Building or service laterals shall be considered part of the lateral to which they are connected and no adjustment of test time shall be allowed to compensate for the smaller diameter of the house sewers.

The pressure gauge used shall be supplied by the Contractor and shall have minimum divisions of one-tenth (0.10) psi, and shall have an accuracy of four-hundredth (0.04) psi. Accuracy and calibration of the gauge shall be certified by a reliable testing firm at six (6) month intervals or when requested by the Engineer. Calibration tests shall have been completed no more than 30 calendar days in advance of the test or intended use.

- c. Alternate Infiltration Test - If excessive groundwater is encountered in the construction of a section of the sewer, the test for leakage previously described shall not be used. The end of the sewer at the upper structure shall be closed sufficiently to prevent the entrance of water and pumping of groundwater shall be discontinued for at least three (3) days, after which the section shall be tested for infiltration. The allowable infiltration for any portion of the sewer system should not exceed one hundred (100) gallons per inch of internal pipe diameter per mile per day (4.6 l/mm/km/day), including manholes. Infiltration in excess of this amount shall be reduced to a quantity within the specified amount before the sewer will be accepted. In any case, the Contractor shall stop any individual leaks that may be observed.

Unless other specified, infiltration will be measured through a meter or by other means satisfactory to the Engineer.

- d. Manhole Leakage Test - When the air pressure test is used for testing of the pipe, the manholes shall be water tested. Each manhole shall be filled with water four (4) feet above flow line of the manhole with the inlet and outlet of each manhole plugged. The maximum leakage rate shall be ten (10) gallons per hour per manhole test to be run for a minimum of thirty (30) minutes.

If the manhole leakage thus determined is excessive, the Contractor shall waterproof the interior of the manhole by applying a coating of poly-epoxy or an approved waterproofing material.

4.19.06. SEWER PIPE REPAIRS

Sewer pipe leakage in excess of the allowable maximum shall be corrected by repairs acceptable to the District; retesting is required between manholes/clean-outs.

The section of damaged pipe will be cut out and the ends of the remaining pipe and replacement pipe will be prepared per Section 4.18.2 c. 1. The closure will be made with a flexible "closure coupling" as supplied by the Manufacturer of type pipe used.

PVC pipe and fitting with flexible couplings shall be used for asbestos cement pipe repairs. Refer to the beginning of this Document regarding Asbestos Containing Material.

4.19.07. ELECTRONIC MARKERS

It shall be required of the Contractor to place the required markers at the end of each lateral. Unless waived by the District, two-inch (2") wide metallic detectable locator tape shall be placed with each lateral, approximately six (6) inches above the pipe per Standard Drawing S-7.

4.19.08. FINAL ACCEPTANCE

Prior to putting any sewer into service, or before final acceptance, all sewer facilities shall be visually checked and all foreign objects, materials or obstructions removed from the facilities. If dirt, silt or other materials are found, the Engineer may require that the facilities be cleaned by flushing, balling, rodding or other means so that the materials may be removed from the system.

SECTION 4.20. MANHOLES AND CLEANOUTS

4.20.01. GENERAL

All manholes shall be constructed in conformance with the District's Standard Drawings No. S-4A and S-4B. All such structures shall be built into the sewer lines at the locations shown on the Plans. Pipe for future lateral sewer lines shall be built into the structures as shown on the Plans, and the outer ends closed with a cap securely fixed in place. The caps shall be so fixed as to be easily removed in the future and shall be watertight. **One-piece cone and shaft will not be accepted.**

All manhole frames and covers shall be furnished in conformance with the District's Standard Drawings No. S-5. Manhole frames and covers will be furnished by the Contractor upon prior approval by the District. Such prior approval by the District shall in no way nullify the District's right to accept or reject any individual unit as furnished or as installed.

4.20.02. PRECAST MANHOLES

Precast manhole sections will be manufactured in a plant designed for this type of work. All units will conform to the details on the above referenced drawings with eccentric cone top sections. Concrete used in the precast sections shall be manufactured of approved and selected materials in such proportions to produce a Class I concrete as per Section 4.2, "Concrete Construction", of these Detailed Technical Provisions, with a minimum compressive strength of 3,000 psi. Sections will be compacted by vibration or centrifugal force and cured according to approved practice, either by steam, sprinkling, membrane solution or a combination of these methods. Manholes shall conform to ASTM C478.

Note: Dry-cast manholes may absorb excessive amounts of water during leakage tests which may give a false failure indicator during the test. Wet-cast manholes have not shown this tendency. The Contractor may use either type of manhole, but is fore-cautioned about false test results.

All sections shall be "tongue and groove" as shown on the Standard Drawings No. S-4A and S-4B, with a minimum depth of three-fourth-inch (3/4"). All edges shall be true and even to enable a close fit when sections are placed together. A maximum tolerance of one-fourth-inch (3/16") will be permitted when two (2) sections are placed together in either a lateral or vertical direction.

4.20.03. MANHOLE BASE

Manhole bases shall be monolithic construction of Class IV concrete and shall be poured to the size, line and grade as shown on the Standard Drawings No. S-4A and S-4B and Plans. The Contractor is referred to Section 4.2, "Concrete Construction", of these Detailed Technical Provisions.

In laying the pipe up to structures, no pipe shall be allowed to project beyond the inside of the wall of the structure. Flexible joints shall be provided in all sewer pipes (except PVC and ABS pipe) outside of manholes, but within 12-inches of concrete base. PVC pipe shall be provided with a suitable sealing ring prior to being poured into base.

A notch or groove conforming to the precast manhole section shall be formed on the top of the base section before the concrete has set.

4.20.04. PRECAST MANHOLE JOINTS

Precast manhole sections shall be tongue and groove alternately on both ends of the sections, and shall be laid with the grooved portion facing up. Each section shall beset so as to enable the manhole to rise vertically above the base.

A concrete waterproof mortar shall be placed on the top of each ring, completely covering the grooved portion prior to the installation of the next precast section. Excess mortar shall flow out equally on both sides of the joint for the complete circumference of the ring and shall be “mounded” smoothly on both the inside and outside of the joint as shown on Standard Drawings No. S-4A and S-4B. Finish mortar joint should have a minimum thickness of one-fourth inch (1/4”).

Mortar shall consist of one (1) part volume of cement and three (3) parts by volume of sand. Mortar shall be mixed in a suitable mixer in a watertight mixing box. The materials must be thoroughly mixed dry until the mass assumes a uniform color and then sufficient water added to bring the mixture to a workable consistency. No mortar which has begun to set shall be used and no retempering thereof will be permitted. Mortar shall conform to Section 4.2 of these Detailed Technical Provisions.

4.20.05. GRADE RINGS

Precast grade rings shall be used to reach desired height of the manhole cover within the limits shown on Standard Drawings No. S-4A and S-4B. Minor adjustments shall be made by the use of “shims” under the frame. Alternate HDPE grade rings are acceptable up to twelve (12) inches in height. Grade rings are not required for manholes constructed in easements unless needed for adjustment to finish grade.

4.20.06. CASTINGS

All castings shall be of tough gray iron, free from cracks and swells. The iron shall conform to the requirements of ASTM A48, Class 30. Prior to shipment, the Contractor shall submit a certified metal analysis test report to the District from an independent testing laboratory listing test values of minerals used and the class of the iron. Foundry markings shall not be cast of the face on the covers.

- a. Manhole/Cleanout Frame and Cover - Manhole or cleanout frame and cover shall be called Pamrex or approved equal. Frame and cover shall be manufactured from ductile iron. Frame shall be circular, incorporated a seating ring and a fitted plug in the hinge housing, and be available in a twenty-four-inch (24") clear opening. The frame depth shall not exceed 4 (four) inches, and the flange shall incorporate bedding slots, locking mechanism, and lifting eyes. Covers shall be hinge and incorporated a 90 degree (90°) blocking system to prevent accidental closure. Covers shall be one man operable using standard tools and shall be capable of withstanding a test of load of 80,000 pounds.
- b. Nameplate and Stamp - A nameplate on the sanitary sewer manhole cover may be required per District' request. After the manhole is set, the Contractor shall stamp the number of the manhole on the north side of the rim. The stamp shall be clearly imprinted with a one-half-inch (1/2") die with the number of the manhole corresponding to the manhole number shown on the Plans.
- c. Easement Rings - Any manhole placed outside of pavement shall be provided with an easement ring in accordance with Standard Drawing No. S-5. Castings shall be precast into Class IV concrete by using forms to the dimensions indicated on the Standard Drawing. The tongue shall conform to the groove on the grade ring or cone section.

4.20.07. ELEVATION OF MANHOLE AND CLEANOUT FRAMES AND COVERS ON LOCAL, COUNTY AND STATE ROADS

Manhole frames and covers installed in the pavement of a Local, County or State road shall be installed with a 12-inch wide and 8-inch deep concrete collar to keep twelve (12) inches from the surface of the existing pavement, as per Standard Drawing S-5; The concrete collar shall be 1/8 inch thick. The final grade of the manhole frame and cover shall be one eighth (1/8) inch below the finished concrete collar. The final grade of the concrete collar shall be one eighth (1/8) inch below the grade of pavement of old asphalt, one quarter below the grade of pavement of asphalt two months old, and three eighth (3/8) inch below the grade of pavement of asphalt two weeks old.

SECTION 4.21. MACHINE TAPPING INTO EXISTING SEWER FOR LATERALS

4.21.01. GENERAL

This Work includes all labor, equipment, appliances and materials as required or necessary for machine tapping into existing sewer lines of the size as shown on the Plans, furnishing and installing the necessary fittings as shown in detail on the Plans, performing the necessary excavation and backfill, and any additional pavement removal and replacement over that paid for as “Pavement Replacement”.

The Contractor shall take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the Work and other persons who may be affected thereby. He will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work.

4.21.02. CONNECTIONS

Connections shall be of the saddle type installed in the main sewer. Connections of this type shall be made in a smooth, round hole, machine-drilled into the main sewer pipe. The fitting used in the connection shall be made in such a manner as to insure that no protrusion of the fitting into the main sewer pipe shall result. The connector shall fit the contour of the inside of the sanitary sewer and shall be specifically designed to fit the particular size main sewer pipe into which the connection is made. The machined-drilled hole shall be such size to provide one-eighth-inch (1/8”) clearance between outside of the fitting and the hole. The space thus provided shall be completely filled with joint material. The space between the shoulder of the fitting and the face of the main sewer pipe shall be one-eighth-inch (1/8”) thick and this space shall also be completely filled with joint material. Refer to the front of the Document for information regarding Asbestos Containing Materials.

4.21.03. JOINT MATERIAL

The joint material used for the connection shall be Permalite Plastics Corporation “Sea Goin Poxxy Putty #1324” or approved equal.

4.21.04. DRILLING MACHINE

The drilling machine shall be of the type manufactured by Pilot Manufacturing Company, Torrance California, or approved equal.

4.21.05. EXISTING SEWER PIPE

Care shall be taken in working around, excavating around, and tapping into the existing sewer line to prevent damage to it. The cost of repairing or replacing any damaged section of the existing sewer line will be at the Contractor's expense.

4.21.06. EXCAVATION AND BACKFILL

The Contractor shall refer to Section 4.1, "Earthwork", of these Detailed Technical Provisions for all requirements relating to excavation and backfill.

4.21.07. LOCATION AND SIZE

The location of the laterals to be tapped into the existing sewer, as shown on the Plans is approximate only and the exact location will be determined in the field by the Engineer to best serve the property in question.

The size of the hole to be cut in the existing sewer line will be as shown on the Plans.

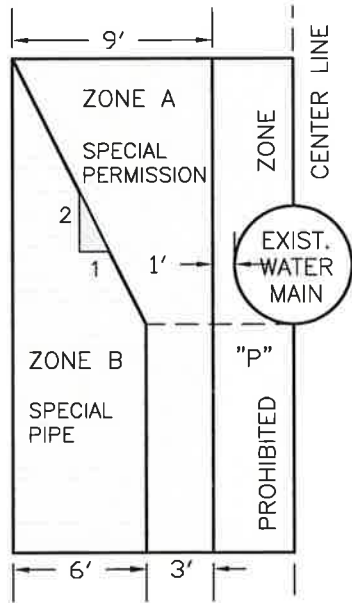
4.21.08. INSPECTION AND APPROVAL

All the Work and material used in machine tapping are subjected to inspection and approval by the District prior to putting into service or before final acceptance.

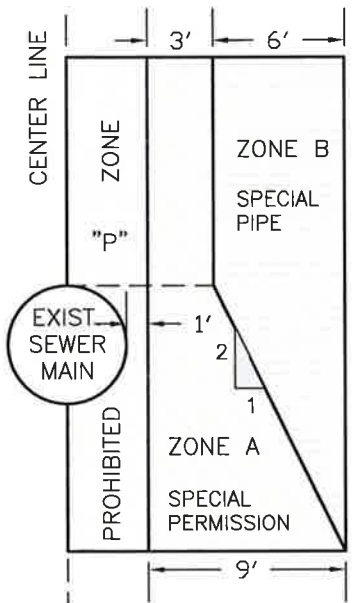
PART 5.
STANDARD DRAWINGS

LIST OF STANDARD DRAWINGS

Standard Drawing No. S-1 Separation of Water Mains and Sanitary Sewers
Standard Drawing No. S-2 Pipe Bedding
Standard Drawing No. S-3 Concrete Blanket
Standard Drawing No. S-4A Precast Concrete Manhole
Standard Drawing No. S-4B Precast Drop Manhole
Standard Drawing No. S-5 Standard Manhole Cover
Standard Drawing No. S-6 Standard Cleanout Type ABS or PVC
Standard Drawing No. S-7 Sewer Lateral
Standard Drawing No. S-8 Chimney and Deep Lateral
Standard Drawing No. S-9 Cut-Off Wall
Standard Drawing No. W-1 Typical Trench Details
Standard Drawing No. W-2 Fire Hydrant Installation
Standard Drawing No. W-3A Concrete Thrust Blocks for Pipelines
Standard Drawing No. W-3B Concrete Thrust Blocks for Pipelines
Standard Drawing No. W-4 Pipe Encasement Details
Standard Drawing No. W-5A Dual or Single Service Connection for Bank Area
Standard Drawing No. W-5B Dual or Single Service Connection for Level Area
Standard Drawing No. W-6 Air & Vacuum Valve Assembly
Standard Drawing No. W-7 4" X 6" Blow-Off Assembly
Standard Drawing No. W-8 2" X 4" Dead-End Flush-Out
Standard Drawing No. W-9 Sample Station Detail
Standard Drawing No. W-10 Tapping Outlets for Steel Pipe
Standard Drawing No. W-11 Valve Box and Cover
Standard Drawing No. W-12 Guard Post Installation Detail
Standard Drawing No. W-13 Backflow Preventer
Standard Drawing No. W-14 Locator Wire Installation
Standard Drawing No. W-15 Pressure Regulation Station Detail
Standard Drawing No. W-16 Fire Service Installation Detail
Standard Drawing No. W-17 Adjustable Pipe Support
Standard Drawing No. W-18 Conductor Tube Detail
Standard Drawing No. W-19 Marker Post
Standard Drawing No. W-20 Trench Detail
Standard Drawing No. W-21 Double Check Assembly Size 3" thru 10"
Standard Drawing No. W-22 Residential Fire Service
Standard Drawing No. M-1 Retaining Wall
Standard Drawing No. M-2 Chain-Link Fence

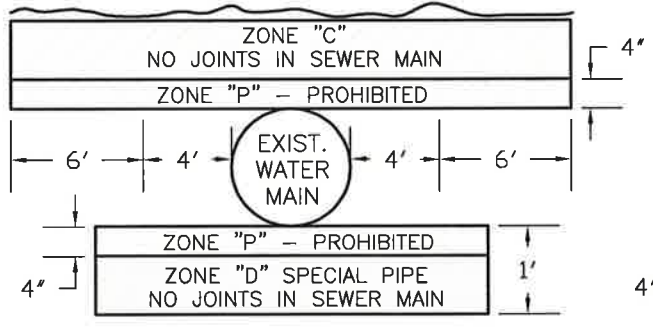


CASE 1: NEW SEWER MAIN

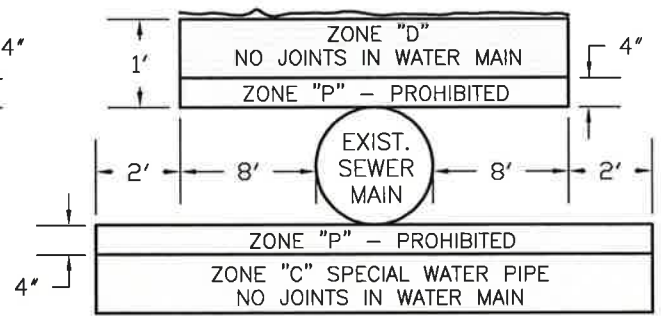


CASE 2: NEW WATER MAIN

FIGURE 1. PARALLEL CONSTRUCTION
NOT TO SCALE



CASE 1: NEW SEWER MAIN



CASE 2: NEW WATER MAIN

FIGURE 2. CROSSINGS
NOT TO SCALE

NOTES:

1. ZONE IDENTICAL ON EITHER SIDE OF CENTER LINES.
2. ZONE "P" IS A PROHIBITED ZONE. SECTION 64630(e)(2) CALIFORNIA CODE OF REGULATIONS, TITLE 22 (CURRENT) ; OR SECTION 64572(d) CALIFORNIA CODE OF REGULATIONS, TITLE 22 (PROPOSED).



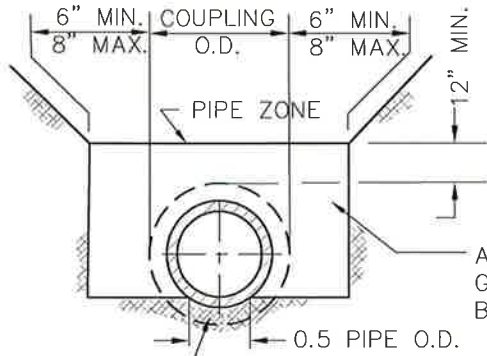
RUNNING SPRINGS WATER DISTRICT

RYAN GROSS
GENERAL MANAGER

SEPARATION OF WATER
MAINS & SANITARY SEWERS

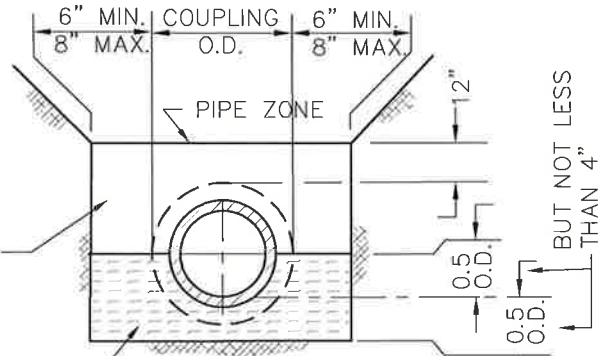
STANDARD DRAWING NO.

S-1



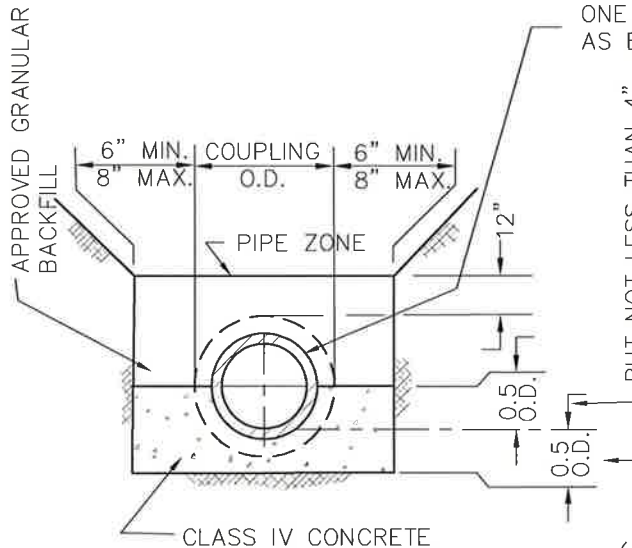
NORMAL BEDDING

(LOAD FACTOR = 1.5)



SPECIAL BEDDING

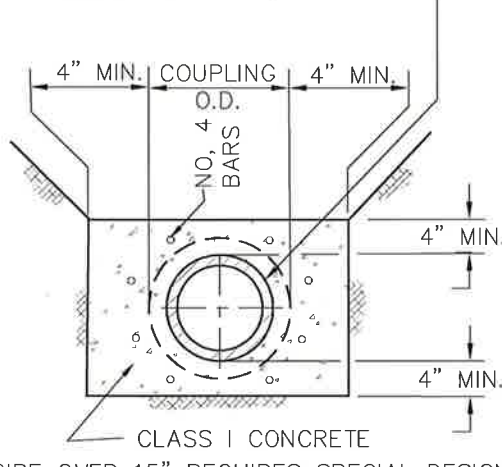
(LOAD FACTOR = 1.9)



CONCRETE GRADLE

(LOAD FACTOR = 3.0)

ONE LAYER OF 15 lb. BUILDING PAPER AS BOND BREAKER AROUND PIPE AND COUPLINGS



CONCRETE ENCASEMENT

(PIPE OVER 15" REQUIRES SPECIAL DESIGN)

(LOAD FACTOR = 4.5)

NOTES:

ALL BACKFILL SHALL BE PLACED IN ACCORDANCE WITH THE SPECIFICATIONS.



RUNNING SPRINGS WATER DISTRICT

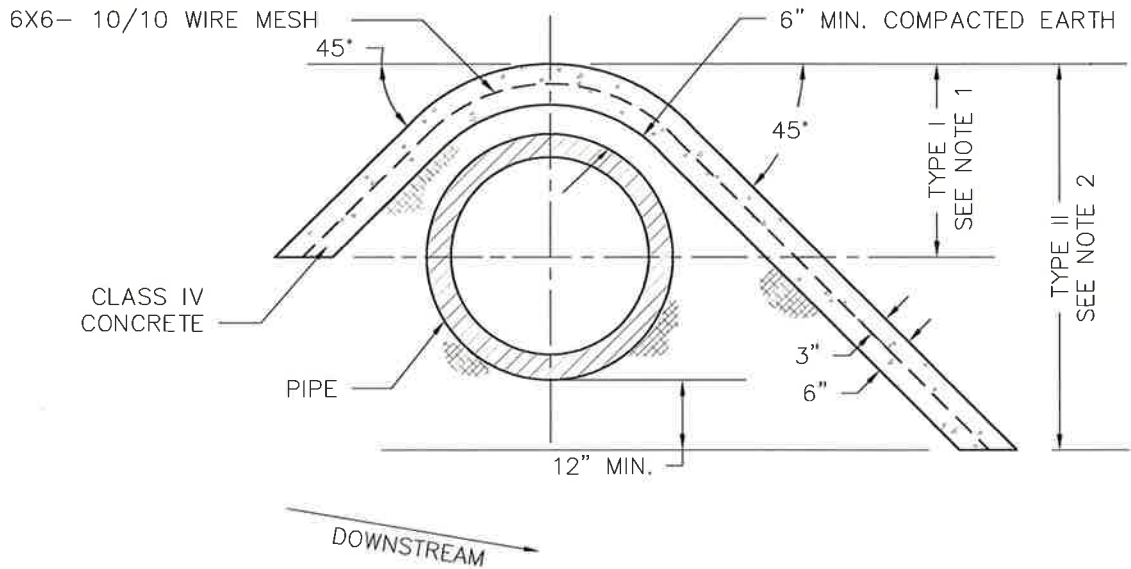
RYAN GROSS
GENERAL MANAGER

PIPE BEDDING

STANDARD DRAWING NO.

S-2

LAST UPDATED: 3/2013



NOTES:

1. THE DOWNSTREAM TOE OF TYPE I CONCRETE BLANKET ENDS AT THE CENTERLINE OF PIPE AS SHOWN ABOVE.
2. THE DOWNSTREAM TOE OF TYPE II CONCRETE BLANKET ENDS 12" BELOW THE BOTTOM OF PIPE AS SHOWN ABOVE.



RUNNING SPRINGS WATER DISTRICT

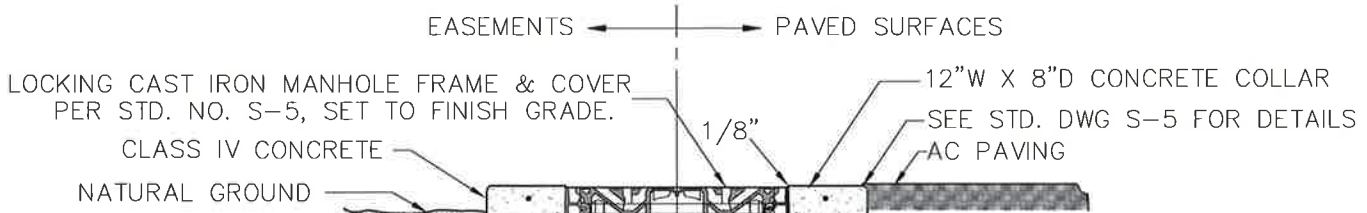
RYAN GROSS
GENERAL MANAGER

CONCRETE BLANKET

STANDARD DRAWING NO.

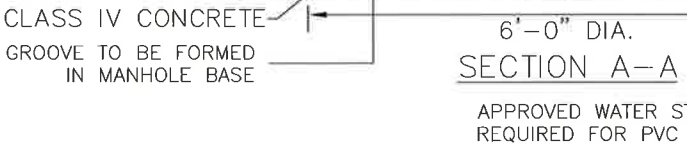
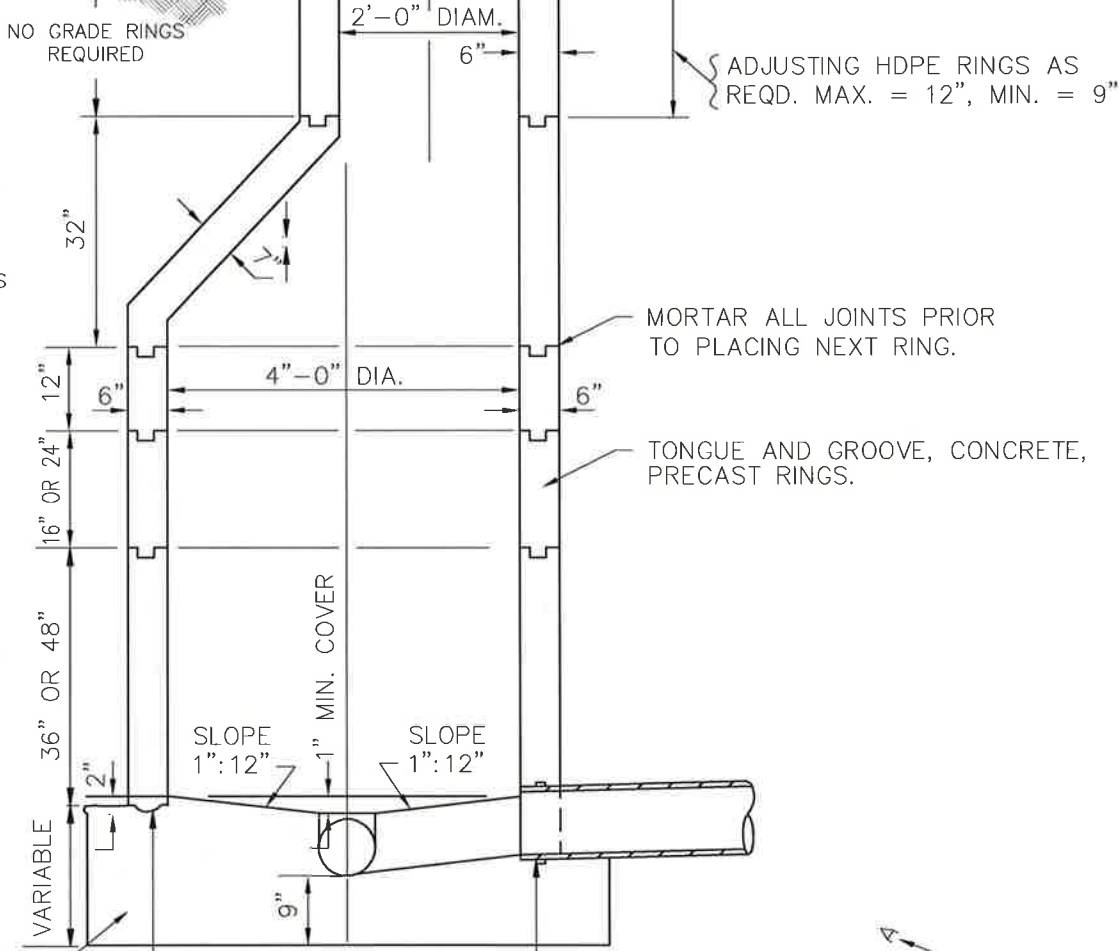
S-3

LAST UPDATED: 3/2013



NOTE:

1. PLACE ECCENTRIC COVER UPSTREAM.
2. ALL JOINTS SHALL BE BANDED INSIDE AND OUT.
3. CHANNELS OF MANHOLE BOTTOMS TO BE FORMED IN CONCRETE. SIDE INLETS SHALL HAVE CHANNELS CURVED IN THE DIRECTION OF FLOW BUT NOT TO RESTRICT THE PLACEMENT OF MECHANICAL PLUGS.
4. BASE SHALL BE POURED AT LEAST 24 HOURS PRIOR TO INSTALLING MANHOLE RINGS - BROOM FINISH.

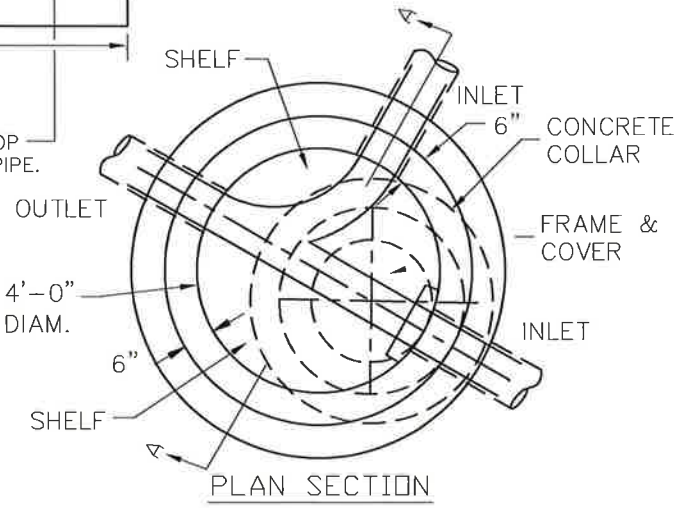


NOTE:

DRY-CAST CONCRETE MANHOLE COMPONENTS MAY ABSORB LARGE AMOUNTS OF WATER DURING LEAK TESTS AND MAY GIVE INCORRECT TEST DATA.

WET-CAST CONCRETE MANHOLE COMPONENTS HAVE NOT SHOWN THIS TENDENCY. CONTRACTOR MAY USE EITHER METHOD FOR OBTAINING CONCRETE MANHOLE COMPONENTS.

LEAK RETESTS SHALL BE BACK-CHARGED TO THE CONTRACTOR.



RUNNING SPRINGS WATER DISTRICT

RYAN GROSS
GENERAL MANAGER

PRECAST CONCRETE MANHOLE

STANDARD DRAWING NO.

S-4A

LAST UPDATED: 3/2013

EASEMENTS ← → PAVED SURFACES

LOCKING CAST IRON MANHOLE FRAME & COVER PER STD. NO. S-5, SET TO FINISH GRADE.

CLASS IV CONCRETE
NATURAL GROUND

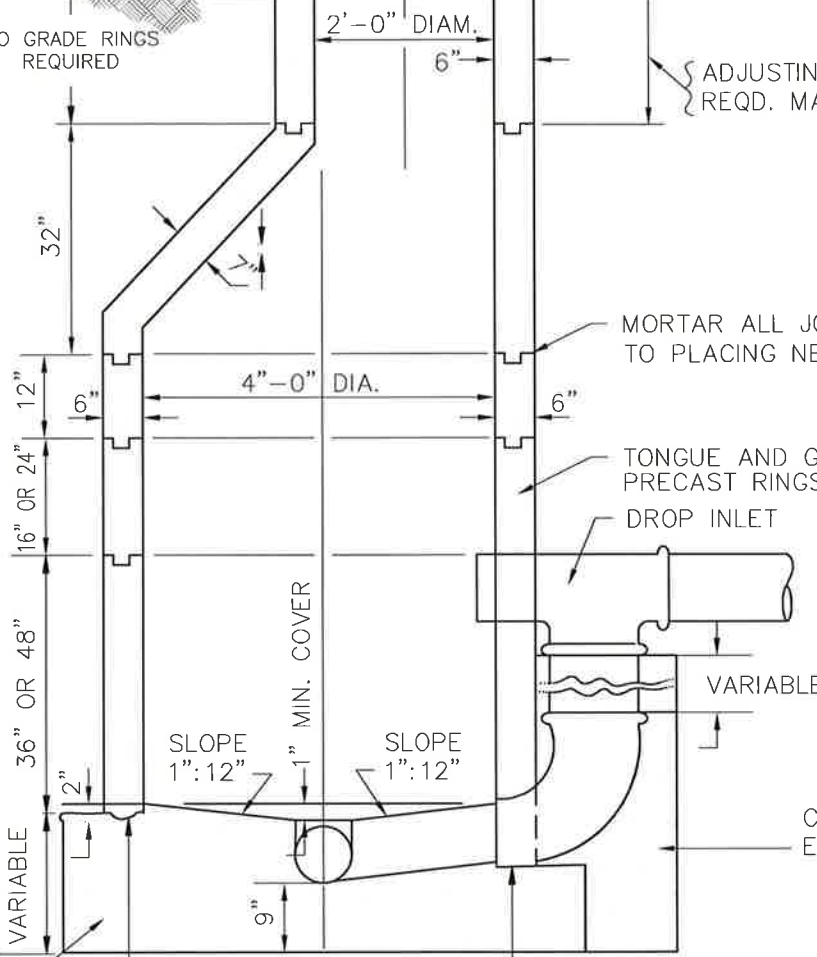
1/8"
12"W X 8"D CONCRETE COLLAR
SEE STD. DWG S-5 FOR DETAILS
AC PAVING

NO GRADE RINGS REQUIRED

ADJUSTING HDPE RINGS AS REQD. MAX. = 12", MIN. = 9"

NOTE:

1. PLACE ECCENTRIC COVER UPSTREAM.
2. ALL JOINTS SHALL BE BANDED INSIDE AND OUT.
3. CHANNELS OF MANHOLE BOTTOMS TO BE FORMED IN CONCRETE. SIDE INLETS SHALL HAVE CHANNELS CURVED IN THE DIRECTION OF FLOW BUT NOT TO RESTRICT THE PLACEMENT OF MECHANICAL PLUGS.
4. BASE SHALL BE POURED AT LEAST 24 HOURS PRIOR TO INSTALLING MANHOLE RINGS - BROOM FINISH.



MORTAR ALL JOINTS PRIOR TO PLACING NEXT RING.

TONGUE AND GROOVE, CONCRETE, PRECAST RINGS.

DROP INLET

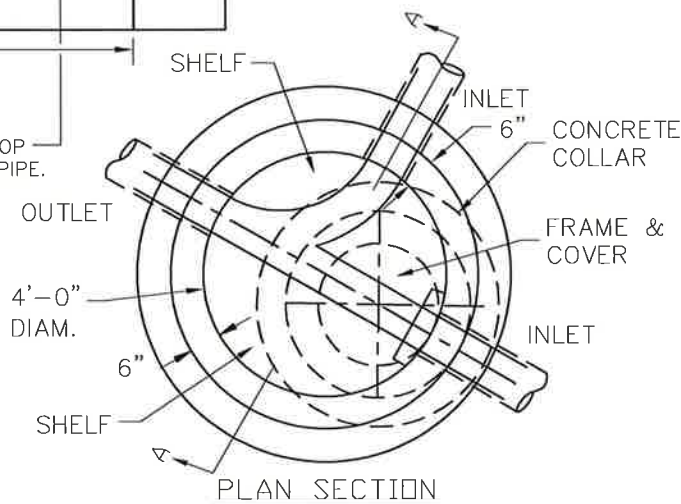
VARIABLE

CONCRETE ENCASEMENT

CLASS IV CONCRETE
GROOVE TO BE FORMED IN MANHOLE BASE

6'-0" DIA.
SECTION A-A

APPROVED WATER STOP REQUIRED FOR PVC PIPE.



NOTE:

DRY-CAST CONCRETE MANOLE COMPONENTS MAY ABSORB LARGE AMOUNTS OF WATER DURING LEAK TESTS AND MAY GIVE INCORRECT TEST DATA.

WET-CAST CONCRETE MANHOLE COMPONENTS HAVE NOT SHOWN THIS TENDANCY. CONTRACTOR MAY USE EITHER METHOD FOR OBTAINING CONCRETE MANHOLE COMPONENTS.

LEAK RETESTS SHALL BE BACK-CHARGED TO THE CONTRACTOR.



RUNNING SPRINGS WATER DISTRICT

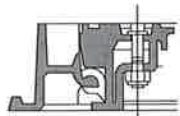
RYAN GROSS
GENERAL MANAGER

PRECAST DROP MANHOLE

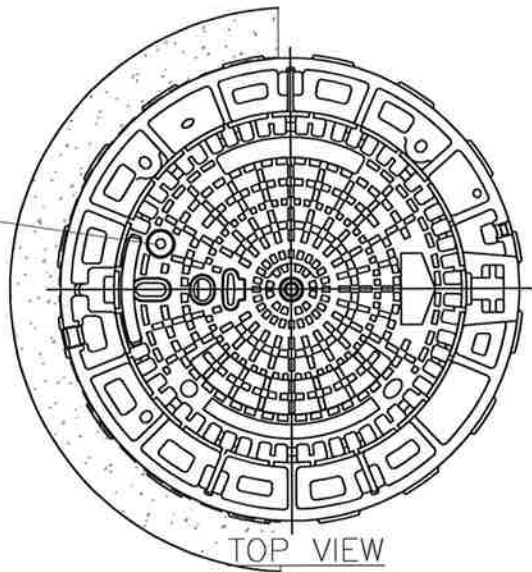
STANDARD DRAWING NO.

S-4B

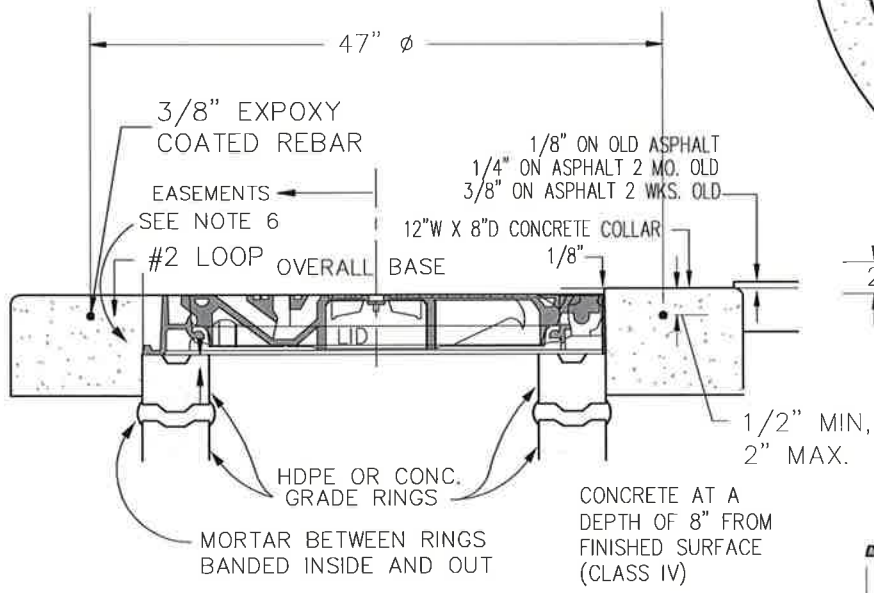
LAST UPDATED: 3/2013



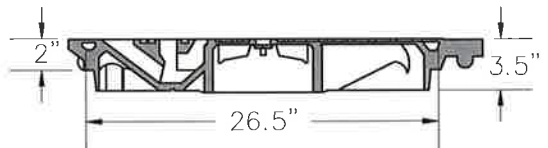
LOCKING MECHANISM



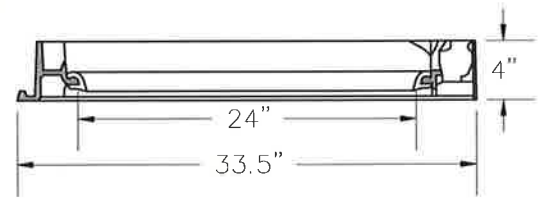
TOP VIEW



SECTION THRU FRAME SHOWING TYPICAL INSTALLATION



COVER SECTION VIEW



FRAME SECTION VIEW

NOTES:

1. MANHOLE COVER SHALL BE DESIGNED FOR AASHTO H-20 LOADING.
2. MANHOLE COVER AND FRAME SHALL BE CALLED PAMREX OR APPROVED LOCKING EQUAL. COVER AND FRAME SHALL BE MANUFACTURED FROM DUCTILE IRON. SUBMIT "OR EQUAL" REQUEST TO DISTRICT 15 WORKING DAYS PRIOR TO INTENDED USE FOR REVIEW AND APPROVAL. UNLESS APPROVED IN WRITING BY THE DISTRICT, "OR EQUAL" SUBSTITUTES SHALL NOT BE INSTALLED.
3. COVERS SHALL BE HINGED AND INCORPORATE A 90 DEGREE BLOCKING SYSTEM TO PREVENT ACCIDENTAL CLOSURE. COVERS SHALL BE ONE MAN OPERABLE USING STANDARD TOOLS AND SHALL BE CAPABLE OF WITHSTANDING A TEST LOAD OF 80,000 LBS.
4. FRAMES SHALL BE CIRCULAR, INCORPORATE A SEATING RING AND A FITTED PLUG IN THE HINGE HOUSING, AND BE AVAILABLE IN A 24 INCH CLEAR OPENING. THE FRAME DEPTH SHALL NOT EXCEED 4 INCHES, AND THE FLANGE SHALL INCORPORATE BEDDING SLOTS, BOLT HOLES, AND LIFTING EYES.
5. ALL COMPONENTS SHALL BE BLACK COATED.
6. FRAME WEIGHT: 73 LBS. COVER WEIGHT: 122 LBS. TOTAL WEIGHT: 195 LBS.
7. PAMREX IS AVAILABLE FROM JIM COX SALES, INC. (800) 838-7377.
8. RSWD SEWER SHALL BE INSTALLED ON THE LOCKING LID.

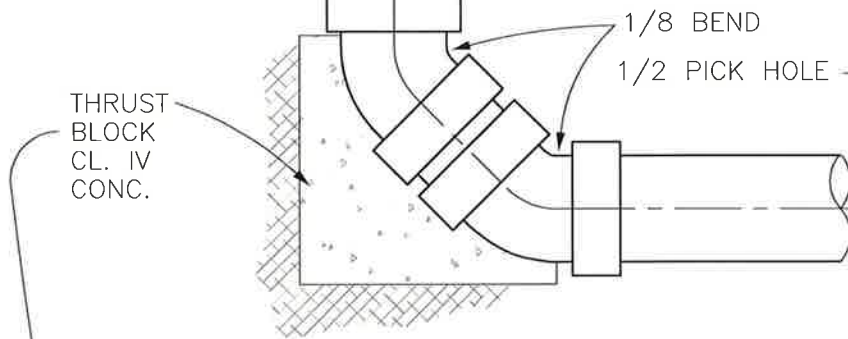
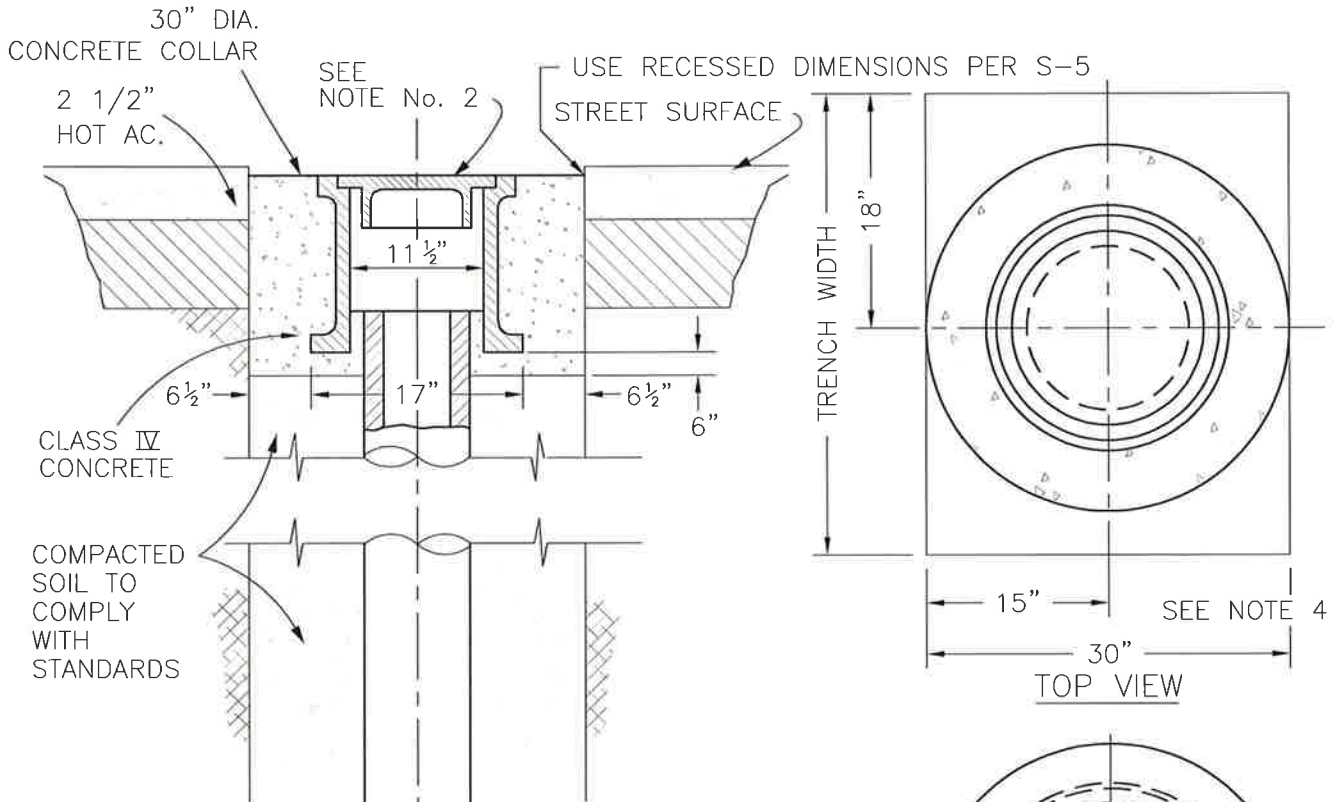


RUNNING SPRINGS WATER DISTRICT

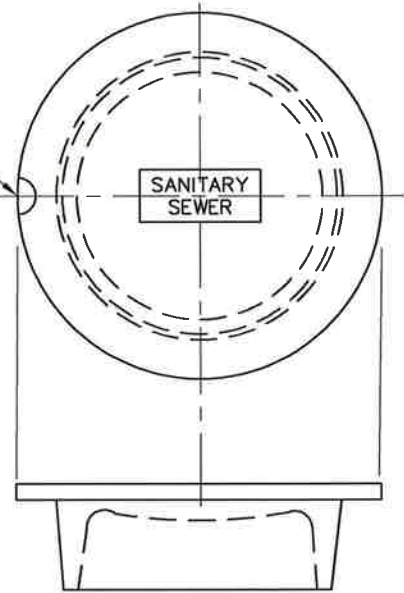
RYAN GROSS
GENERAL MANAGER

STANDARD MANHOLE COVER

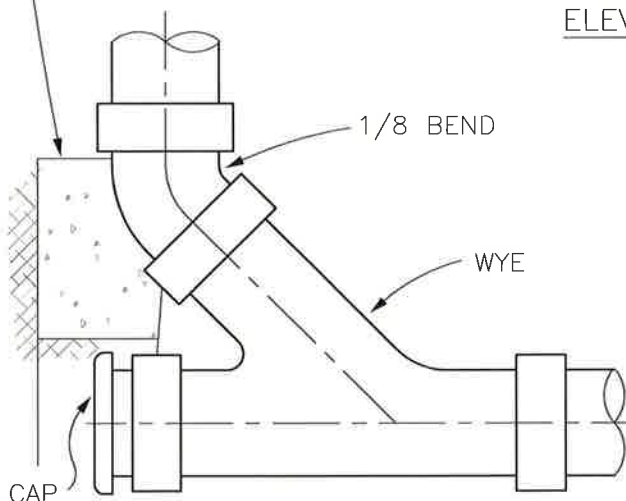
STANDARD DRAWING NO. **S-5**



ELEVATION



COVER



ALTERNATE

NOTES

1. CLENOUT PIPE MUST BE SAME DIAMETER AS MAIN LINE SEWER.
2. CASTING SHALL BE ALHAMBRA FOUNDRY A-1241 (REVISED) OR APPROVED EQUAL BY THE ENGINEER.
3. COVER, FRAME & CONCRETE PAD ARE TYPICAL FOR 8" MAIN LINE SEWERS ONLY.
4. CONCRETE COLLAR ON MAINLINE, BUT NOT AT PROPERTY LINE.



RUNNING SPRINGS WATER DISTRICT

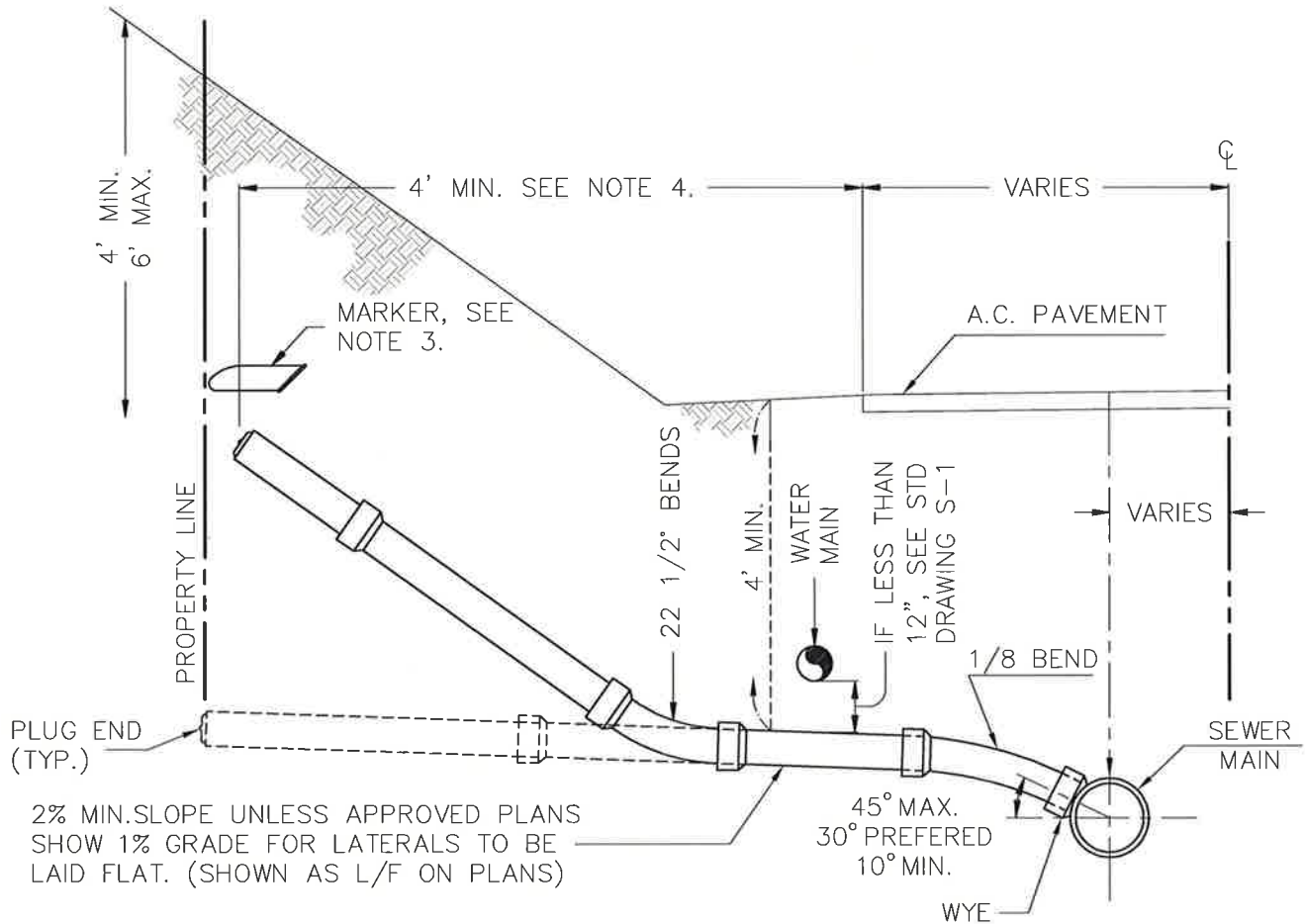
RYAN GROSS
GENERAL MANAGER

STANDARD CLENOUT

STANDARD DRAWING NO.

S-6

LAST UPDATED: 3/2013



2% MIN. SLOPE UNLESS APPROVED PLANS SHOW 1% GRADE FOR LATERALS TO BE LAID FLAT. (SHOWN AS L/F ON PLANS)

NOTES:

1. 4" PIPE FOR SINGLE DWELLINGS. 6" MIN. FOR ALL OTHER LATERALS.
2. LATERAL LOCATIONS AS NOTED ON THE "AS-BUILT" PLANS SHALL BE MEASURED AT RIGHT ANGLES TO STREET CENTERLINE FROM THE CENTERLINE OF THE NEAREST DOWNSTREAM MANHOLE COVER.
3. MAKER SHALL BE A 15" DIAMETER PASSIVE ELECTRONIC MARKER PLACED FLAT AND 12" MIN. ABOVE END OF LATERAL, BUT NOT TO EXCEED 5' DEEP. MAKER SHALL HAVE REPULSE FREQUENCY OF 122.5 KHZ.
4. END OF LATERAL SHALL BE AT PROPERTY LINE, BUT IN NO CASE SHALL IT BE LESS THAN 4' OUTSIDE EDGE OF PAVEMENT.
5. PROPERTY OWNER SHALL BE RESPONSIBLE FOR INSTALLING CLEANOUT AT PROPERTY LINE TO MEET LOCAL PLUMBING CODES.



RUNNING SPRINGS WATER DISTRICT

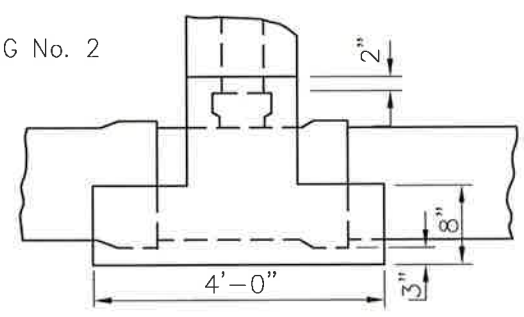
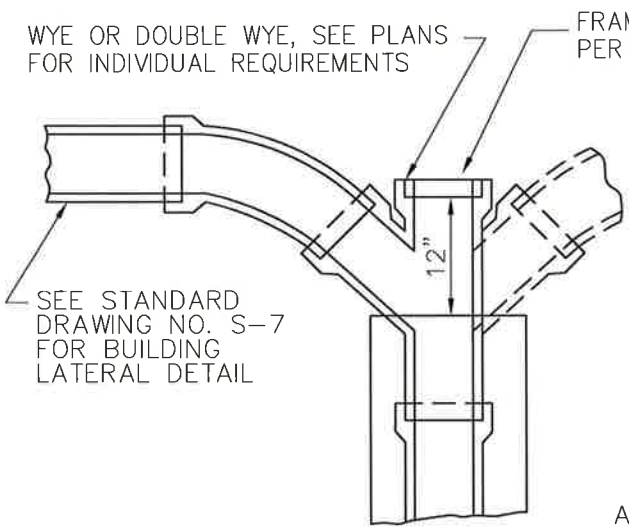
RYAN GROSS
GENERAL MANAGER

SEWER LATERAL

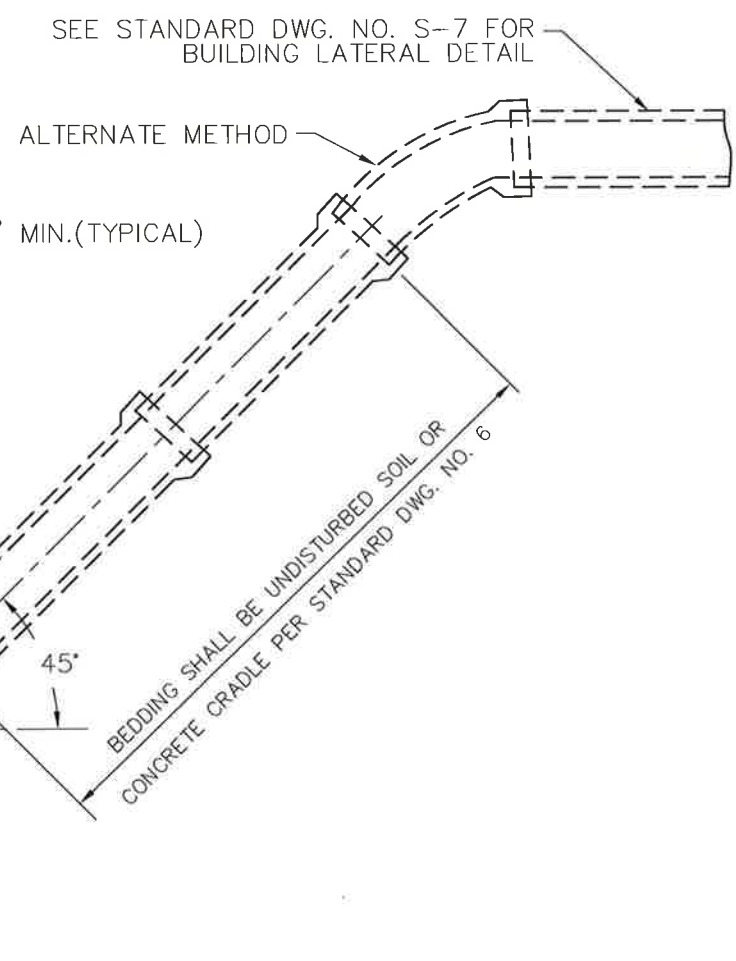
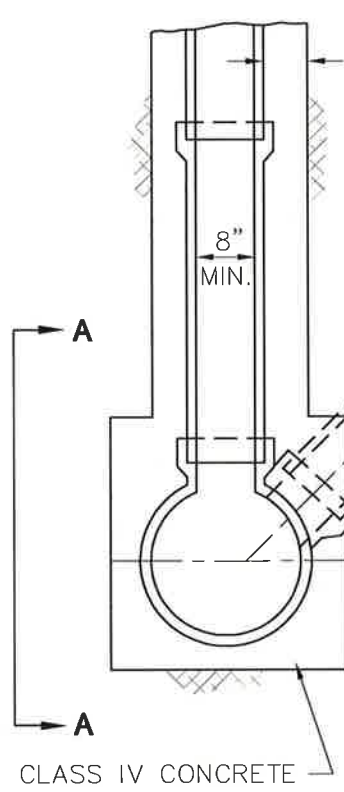
STANDARD DRAWING NO.

S-7

LAST UPDATED: 3/2013



SECTION A-A



CLASS IV CONCRETE

NOTES:

1. SEE CONSTRUCTION DRAWINGS FOR LOCATION AND SIZE OF LATERALS AND CHIMNEYS.
2. NOT TO BE USED UNLESS AUTHORIZED BY THE DISTRICT.



RUNNING SPRINGS WATER DISTRICT

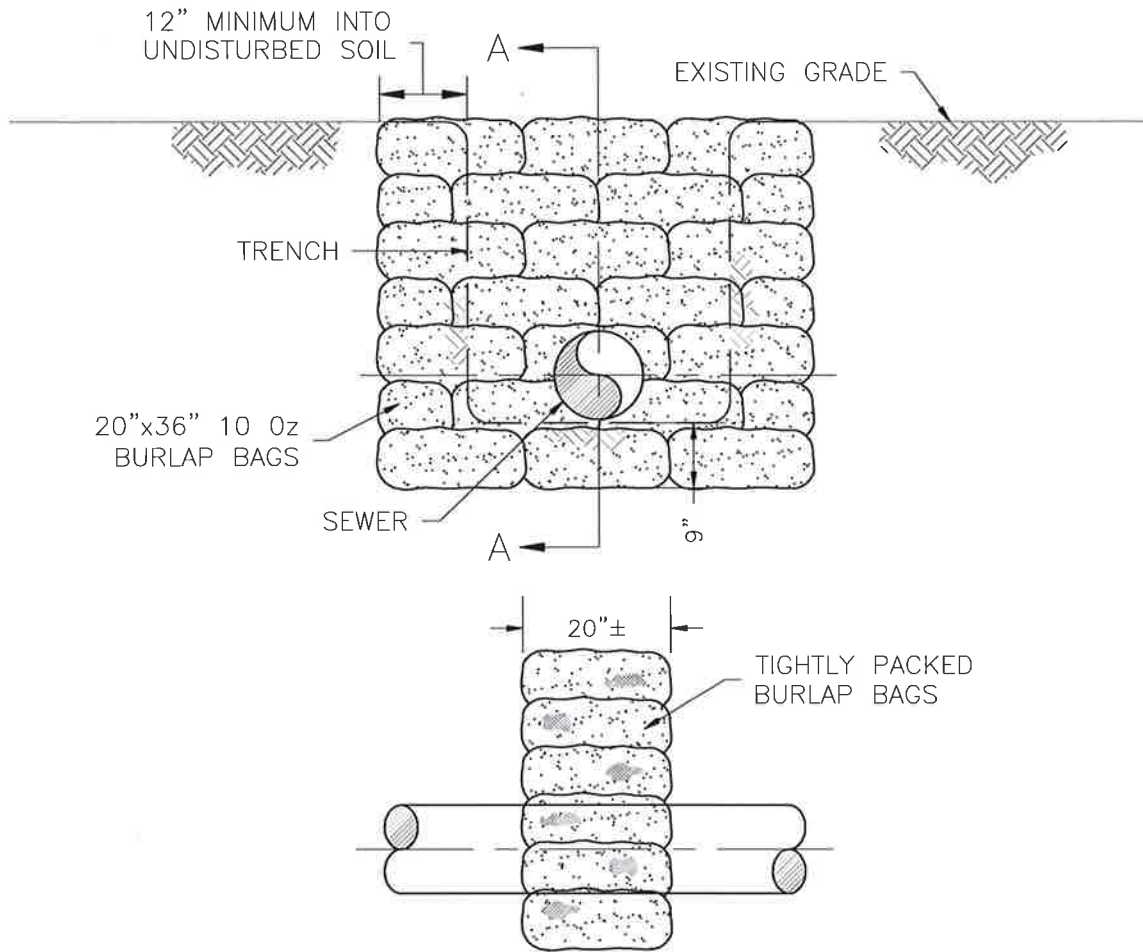
RYAN GROSS
GENERAL MANAGER

CHIMNEY & DEEP LATERAL

STANDARD DRAWING NO.

S-8

LAST UPDATED: 3/2013



SECTION A-A

NOTES:

1. FILL BAGS 4/5 FULL WITH SOIL MIXTURE IMMEDIATELY PLACED AND TAMPED TO CONFORM WITH ADJACENT BAGS.
2. SOIL MIXTURE SHALL CONTAIN AN SAND EQUIVALENT (S.E.) VALUE OF 30 OR GREATER, CEMENT MIXTURE SHALL BE 3-1/2 SACKS PER CU. YD.
3. SPACING OF CUT OFF WALLS SHALL BE APPROXIMATELY EVERY 50 LINEAL FEET ON SLOPES GREATER THAN 30% OR ON ALL SEWERS WITHIN AN ERODED DRAINAGE COURSE.
4. AS AN ALTERNATIVE, CUT-OFF WALLS CAN BE CONSTRUCTED BY FORMING TO ABOVE DIMENSIONS AND POURING WITH 3:1 SOIL-CEMENT MIXTURE.



RUNNING SPRINGS WATER DISTRICT

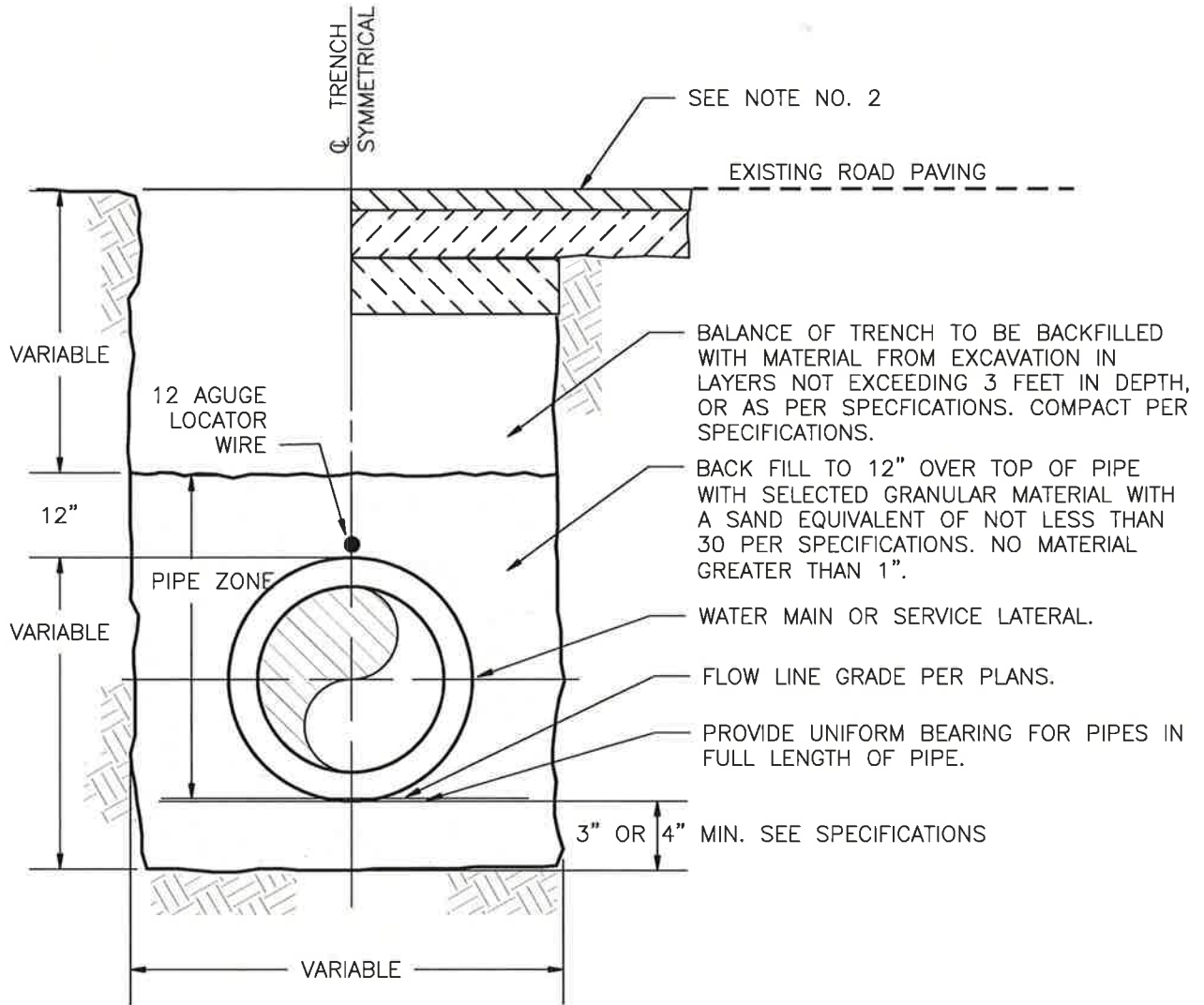
RYAN GROSS
GENERAL MANAGER

CUT-OFF WALL

STANDARD DRAWING NO.

S-9

LAST UPDATED: 3/2013



NOTES:

1. WIDTH OF TRENCH
 MINIMUM = PIPE O.D. + 12"
 MAXIMUM = PIPE O.D. + 16"
2. REPLACE ASPHALT CONCRETE PAVEMENT AND ROAD BASE IN ACCORDANCE WITH EXCAVATION PERMIT.



RUNNING SPRINGS WATER DISTRICT

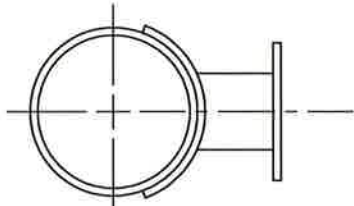
RYAN GROSS
 GENERAL MANAGER

TYPICAL TRENCH DETAIL

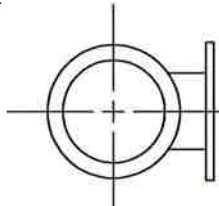
STANDARD DRAWING NO.

W-1

LAST UPDATED: 3/2013



USE 6" FLANGED SADDLED OUTLET FOR INSTALLATION ON 12" OR LARGER PIPE



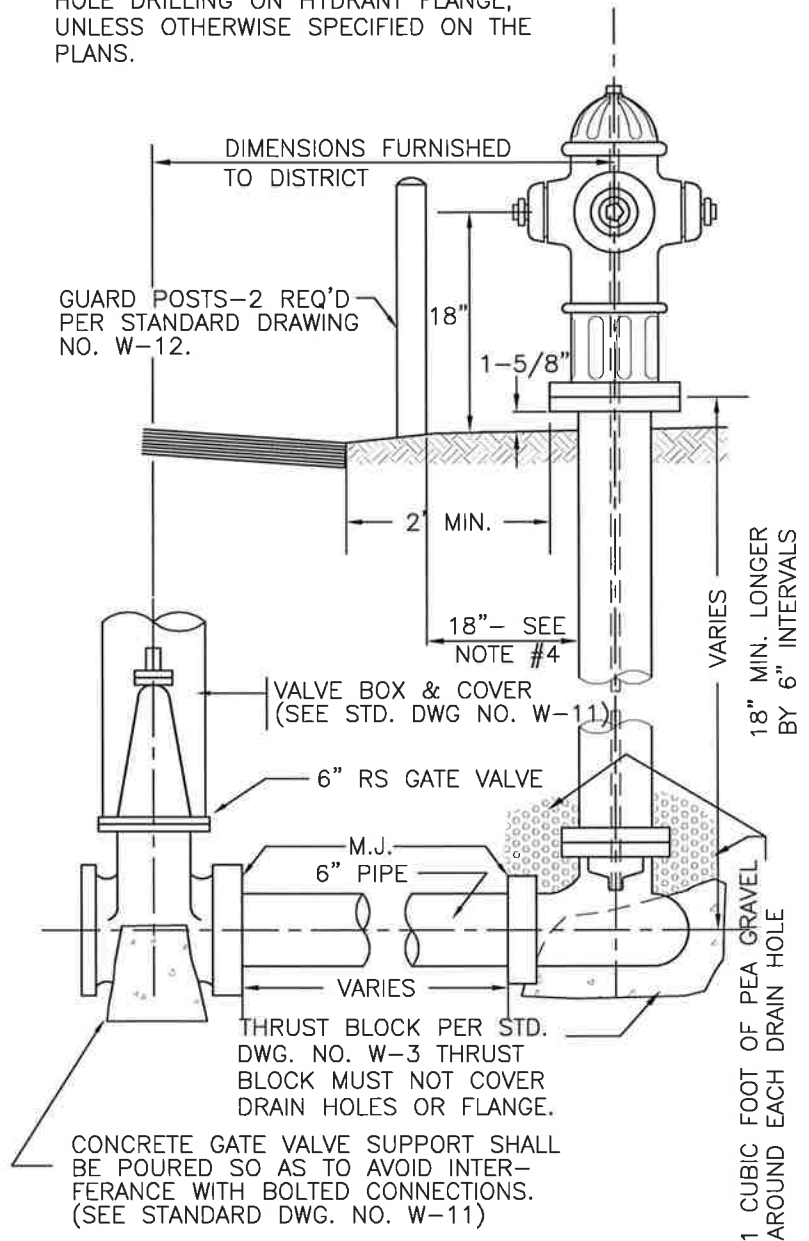
USE C.I. TEE FOR INSTALLATION ON 6", 8" OR 10" PIPELINE

PIPELINE INSTALLATION

NOTES:

1. HYDRANT TO BE PAINTED BE PAINTED WITH ONE COAT OF SURFACE PRIMER & TWO COATS OF FINISH PAINT. THE PAINT SHALL BE CHEX-RUST PRIMER & SAFETY YELLOW SPEED TEC 313-02 FINISH PER FULLER PAINT COMPANY OR 1069 HEAVY DUTY RUST INHIBITIVE RED PRIMER & 9348 SAFETY YELLOW FINISH COAT PER RUST-OLEUM, OR SELECTED/APPROVED BY DISTRICT.
2. FIRE HYDRANT TO BE LOCATED A MINIMUM OF 2 FEET CLEARANCE FROM ANY OBSTRUCTION.
3. FIRE HYDRANT LOCATIONS TO BE DETERMINED BY DISTRICT.
4. LARGE OUTLET TO BE POINTED TOWARDS THE STREET.
5. HYDRANT TO FACE STREET.

USE MUELLER A-423 SUPER CENTRURION 250 3-WAY (5-1/4" MAIN VALVE OPENING) HYDRANT HEAD OR APPROVED EQUAL, 8 HOLE DRILLING ON HYDRANT FLANGE, UNLESS OTHERWISE SPECIFIED ON THE PLANS.



FIRE HYDRANT ASSEMBLY WITH SAFETY FLANGE

6. WHEN THE THRUST BLOCK IS TO BE POURED, DO NOT TO BLOCK THE HYDRANT DRAIN HOLES.
7. UNLESS OTHERWISE SPECIFIED BY THE DISTRICT, THE SETBACK IS 2 FEET MINIMUM FROM THE CURB FACE TO THE NEAREST POINT ON THE HYDRANT



RUNNING SPRINGS WATER DISTRICT

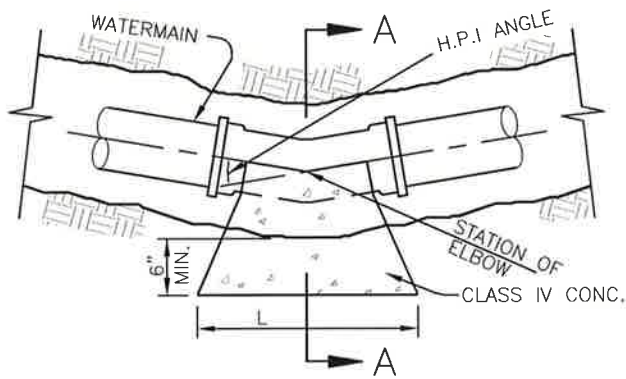
RYAN GROSS
GENERAL MANAGER

FIRE HYDRANT INSTALLATION
(6" X 2.5" & 1" - 4.5")
SUPER FIRE HYDRANT (DRY BARRELL)

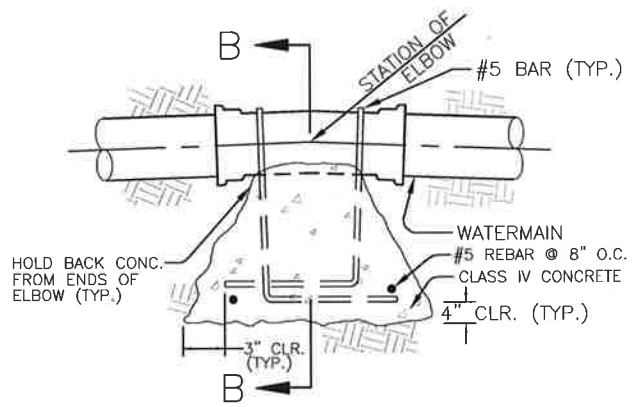
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W-2

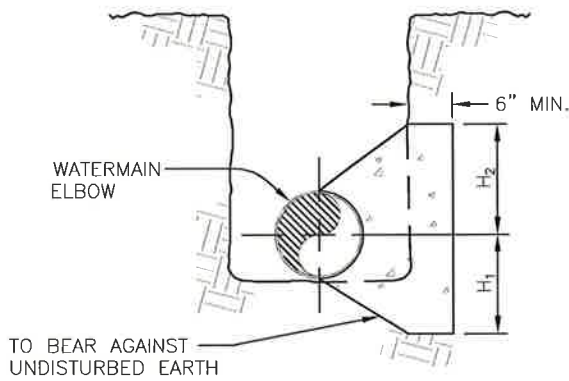
LAST UPDATED: 3/2013



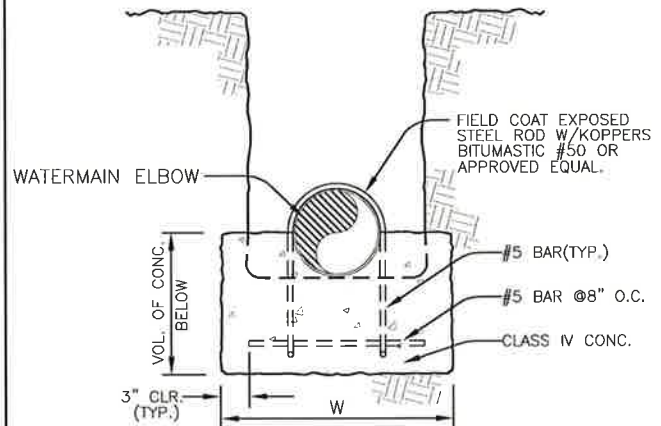
SECTIONAL PLAN



SECTIONAL ELEVATION



SECTION A-A



SECTION B-B

HORIZONTAL THRUST BLOCK

PIPE DIA.	H ₁	H ₂	L	H.P.I. ANGLE
4"	1/2 O.D.	1/2 O.D.	4'-0"	5° TO 41°
4"	4"	4"	4'-0"	42° TO 83°
4"	10"	5"	4'-0"	84° TO 104°
6"	1/2 O.D.	1/2 O.D.	4'-0"	5° TO 27°
6"	6"	6"	4'-0"	28° TO 51°
6"	1'-6"	9"	4'-0"	52° TO 90°
8"	1/2 O.D.	1/2 O.D.	4'-0"	5° TO 20°
8"	8"	8"	4'-0"	21° TO 36°
8"	1'-8"	10"	4'-0"	37° TO 54°
8"	2'-2"	1'-1"	4'-0"	55° TO 78°
8"	2'-8"	1'-4"	4'-0"	79° TO 111°
10"	1/2 O.D.	1/2 O.D.	4'-0"	5° TO 16°
10"	10"	10"	4'-0"	17° TO 28°
10"	1'-10"	11"	4'-0"	29° TO 39°
10"	2'-4"	1'-2"	4'-0"	40° TO 53°
10"	2'-10"	1'-5"	4'-0"	54° TO 70°
10"	2'-10"	1'-5"	6'-0"	71° TO 120°
12"	1/2 O.D.	1/2 O.D.	4'-0"	5° TO 13°
12"	12"	12"	4'-0"	14° TO 22°
12"	2'-0"	12"	4'-0"	23° TO 30°
12"	2'-6"	1'-3"	4'-0"	31° TO 40°
12"	3'-0"	1'-6"	4'-0"	41° TO 52°
12"	3'-0"	1'-6"	6'-0"	53° TO 83°

VERTICAL ANCHOR BLOCK

PIPE DIA.	W	VOLUME OF CONC (cu ft)	GRADE % DIFFERENCE
4"	1'-6"	4.3	5 TO 15
4"	1'-6"	6.5	16 TO 25
4"	1'-6"	8.6	26 TO 35
4"	1'-6"	10.8	36 TO 45
4"	1'-6"	13.0	46 TO 55
4"	1'-6"	15.1	56 TO 65
6"	2'-0"	7.6	5 TO 10
6"	2'-0"	11.4	11 TO 25
6"	2'-0"	15.2	26 TO 40
6"	2'-0"	22.8	41 TO 55
8"	2'-0"	10.3	5 TO 10
8"	2'-0"	15.5	11 TO 20
8"	2'-0"	20.6	21 TO 30
8"	2'-0"	31.0	31 TO 40
8"	2'-0"	41.3	41 TO 55
10"	2'-6"	20.9	5 TO 15
10"	2'-6"	27.8	16 TO 25
10"	2'-6"	41.7	26 TO 35
10"	2'-6"	55.6	36 TO 45
10"	2'-6"	69.5	46 TO 55
12"	2'-6"	27.6	5 TO 15
12"	2'-6"	36.8	16 TO 25
12"	2'-6"	55.3	26 TO 35
12"	2'-6"	73.7	36 TO 45
12"	2'-6"	92.1	46 TO 55



RUNNING SPRINGS WATER DISTRICT

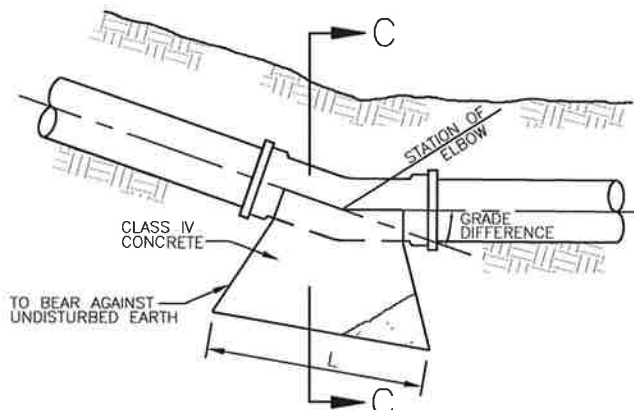
RYAN GROSS
GENERAL MANAGER

CONCRETE THRUST BLOCKS FOR PIPELINES
CLASS 200 P.S.I. MAX.

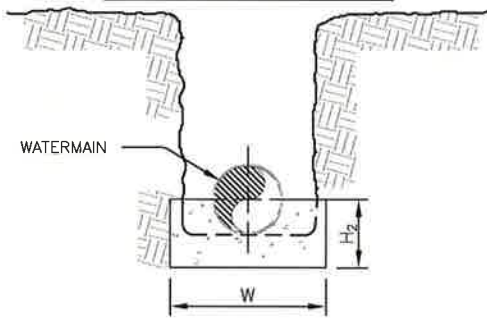
STANDARD DRAWING NO.

W-3A

LAST UPDATED: 3/2013

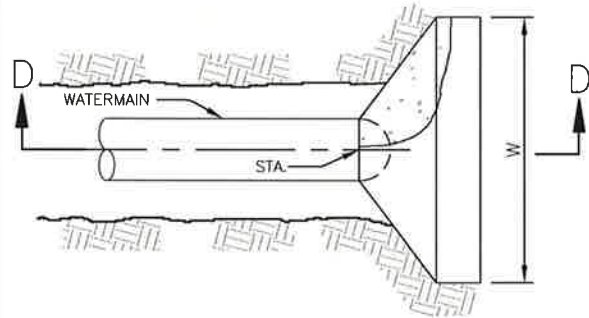


SECTIONAL ELEVATION

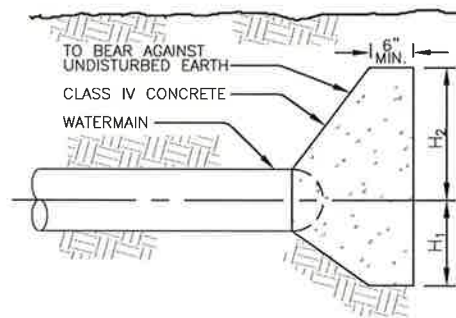


SECTION C-C
VERTICAL BEARER BLOCK

PIPE DIA.	W	H ₂	L	GRADE % DIFF.
4"	1'-6"	8"	1'-0"	5 TO 60
6"	2'-0"	9"	1'-0"	5 TO 40
6"	2'-0"	9"	1'-6"	41 TO 55
8"	2'-0"	10"	1'-0"	5 TO 25
8"	2'-0"	10"	1'-6"	16 TO 40
8"	2'-0"	10"	2'-0"	41 TO 55
10"	2'-6"	1'-2"	1'-0"	5 TO 10
10"	2'-6"	1'-2"	2'-0"	11 TO 40
10"	2'-6"	1'-2"	3'-0"	41 TO 60
12"	2'-6"	1'-3"	2'-0"	5 TO 25
12"	2'-6"	1'-3"	3'-0"	26 TO 45
12"	2'-6"	1'-3"	4'-0"	46 TO 60

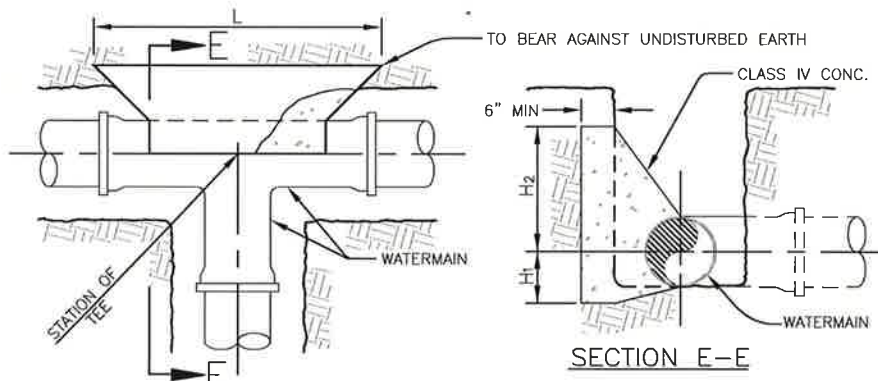


SECTIONAL PLAN



SECTION D-D
END THRUST BLOCK

*PIPE DIA.	H ₁	H ₂	L
4"	9"	6"	3'-6"
6"	1'-6"	9"	4'-0"
8"	2'-2"	1'-1"	4'-0"
10"	2'-10"	1'-5"	4'-0"
12"	3'-0"	1'-6"	5'-0"



SECTIONAL PLAN

SECTION E-E
TEE THRUST BLOCK

*PIPE DIA.	H ₁	H ₂	L
4"	9"	6"	3'-6"
6"	1'-6"	9"	4'-0"
8"	2'-2"	1'-1"	4'-0"
10"	2'-10"	1'-5"	4'-0"
12"	3'-0"	1'-6"	5'-0"

* USE OUTLET PIPE DIAMETER



RUNNING SPRINGS WATER DISTRICT

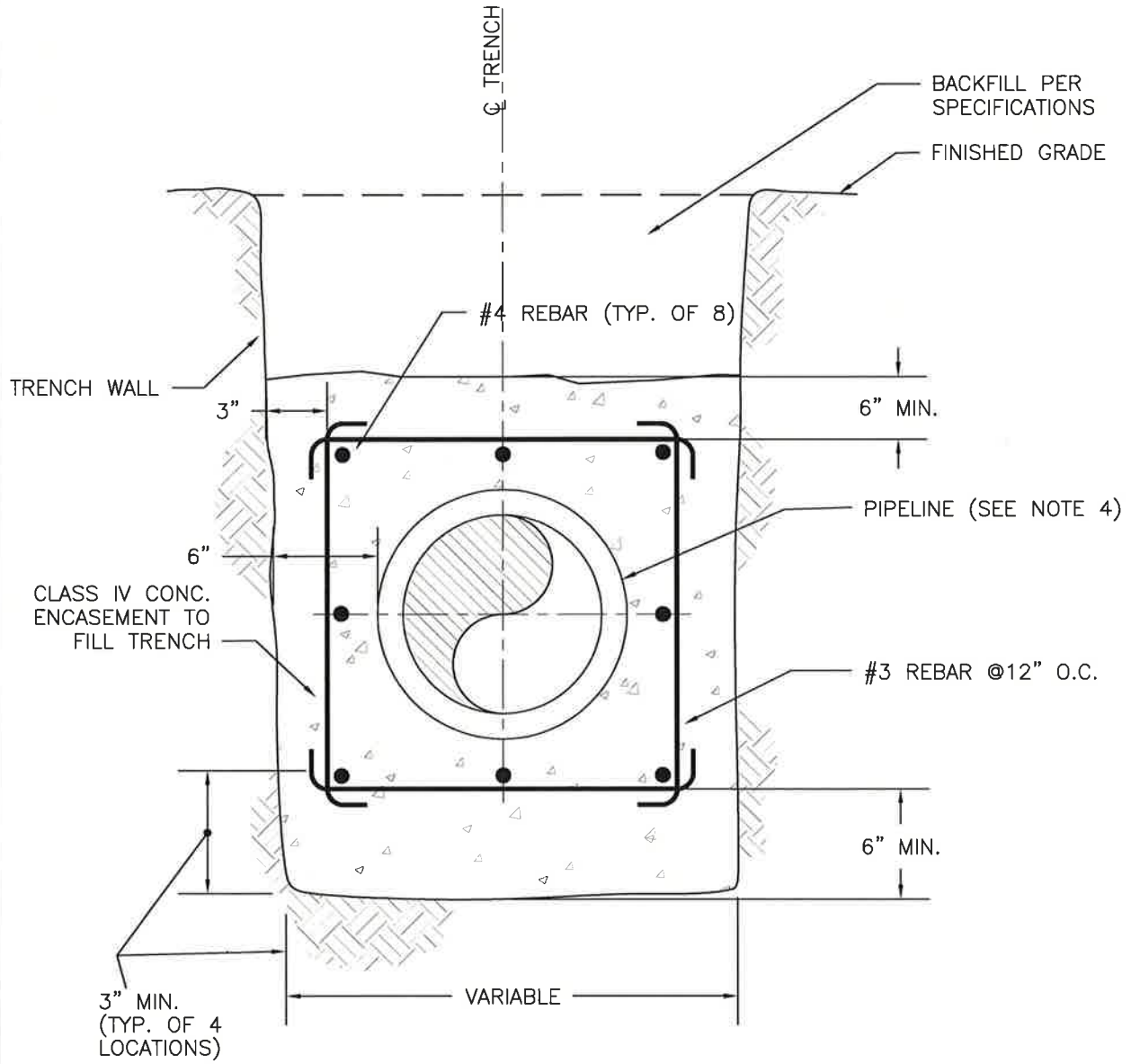
RYAN GROSS
GENERAL MANAGER

**CONCRETE THRUST BLOCKS
FOR PIPELINES**
CLASS 200 P.S.I. MAX.

STANDARD DRAWING NO.

W-3B

LAST UPDATED: 3/2013



NOTES:

1. PIPE ENCASEMENT TO BE INSTALLED WHERE INDICATED ON THE PLANS AND/OR AS DIRECTED IN THE FIELD BY THE DISTRICT.
2. CONTRACTOR SHALL TAKE DUE PRECAUTION AGAINST PIPE FLOTATION DURING PLACING OF THE CONCRETE.
3. IF ANY PIPE APPURTENANCE, SUCH AS OUTLETS, MANWAYS, ETC., ARE REQUIRED IN THE AREA WHERE PIPE ENCASEMENT IS REQUIRED, THE ENCASEMENT SHALL BE FORMED SO THAT REASONABLE ACCESS APPURTENANCES.
4. WRAP PIPE WITH THREE (3) LAYERS OF 20 LB FELT PAPER.



RUNNING SPRINGS WATER DISTRICT

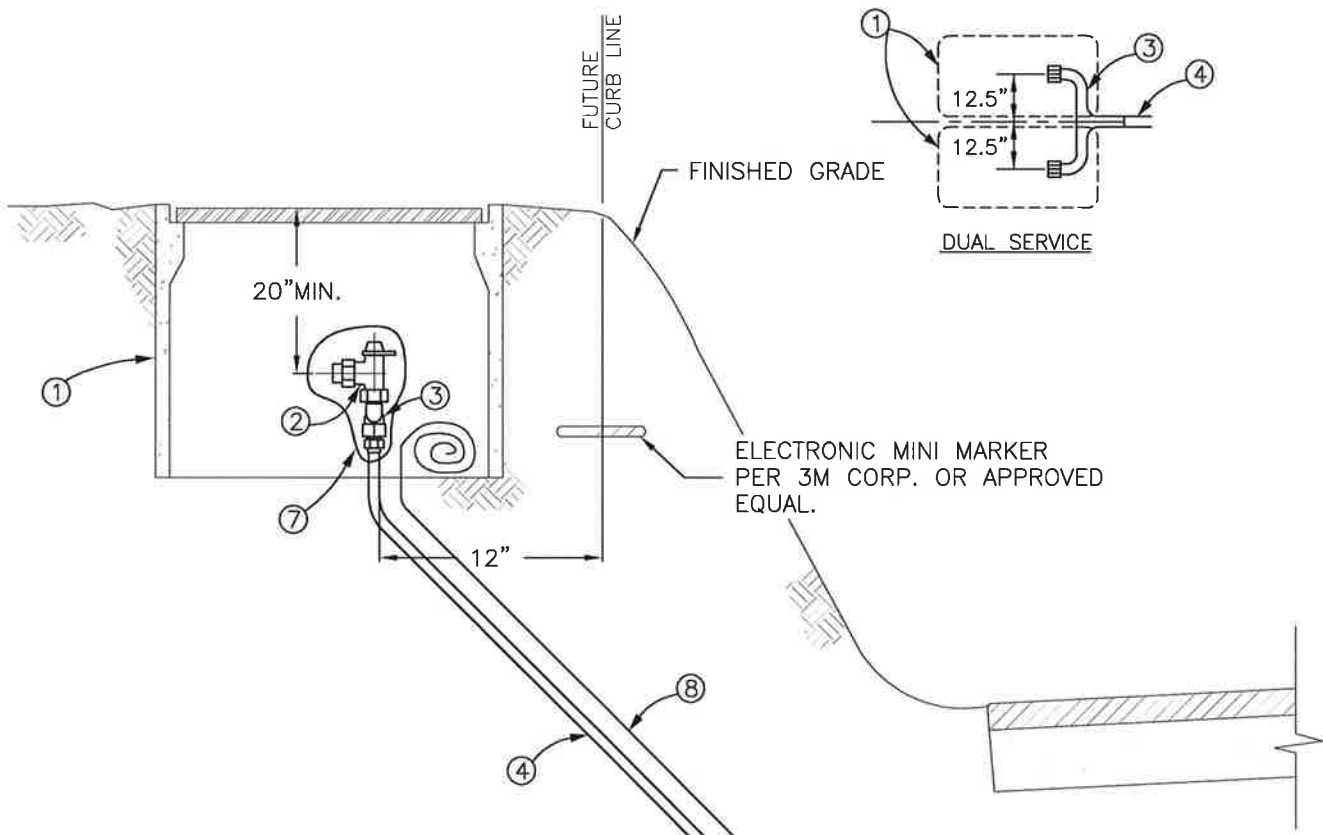
RYAN GROSS
GENERAL MANAGER

PIPE ENCASEMENT DETAIL

STANDARD DRAWING NO.

W-4

LAST UPDATED: 3/2013



- ① FUTURE METER BOX.
- ② ANGLE METER STOP PER FORD KV13-332W OR APPROVED EQUAL. FOR DUAL SERVICE AND KV43-332W OR APPROVED EQUAL. FOR SINGLE SERVICE.
- ③ DUAL SERVICE USE FORD U-48-43-12-1/2 WITH #52 INSERT STAINLESS STEEL LINER, 1" OR LARGER.
- ④ 1" OR LARGER HIGH DENSITY POLYETHYLENE (HDPE) PE 3406 PIPE PER AWWA C-901, COPPER PIPE SIZE.
- ⑤ CORPORATION STOP PER FORD F-1100 WITH #52 STAINLESS STEEL LINER, 1" OR LARGER.
- ⑥ 1 1/4" WELDED SADDLE FOR STEEL PIPE OR SMITH-BLAIR, NYLON COATED 315 WITH FULLY FORMED TAPPED THREADS, IRON PIPE SIZE AND TYPE 304 STAINLESS STEEL STRAP. BOLTS, NUTS, WASHERS TO BE 5/8" N.C. TEFLON COATED FOR C-900 8" PVC PIPE.
- ⑦ POLYETHYLENE BAG, 4-6 MILS PER TRANSPARENT PRODUCTS CORPS. OR APPROVED EQUAL.
- ⑧ LOCATION WIRE PER STANDARD DRAWING NO. W-14.

NOTES:

- 1. MINIMUM COVER OVER SERVICE LATERAL SHALL BE 42" INCHES.



RUNNING SPRINGS WATER DISTRICT

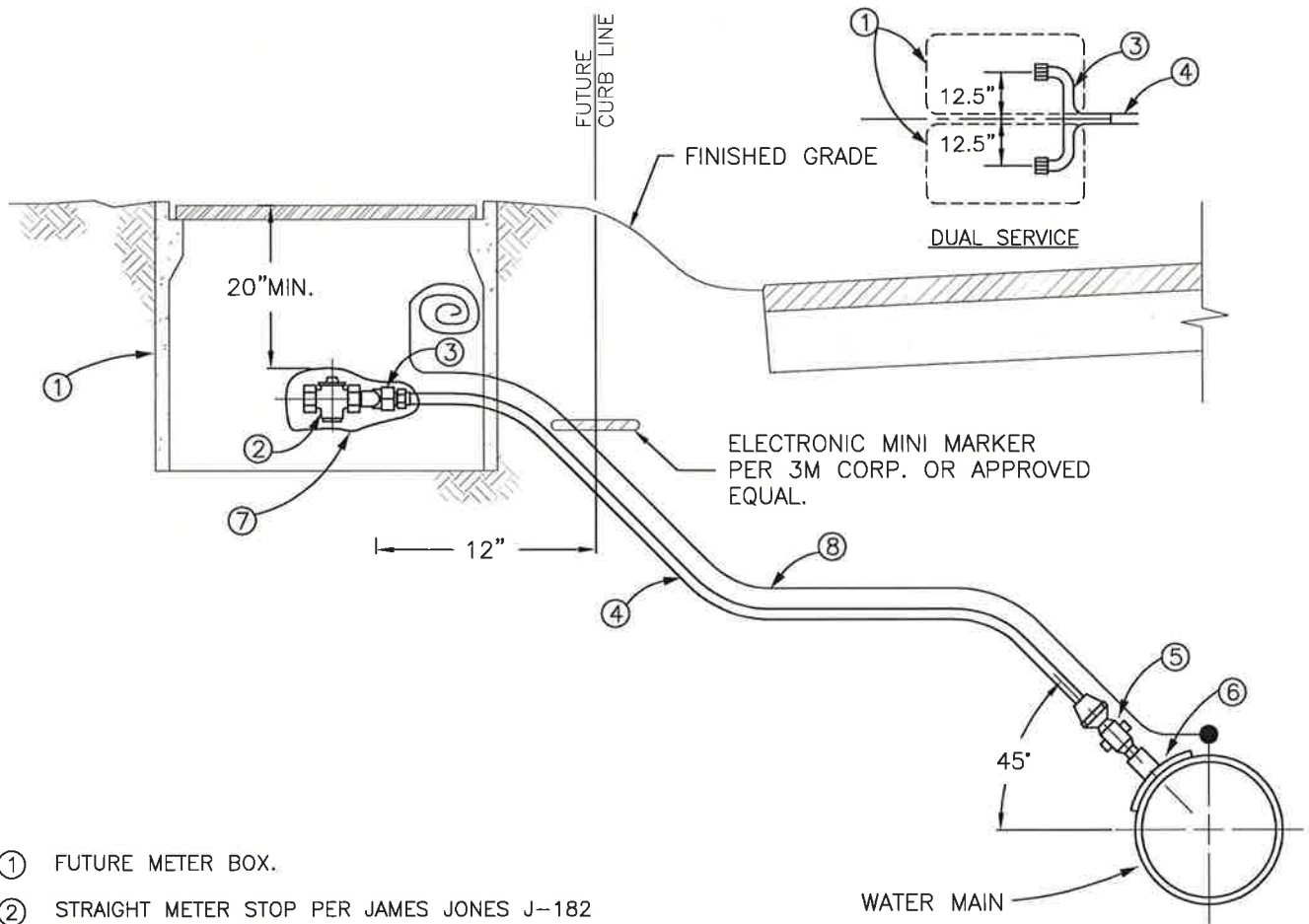
RYAN GROSS
GENERAL MANAGER

DUAL OR SINGLE SERVICE CONNECTION FOR BANK AREA

STANDARD DRAWING NO.

W-5A

LAST UPDATED: 3/2013



- ① FUTURE METER BOX.
- ② STRAIGHT METER STOP PER JAMES JONES J-182 OR APPROVED EQUAL.
- ③ DUAL SERVICE USE FORD U-48-43-12-1/2 WITH #52 INSERT STAINLESS STEEL LINER, 1" OR LARGER.
- ④ 1" OR LARGER HIGH DENSITY POLYETHYLENE (HDPE) PE 3406 PIPE PER AWWA C-901, COPPER PIPE SIZE.
- ⑤ CORPORATION STOP PER FORD F-1100 WITH #52 STAINLESS STEEL LINER, 1" OR LARGER.
- ⑥ 1 1/4" WELDED SADDLE FOR STEEL PIPE OR SMITH-BLAIR, NYLON COATED 315 WITH FULLY FORMED TAPPED THREADS, IRON PIPE SIZE AND TYPE 304 STAINLESS STEEL STRAP. BOLTS, NUTS, WASHERS TO BE 5/8" N.C. TEFLON COATED FOR C-900 8" PVC PIPE.
- ⑦ POLYETHYLENE BAG, 4-6 MILS PER TRANSPARENT PRODUCTS CORPS. OR APPROVED EQUAL.
- ⑧ LOCATION WIRE PER STANDARD DRAWING NO. W-14.

NOTES:

- 1. MUELLER WINGLOCKS H-11026 ARE APPROVED FOR LEVEL SERVICE SETTINGS.
- 2. MINIMUM COVER OVER SERVICE LATERAL SHALL BE 42" INCHES.



RUNNING SPRINGS WATER DISTRICT

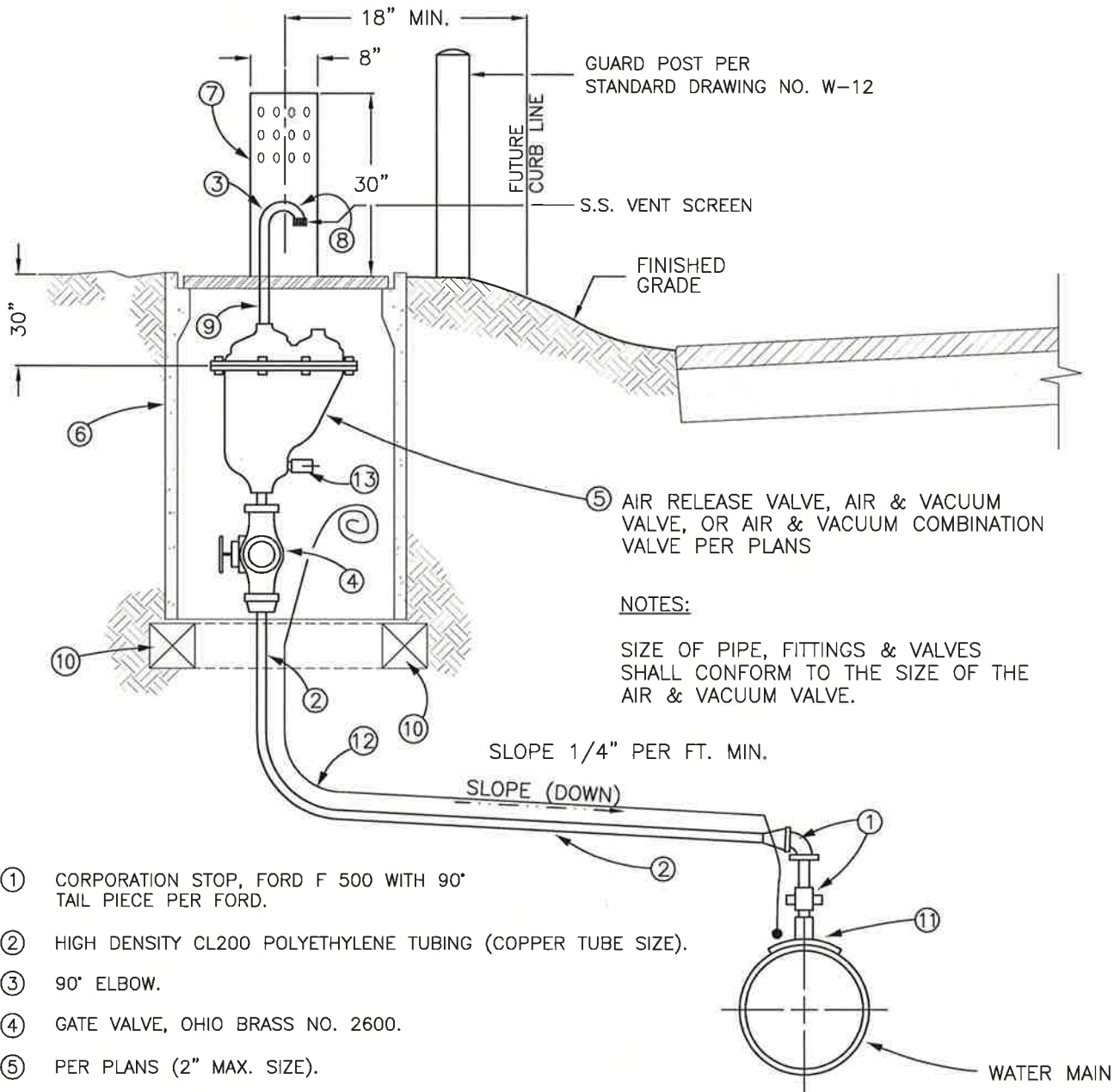
RYAN GROSS
GENERAL MANAGER

DUAL OR SINGLE SERVICE
CONNECTION FOR LEVEL AREA

STANDARD DRAWING NO.

W-5B

LAST UPDATED: 3/2013



NOTES:

SIZE OF PIPE, FITTINGS & VALVES SHALL CONFORM TO THE SIZE OF THE AIR & VACUUM VALVE.

- ① CORPORATION STOP, FORD F 500 WITH 90° TAIL PIECE PER FORD.
- ② HIGH DENSITY CL200 POLYETHYLENE TUBING (COPPER TUBE SIZE).
- ③ 90° ELBOW.
- ④ GATE VALVE, OHIO BRASS NO. 2600.
- ⑤ PER PLANS (2" MAX. SIZE).
- ⑥ 13" X 24" (ID) 2-BROOKS #38 BOX OR APPROVED EQUAL.
- ⑦ 30" X 8" X 0.188" WALL PERFORATED GALVANIZED STEEL PIPE WELDED TO A 12.5" X 23.5" DIAMOND PLATE STEEL LID.
- ⑧ 1" 90° STEEL ELBOW.
- ⑨ 1" X 12" PLASTIC NIPPLE.
- ⑩ 4" X 4" REDWOOD SUPPORTS FOR FOUR WALLS OF BOX.
- ⑪ CONNECTION PER STANDARD DRAWING NO. W-5 (SIMILAR).
- ⑫ LOCATION WIRE PER STANDARD DRAWING NO. W-14.
- ⑬ BRASS BALL VALVE AND NIPPLE PER NIDCO MODEL T-580 OR APPROVED EQUAL.



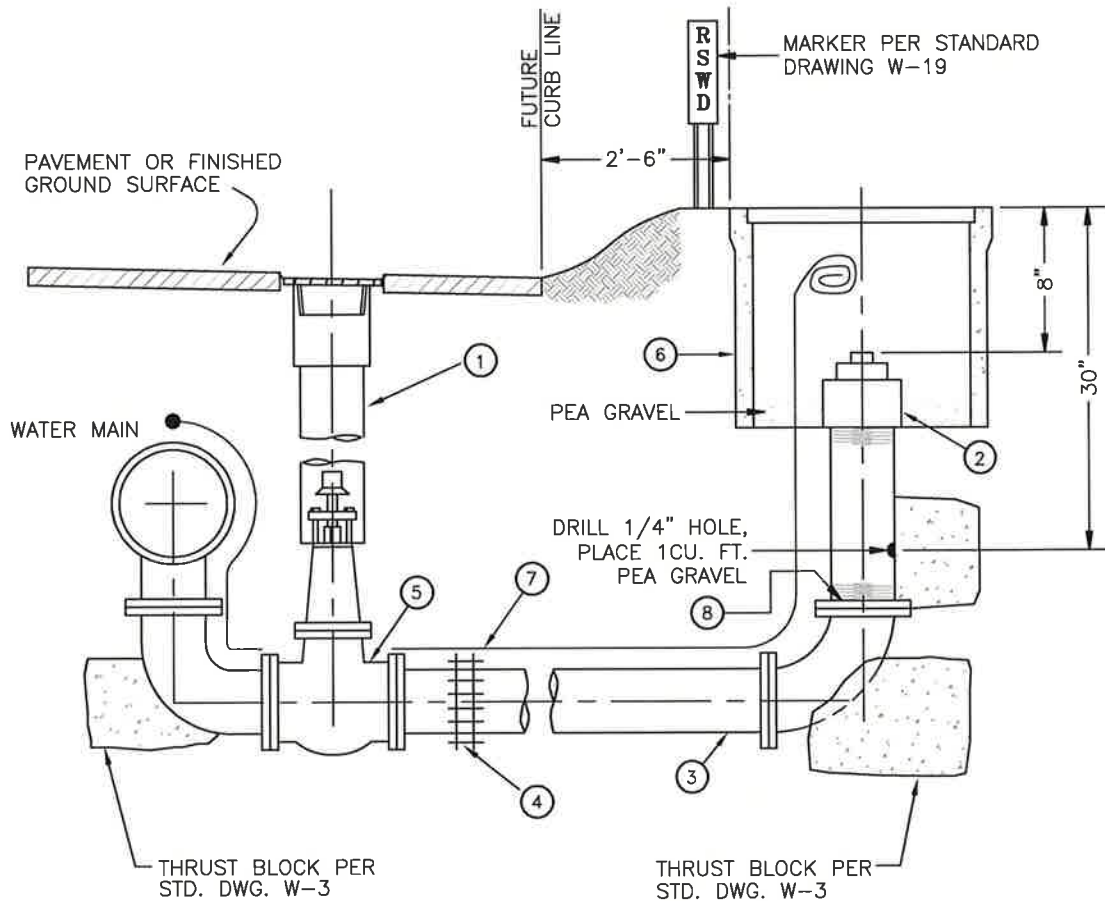
RUNNING SPRINGS WATER DISTRICT

RYAN GROSS
GENERAL MANAGER

AIR & VACUUM VALVE ASSEMBLY

STANDARD DRAWING NO.

W-6



NOTES:

1. 4" BLOW-OFF WILL BE REQUIRED FOR 6" - 12" WATER MAIN.
6" BLOW-OFF WILL BE REQUIRED FOR 14" AND LARGER WATER MAIN.
2. SIZE OF PIPE, VALVE AND FITTINGS SHALL CONFORM TO THE SIZE OF BLOW-OFF REQUIRED.

- ① 8" VALVE BOX AND COVER PER STANDARD DRAWING NO. W-11
- ② 4" OR 6" THREAD GALVANIZED IRON PIPE COUPLING WITH SLOTTED PLUG
- ③ 4" OR 6" DUCTILE IRON PIPE
- ④ 4" OR 6" FLEXIBLE COUPLING
- ⑤ 4" OR 6" F X M.J. RESILIENT SEATED GATE VALVE WITH PRESSURE RATING TO MATCH MAIN LINE. SEE STANDARD DRAWING NO. W-11
- ⑥ 14" X 14" (MIN.) UTILITY BOX
- ⑦ LOCATION WIRE PER STANDARD DRAWING NO. W-14
- ⑧ COMPANION FLANGE



RUNNING SPRINGS WATER DISTRICT

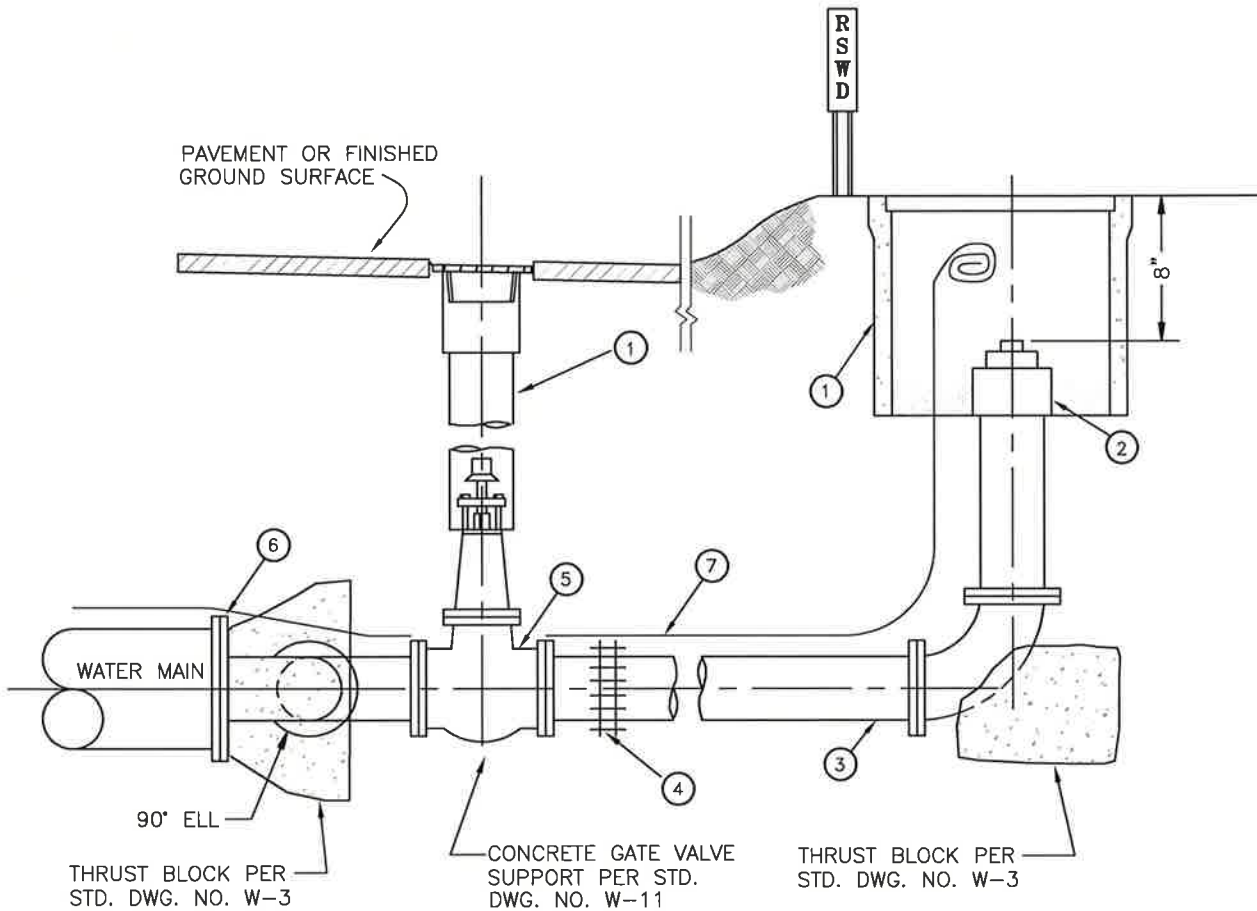
RYAN GROSS
GENERAL MANAGER

4" & 6" BLOW-OFF ASSEMBLY

STANDARD DRAWING NO.

W-7

LAST UPDATED: 3/2013



NOTES:

1. A 2" FLUSH-OUT SHALL BE REQUIRED FOR A 6" AND SMALLER WATER MAIN. A 4" FLUSH-OUT SHALL BE REQUIRED FOR A 8" AND LARGER WATER MAIN.
2. SIZE OF PIPE, VALVE AND FITTINGS SHALL CONFORM TO THE SIZE OF FLUSH-OUT REQUIRED.

- ① 14" X 14" (MIN.) UTILITY BOX
- ② 2" OR 4" THREAD GALVANIZED IRON PIPE COUPLING WITH SLOTTED PLUG.
- ③ 2" STANDARD GALVANIZED OR 4" DUCTILE IRON PIPE
- ④ 2" OR 4" FLEXIBLE COUPLING
- ⑤ 2" SCREWED GATE VALVE WITH WRENCH NUT OR 4" F X F RESILIENT SEATED GATE VALVE
- ⑥ DUCTILE IRON PLUG OR CAP WITH 2" OR 4" THREADED OUTLET.
- ⑦ LOCATION WIRE PER STANDARD DRAWING NO. W-14.



RUNNING SPRINGS WATER DISTRICT

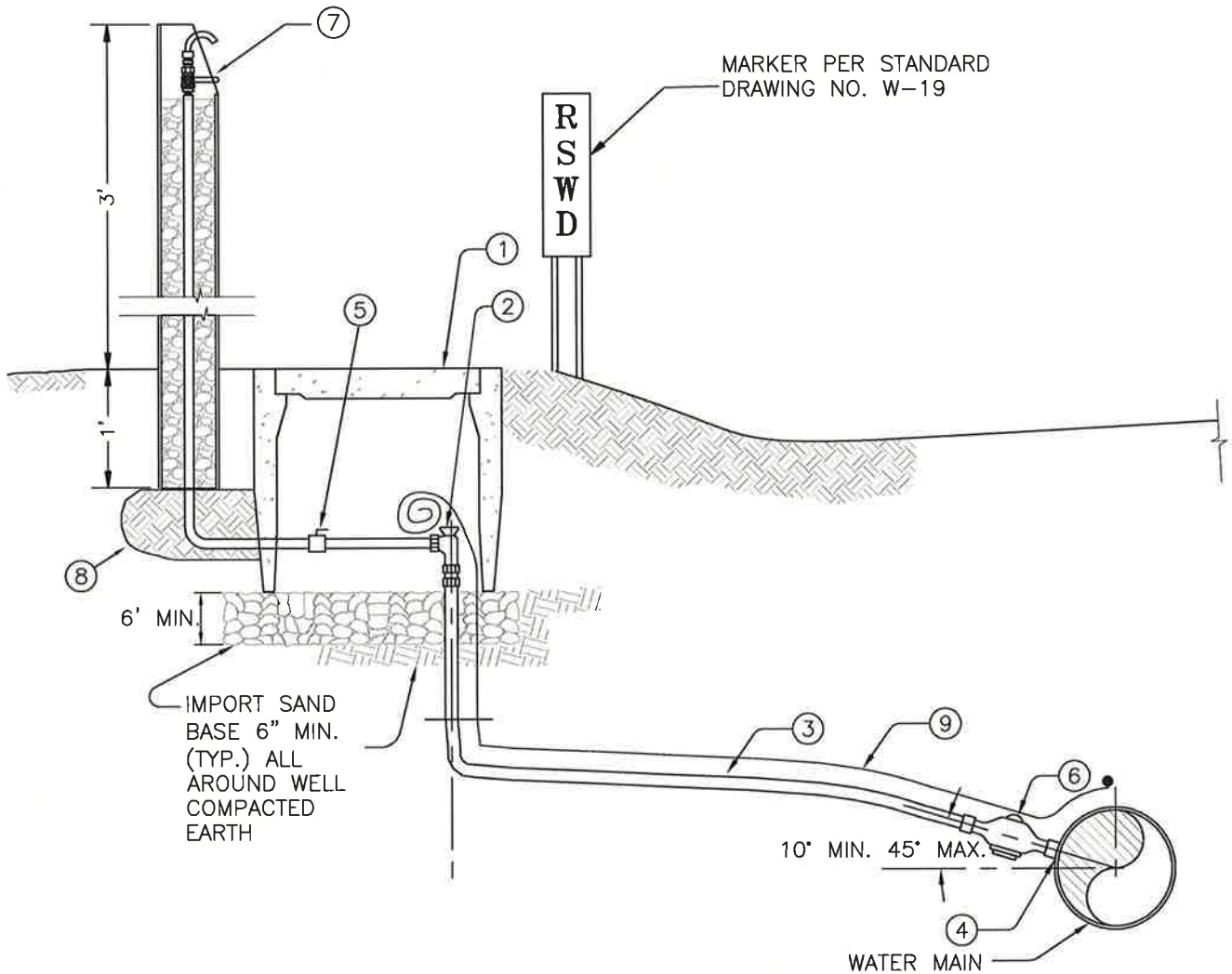
RYAN GROSS
GENERAL MANAGER

2" & 4" DEAD-END FLUSH-OUT

STANDARD DRAWING NO.

W-8

LAST UPDATED: 3/2013



- ① METER BOX AND COVER PURCHASED FROM THE DISTRICT
- ② 1" INVERTED KEY ANGLE METER VALVE, THREAD X PACK JOINT
- ③ SERVICE PER STANDARD DRAWING NO. W-5
- ④ 1" SERVICE SADDLE PER STANDARD DRAWING NO. W-5
- ⑤ 1" STOP AND WASTE VALVE WITH LEVER OPERATOR
- ⑥ 1" ϕ BALL CORPORATION STOP PER STANDARD DRAWING NO. W-5
- ⑦ SAMPLING STATION, BY KORALEEN STATION GUARD XLT FOR COLD CLIMATES OR APPROVED EQUAL
- ⑧ 90° COMPACTED SOIL
- ⑨ LOCATION WIRE



RUNNING SPRINGS WATER DISTRICT

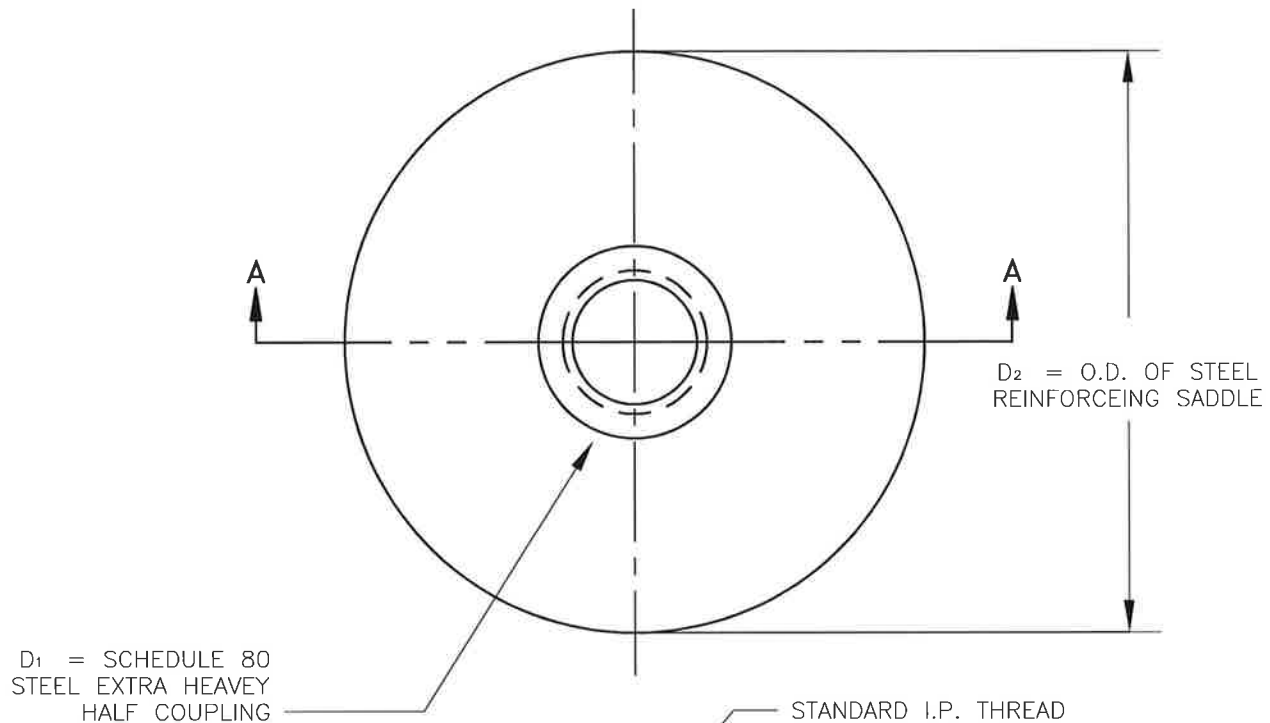
RYAN GROSS
GENERAL MANAGER

SAMPLE STATION DETAIL

STANDARD DRAWING NO.

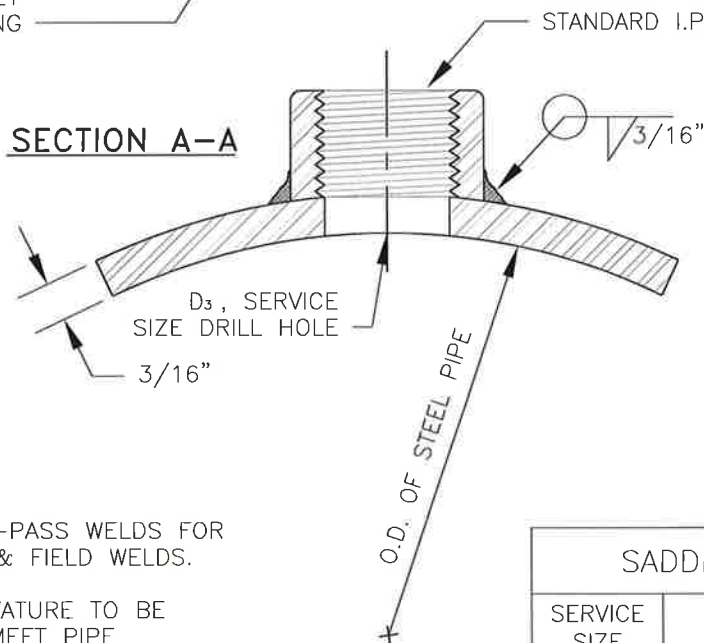
W-9

LAST UPDATED: 3/2013



D₁ = SCHEDULE 80
STEEL EXTRA HEAVY
HALF COUPLING

D₂ = O.D. OF STEEL
REINFORCING SADDLE



SECTION A-A

STANDARD I.P. THREAD

3/16"

D₃, SERVICE
SIZE DRILL HOLE

3/16"

O.D. OF STEEL PIPE

NOTES:

1. USE DOUBLE-PASS WELDS FOR FABRICATION & FIELD WELDS.
2. SADDLE CURVATURE TO BE FORMED TO MEET PIPE DIAMETERS.
3. WHEN INSTALLED, OUTLET TO BE COATED WITH SAME COATING AS PIPE.
4. I.P. X I.P. NYLON BUSHING (USE I.P. X M.J. CORPORATION STOP.

SADDLE DIMENSIONS

SERVICE SIZE	D ₁	D ₂	D ₃
1"	2"	5"	1-1/2"
1-1/2"	2-1/2"	6"	2"
2"	3"	7"	2-1/2"



RUNNING SPRINGS WATER DISTRICT

RYAN GROSS
GENERAL MANAGER

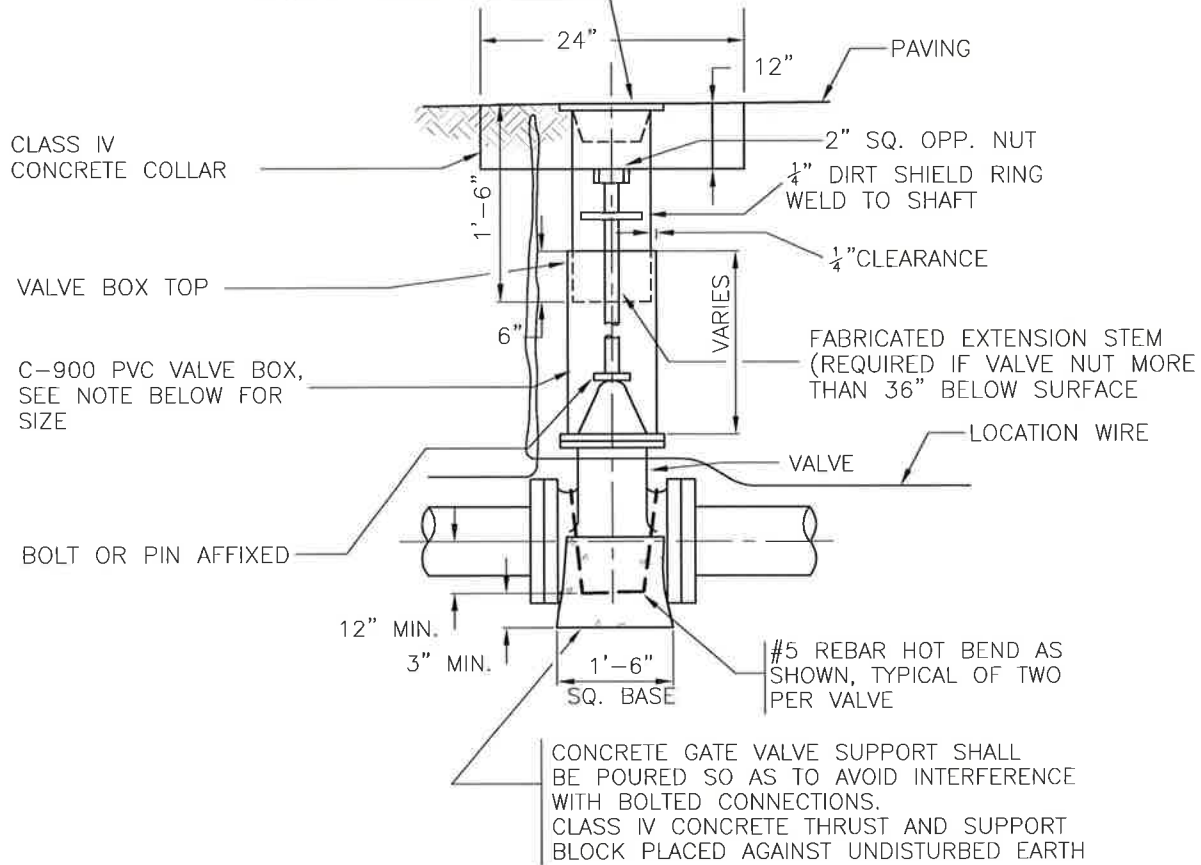
**TAPPING OUTLET
FOR STEEL PIPE
1" THRU 2"**

STANDARD DRAWING NO.

W-10

LAST UPDATED: 3/2013

VALVE BOX COVER, CAST IRON LABELED "WATER"
 PAINT WITH ONE (1) COAT 1069 HEAVY DUTY RUST INHIBITIVE
 RED PRIMER AND TWO (2) COATS OF RUST-O-LEUM BLUE
 HYDRANT ENAMEL



NOTE:

- O.D. OF VALVE BOX
1. 2"-6" VALVE - 6.90"
 2. 8"-16" VALVE - 9.05"



RUNNING SPRINGS WATER DISTRICT

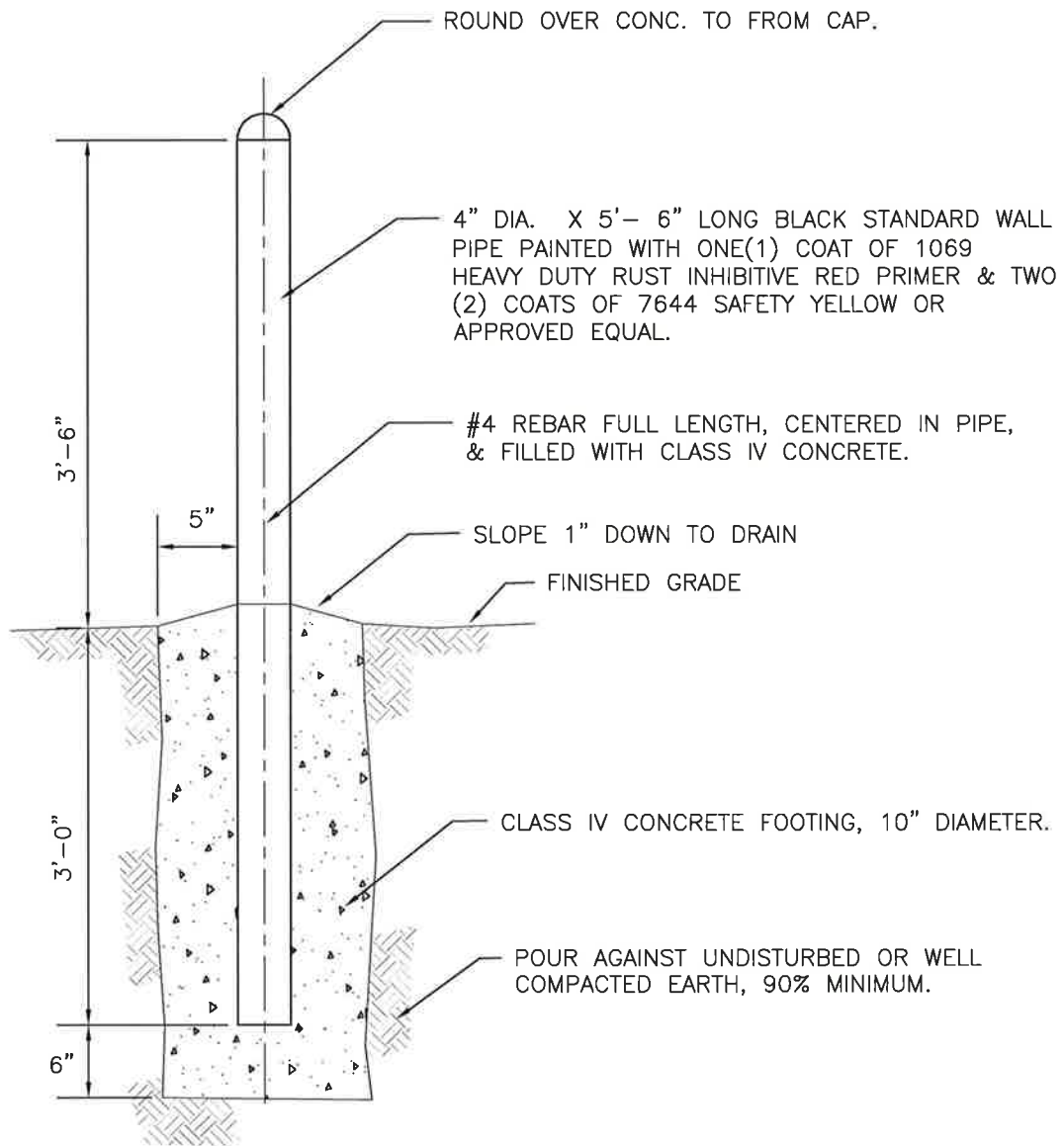
RYAN GROSS
 GENERAL MANAGER

VALVE BOX & COVER

STANDARD DRAWING NO.

W-11

LAST UPDATED: 3/2013



NOTES:

1. GUARD POSTS ARE 2' TO 3' INTERVAL PER DIRECTION, AND 36" FROM ϕ OF FIRE HYDRANT, 24" FROM ϕ OF AIR VALVE.
2. LOCATION SHALL BE AS SHOWN ON PLAN VIEW, REQUIRED BY OTHER STANDARD DRAWINGS, OR AS DIRECTED IN THE FIELD BY THE INSPECTOR OR THE ENGINEER.



RUNNING SPRINGS WATER DISTRICT

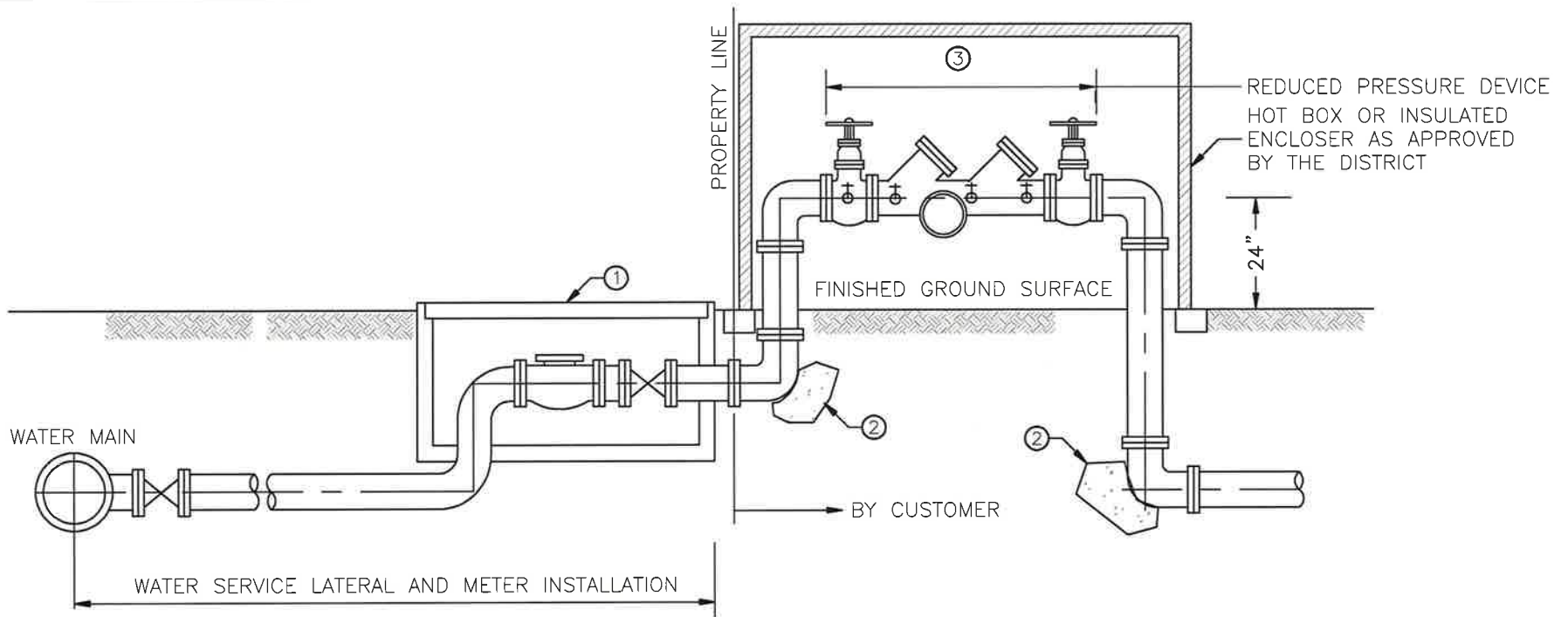
RYAN GROSS
GENERAL MANAGER

**GUARD POST
INSTALLATION DETAIL**

STANDARD DRAWING NO.

W-12

LAST UPDATED: 3/2013



NOTES:

1. NO CONNECTIONS OR TEES BETWEEN WATER METER AND R.P. DEVICES.
 2. INSTALL R.P. DEVICE AT PROPERTY LINE, DEPENDING ON RIGHT-OF-WAY R.P. DEVICE MAYBE INSTALLED PARALLEL TO PROPERTY LINE.
 3. INSTALLATION SHALL BE APPROVED BY THE DISTRICT.
 4. R.P. DEVICES SHALL BE APPROVED BY UNIVERSITY OF SOUTHERN CALIFORNIA FOUNDATION PER HEALTH SERVICE DEPARTMENT'S REQUIREMENTS AND SHALL BE FEBCO OR APPROVED EQUAL.
 5. MINIMUM 24" CLEARANCE REQUIRED AROUND THE R.P. DEVICE.
 6. R.P. DEVICE SHALL BE MINIMUM 24" ABOVE FINISH GROUND.
 7. EACH R.P. DEVICE SHALL BE PROVIDED WITH TEST COCKS, SIZE AS LISTED BELOW:
 FOR 3/4" TO 2" DEVICE, USE 1/4" COCKS
 FOR 2-1/2" TO 4" DEVICE, USE 1/2" COCKS
 FOR 6" AND LARGER DEVICE, USE 3/4" COCKS
- ① WATER METER AND METER BOX. METER TO REGISTER IN CUBIC FEET.
 - ② CONCRETE THRUST BLOCK PER STANDARD DRAWING NO. W-3.
 - ③ REDUCED PRESSURE (R.P.) PRINCIPAL TYPE BACKFLOW PREVENTER PER SPECIFICATIONS, SIZE AS INDICATED ON PLANS.

W-13



RUNNING SPRINGS WATER DISTRICT

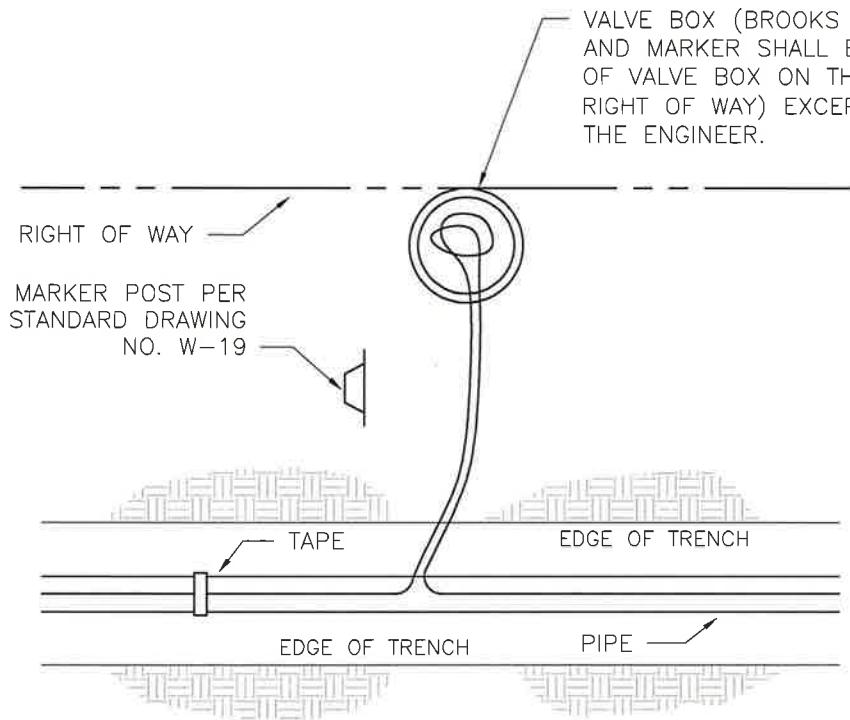
RYAN GROSS
GENERAL MANAGER

**BACKFLOW PREVENTER
(REDUCED PRESSURE)**

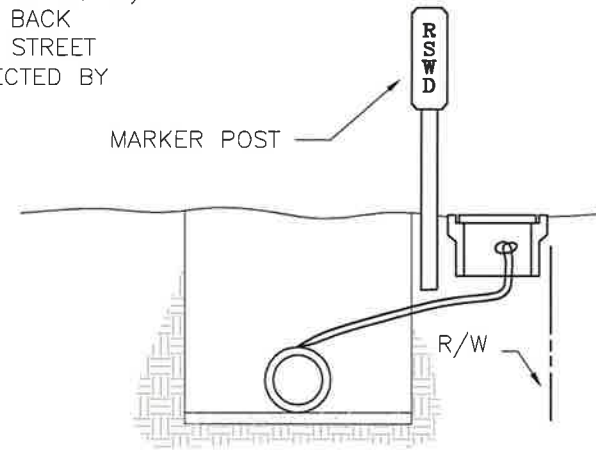
STANDARD DRAWING NO.

W-13

LAST UPDATED: 9/2013



PLAN VIEW



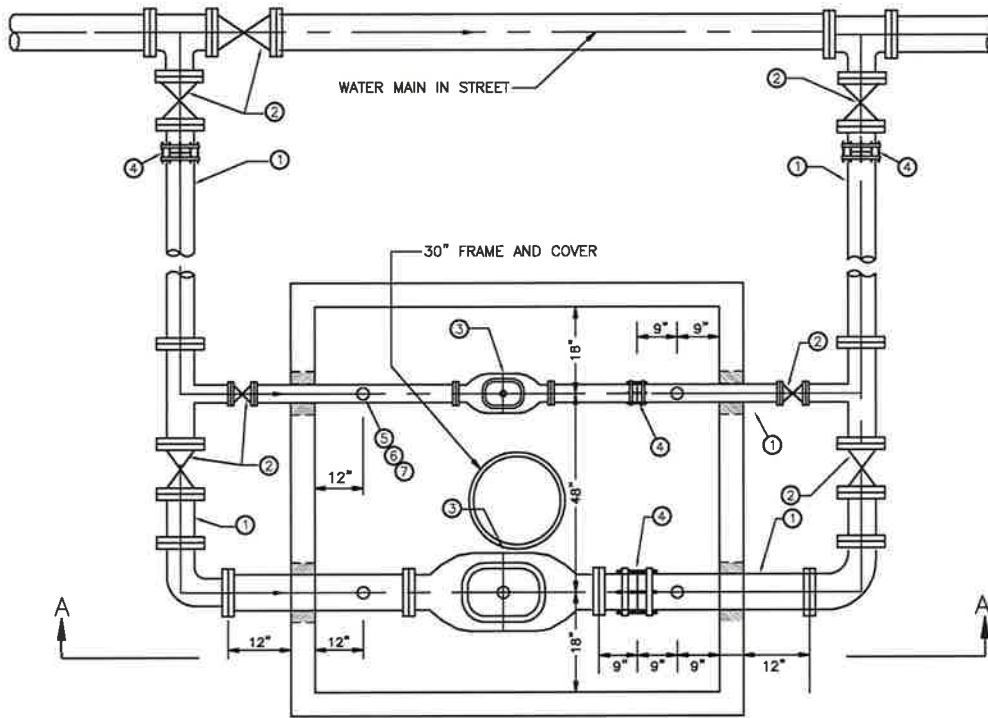
VALVE BOX (BROOKS NO. 1-SP OR APPROVED EQUAL) AND MARKER SHALL BE LOCATED WITH THE BACK OF VALVE BOX ON THE PROPERTY LINE (IN STREET RIGHT OF WAY) EXCEPT AS OTHERWISE DIRECTED BY THE ENGINEER.

NOTES:

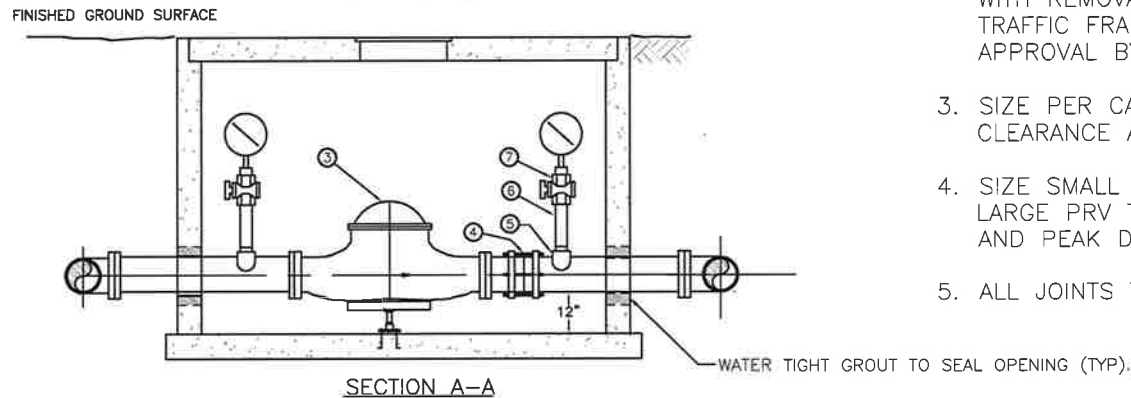
LOCATOR WIRE: (12 GAUGE TWISTED WIRE SOLID COPPER WIRE)

1. TO BE PLACED ON TOP OF PIPE & SECURED WITH TAPE.
2. LOCATOR WIRE SHALL BE BROUGHT TO THE SURFACE AT 660 FEET O.C. MAXIMUM BY FIRE HYDRANTS OR INSTALL R.S.W.D. MARKER POST (GIVE STATIONS AT VALVE BOXES).
3. LOOP 2 FEET OR WIRE IN BROOKS NO. 1-SP, OR APPROVED EQUAL, VALVE BOX WITHIN 2 FEET OF FIRE HYDRANT OR R.S.W.D. MARKER.
4. WIRE TO BE CONTINUOUS.
5. LOCATOR WIRE SHALL BE INSTALLED OVER ALL WATERLINES, RECLAIMED WATERLINES AND FORCE MAINS.
6. USE A CAST IRON COVER LABELED WATER, SEWER OR RECLAIMED (RECLAIMED TO BE PAINTED LAVENDER).





PLAN VIEW



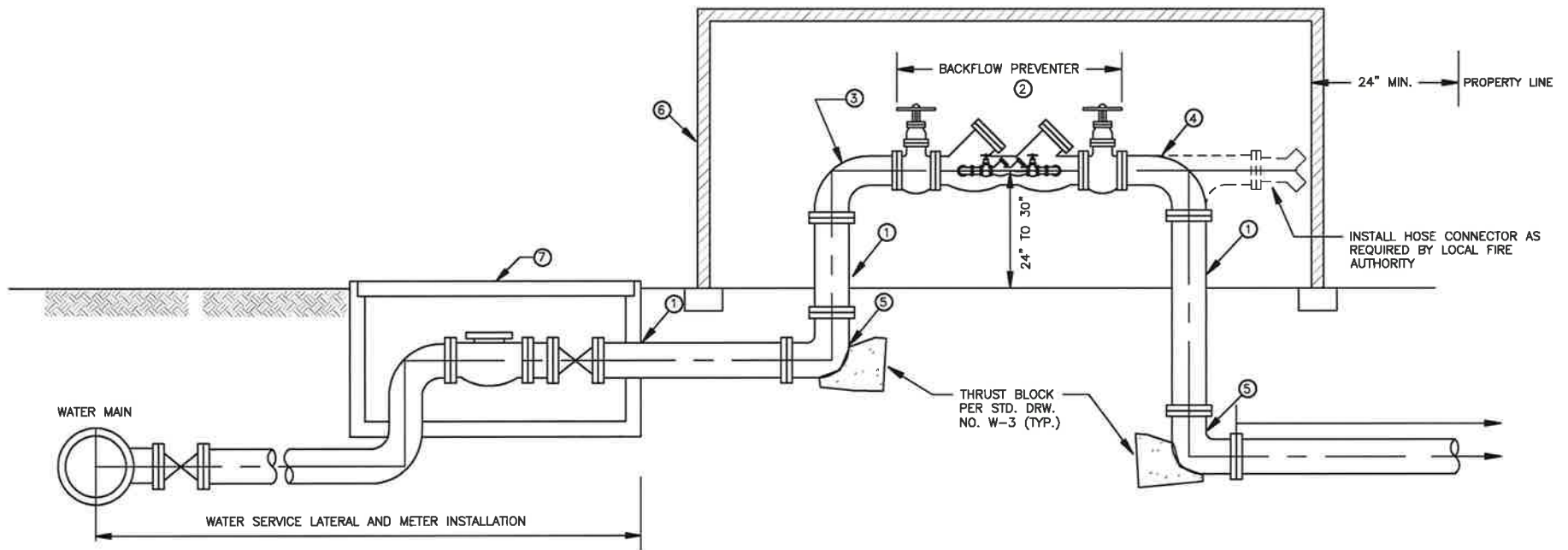
SECTION A-A

ITEM	QTY	DESCRIPTION
①	---	DUCTILE IRON PIPE, SAME SIZE AS VALVE, SEE PLAN FOR SIZE.
②	7	R.S. GATE VALVE AND VALVE BOX PER STD. DWG. W-11, SAME SIZE AS PIPELINE.
③	2	PRESSURE REDUCING VALVE, SIZE AS INDICATED ON PLAN. (CLAYTON 90G-01KC)
④	4	FLEXIBLE COUPLING PER SPEC.
⑤	4	1" NOZZLE
⑥	4	1"Ø X 4" LONG SCH. 40 GALV. IRON PIPE THREADED BOTH ENDS.
⑦	4	1"Ø GATE VALVE, INSIDE I.P.T. X INSIDE I.P.T. WITH BUSHING AND PRESSURE GAGE

NOTES:

1. VALVE SHALL HAVE APPROVED PIPE SUPPORT.
2. CONCRETE VAULT SHALL BE DESIGNED FOR H-20 LOADING WITH REMOVABLE CONCRETE TOP AND 30-INCH DIAMETER TRAFFIC FRAME AND COVER. SUBMIT DESIGN FOR REVIEW AND APPROVAL BY THE DISTRICT.
3. SIZE PER CAST CONCRETE VAULT TO PROVIDE MINIMUM CLEARANCE AS SHOWN.
4. SIZE SMALL PRV TO MEET AVERAGE DAILY DEMAND; SIZE LARGE PRV TO MEET THE HIGHER OF PEAK HOUR DEMAND AND PEAK DAILY DEMAND PLUS FIRE FLOW.
5. ALL JOINTS TO BE RESTRAINED.



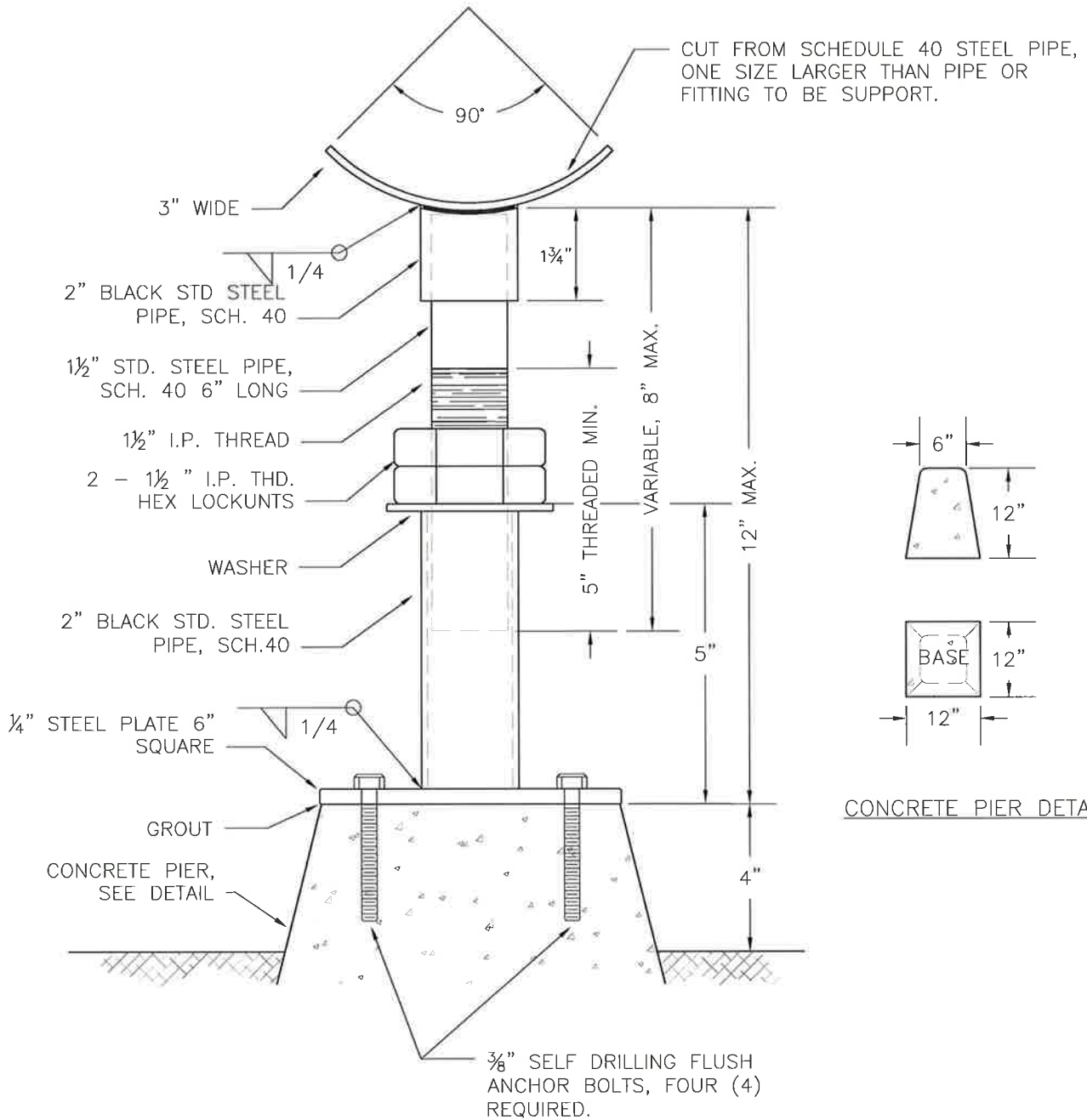


- ① DUCTILE IRON BRANCH PIPELINE (SIZE = SIZE OF BACKFLOW PREVENTER + 2")
- ② DOUBLE CHECK BACKFLOW PREVENTER, FEBCO, WILKIN OR APPROVED EQUAL. SIZE PER PLANS
- ③ DUCTILE IRON FLANGED REDUCING ELBOW
- ④ FLANGED REDUCING ELBOW OR FLANGED TEE WHEN HOSE CONNECTOR IS REQUIRED
- ⑤ F X M.J. ELBOW
- ⑥ HOT BOX OR INSULATED ENCLOSURE AS APPROVED BY THE DISTRICT
- ⑦ WATER METER AND METER BOX TO REGISTER IN CUBIC FEET

NOTES:

- 1. 24" MINIMUM CLEARANCE REQUIRED AROUND THE DEVICE.
- 2. DEPENDING ON THE RIGHT-OF-WAY, DEVICE MAY HAVE TO BE INSTALLED PARALLEL TO PROPERTY LINE.





NOTES:

1. IN EVENT SUPPORT IS MOUNTED ON CONCRETE SLAB OR FLOOR, PIER NOT REQUIRED.
2. ALL EXPOSED METAL SURFACES SHALL BE PROTECTED IN ACCORDANCE WITH THE SPECIFICATIONS, EXCEPT THE THREADS.
3. DIMENSIONS OF CONCRETE PIER MAY BE INCREASED DEPENDING ON FIELD CONDITIONS.



RUNNING SPRINGS WATER DISTRICT

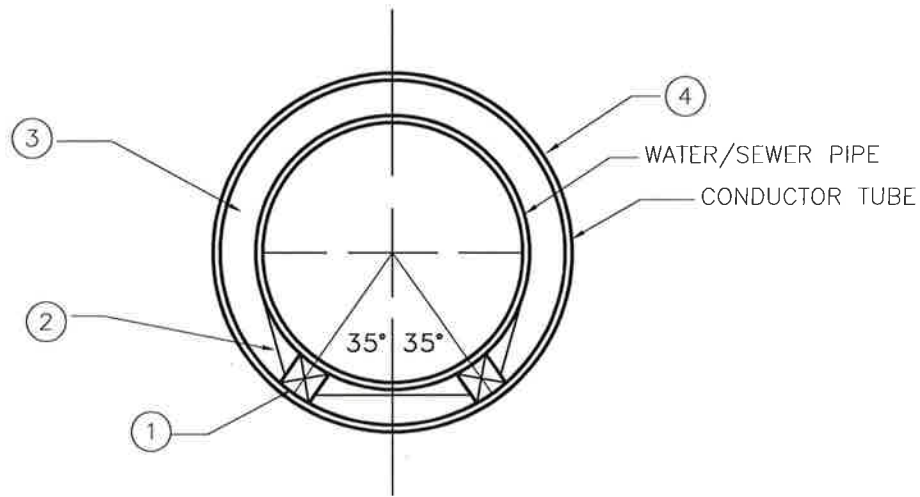
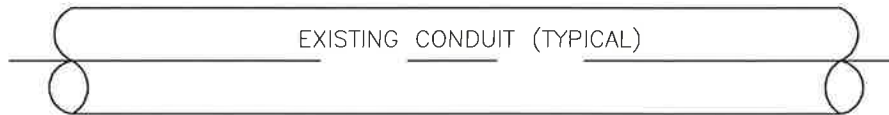
RYAN GROSS
GENERAL MANAGER

ADJUSTABLE PIPE SUPPORT

STANDARD DRAWING NO.

W-17

LAST UPDATED: 3/2013



- ① 4" X 4" ROUGH REWOOD SKID, CUT TO BEAR ON CONDUCTOR TUBE
- ② ¾" WIDE X 0.045" THICK STAINLESS STEEL BAND
- ③ BLOWN SAND
- ④ STEEL CONDUCTOR TUBE PER ASTM A28 (WALL THICKNESS MIN. ¼" OR PER PLANS)

NOTES:

1. MINIMUM 4" CLEARANCE IS REQUIRED BETWEEN INNER WALL OF CONDUCTOR TUBE AND OUTER WALL OF WATER/SEWER PIPE.
2. CONDUCTOR TUBES 30 INCHES IN DIAMETER AND GREATER REQUIRE CAL-OSHA PERMIT.



RUNNING SPRINGS WATER DISTRICT

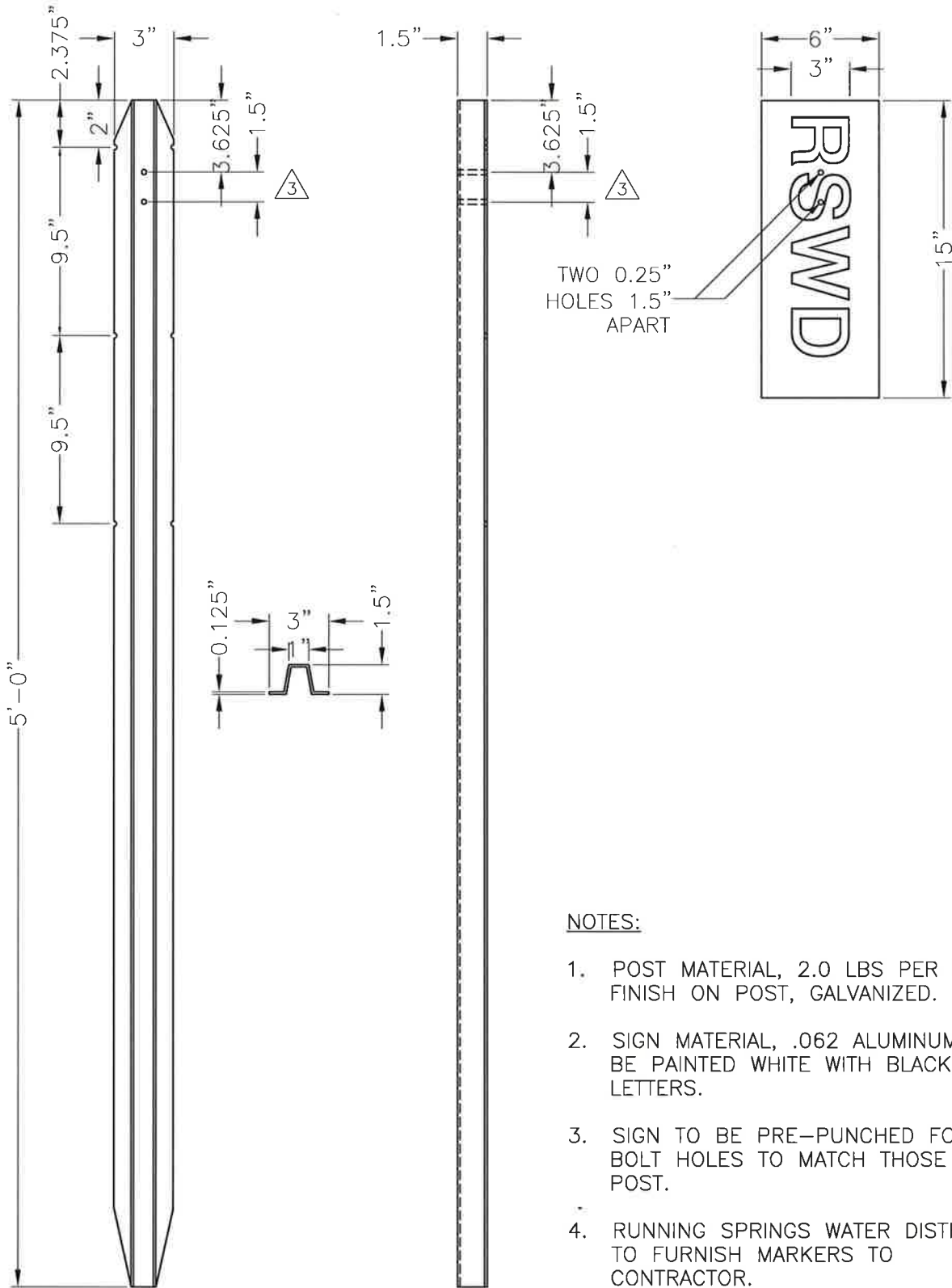
RYAN GROSS
GENERAL MANAGER

CONDUCTOR TUBE DETAIL

STANDARD DRAWING NO.

W-18

LAST UPDATED: 3/2013



NOTES:

1. POST MATERIAL, 2.0 LBS PER FOOT; FINISH ON POST, GALVANIZED.
2. SIGN MATERIAL, .062 ALUMINUM: TO BE PAINTED WHITE WITH BLACK LETTERS.
3. SIGN TO BE PRE-PUNCHED FOR BOLT HOLES TO MATCH THOSE IN POST.
4. RUNNING SPRINGS WATER DISTRICT TO FURNISH MARKERS TO CONTRACTOR.



RUNNING SPRINGS WATER DISTRICT

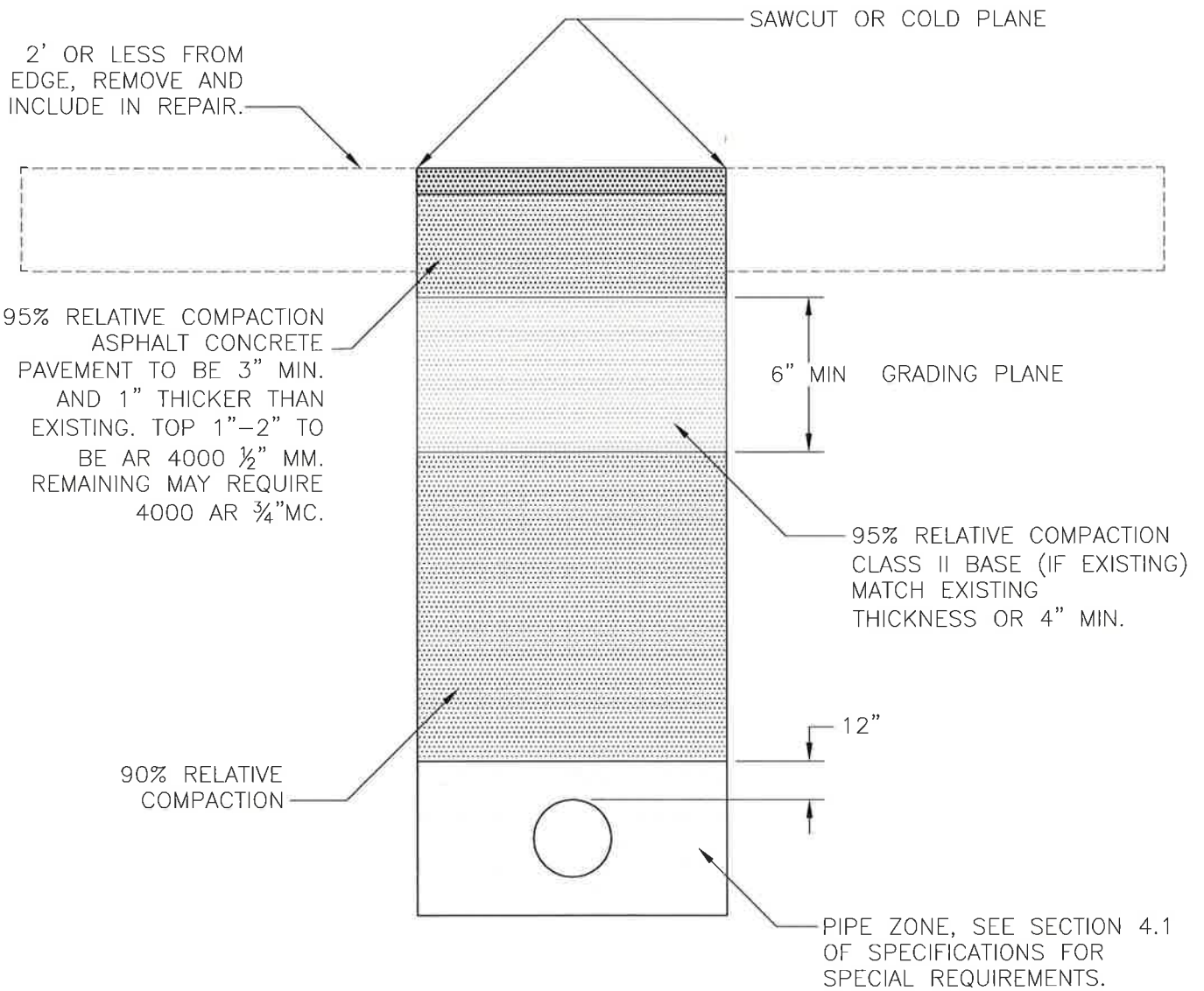
RYAN GROSS
GENERAL MANAGER

MARKER POST

STANDARD DRAWING NO.

W-19

LAST UPDATED: 3/2013



NOTES:

1. ALL EXCAVATIONS WITHIN COUNTY RIGHT-OF-WAY REQUIRE AN EXCAVATION PERMIT FROM THE ROAD PERMIT SECTION.
2. TEMPORARY PAVING 2" THICK COMPACTED SMOOTH AND FLUSH, SHALL BE PLACED IN ALL AREAS PAVING WAS REMOVED PRIOR TO OPENING TO TRAFFIC AND AT THE END OF EACH DAY.
3. COMPACTION TEST ON BACKFILL IN THE 90% RELATIVE COMPACTION ZONE SHALL BE AT VARYING DEPTHS ON 250' INTERVALS AND SUBMITTED TO INSPECTION PRIOR TO PERMANENT PAVING. CLASS II AGGREGATE BASE AND THE GRADING PLANE SHALL BE 95% RELATIVE COMPACTION ON 500' INTERVALS.
4. NOTIFY PERMIT INSPECTOR ONE WORKING DAY PRIOR TO STARTING A PROJECT AND FOR EACH PHASE OF CONSTRUCTION.



RUNNING SPRINGS WATER DISTRICT

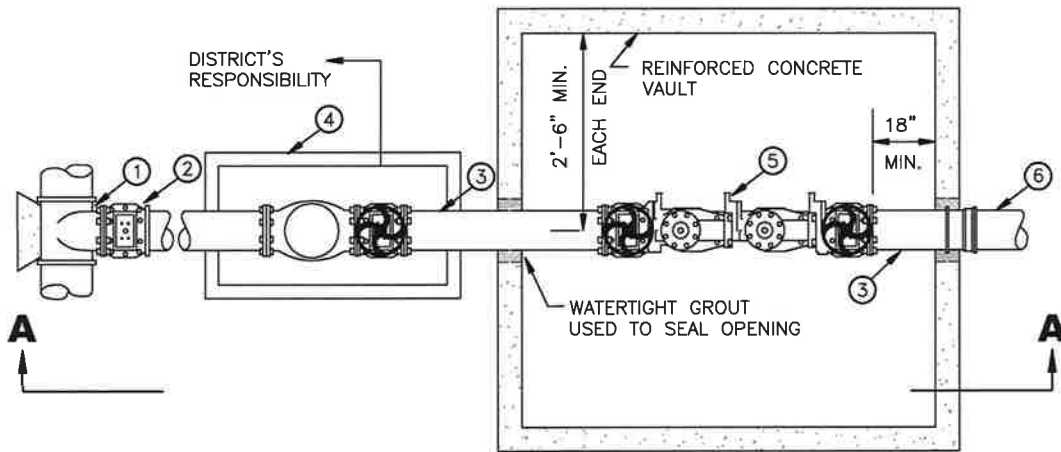
RYAN GROSS
GENERAL MANAGER

TRENCH DETAIL

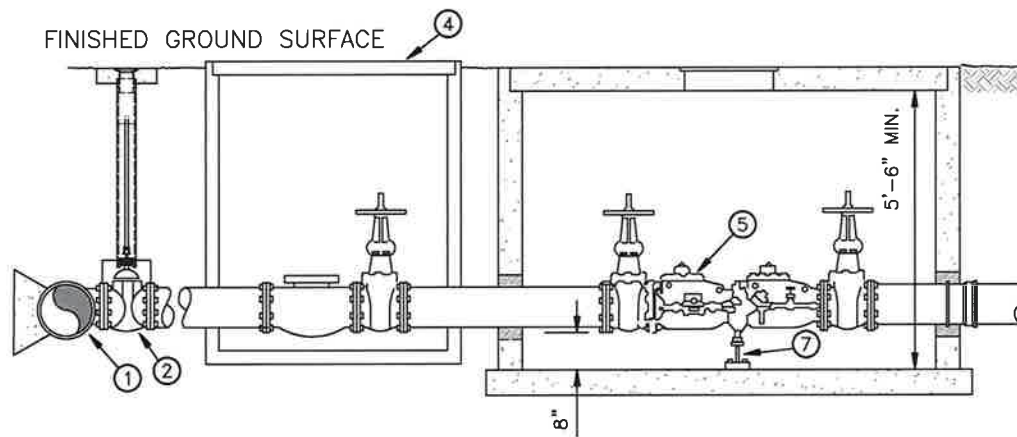
STANDARD DRAWING NO.

W-20

LAST UPDATED: 3/2013



PLAN VIEW



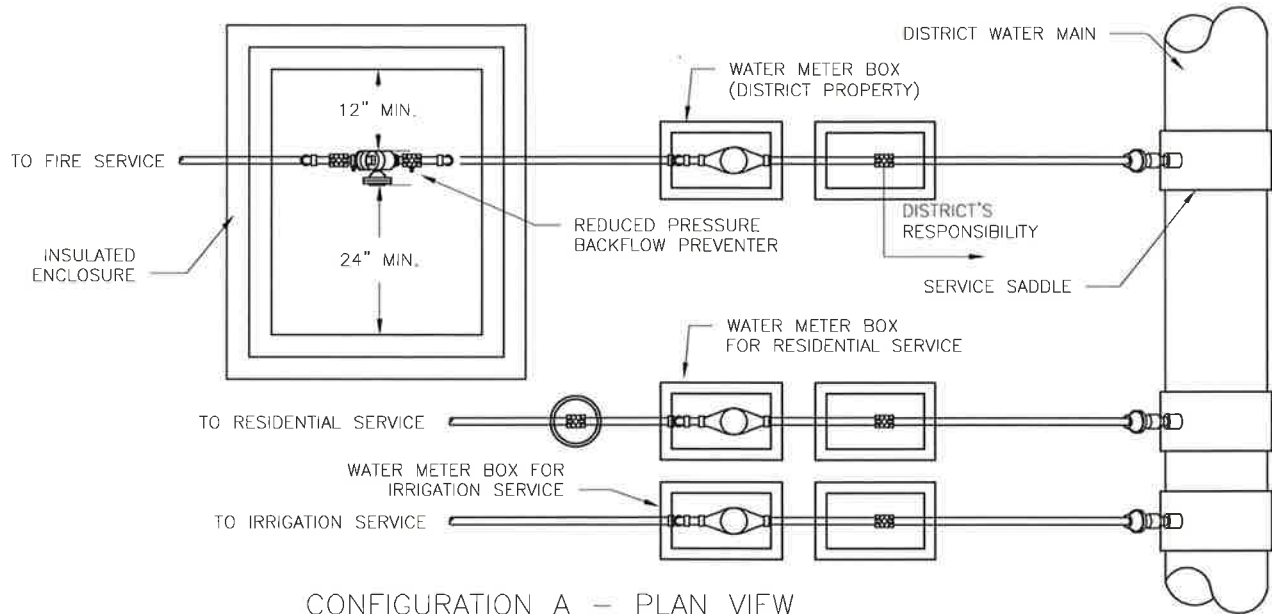
SECTION A-A

ITEM	QTY	DESCRIPTION
①	1	TEE OR TAPPING TEE, FLANGED.
②	1	GATE VALVE FLG'D & VALVE BOX PER STANDARD DRAWING NO. W-11
③	A.R.	DUCTILE IRON PIPE WITH RESTRAINED JOINT.
④	1	WATER METER AND METER BOX.
⑤	1	DOUBLE CHECK ASSEMBLY, CLA-VAL MODEL 16.
⑥	A.R.	PVC 900 PIPE
⑦	1	ADJUSTABLE PIPE SUPPORT PER STANDARD DRAWING W-17.

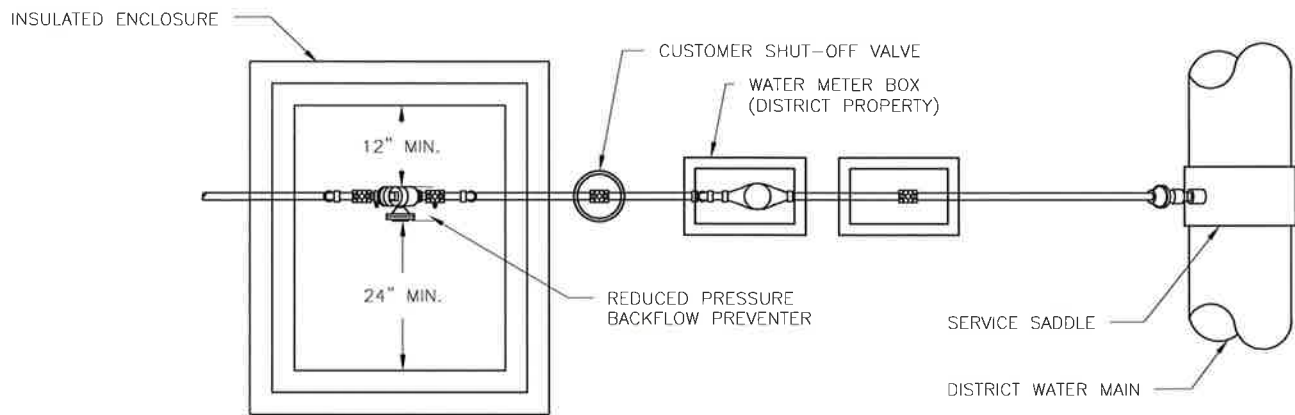
NOTES:

1. ALL NUTS AND BOLTS FOR GATE VALVE AND TAPPING TEE TO BE GRADE 316 STAINLESS STEEL.
2. WATER METER TO REGISTER IN CUBIC FEET.
3. ITEMS LISTED MAY BE SUBSTITUTED WITH AN APPROVED EQUAL, UNLESS OTHERWISE NOTED.
4. A.R. = AS REQUIRED.
5. SUPPLY HEAVY CHAINS AND LOCKS TO LOCK HANDWHEELS ON VALVES.
6. CONCRETE VAULT SHALL BE DESIGNED FOR H-20 LOADING WITH REMOVABLE CONCRETE TOP AND 30-INCH DIAMETER TRAFFIC FRAME AND COVER; SUBMIT DESIGN FOR REVIEW AND APPROVAL BY THE DISTRICT.

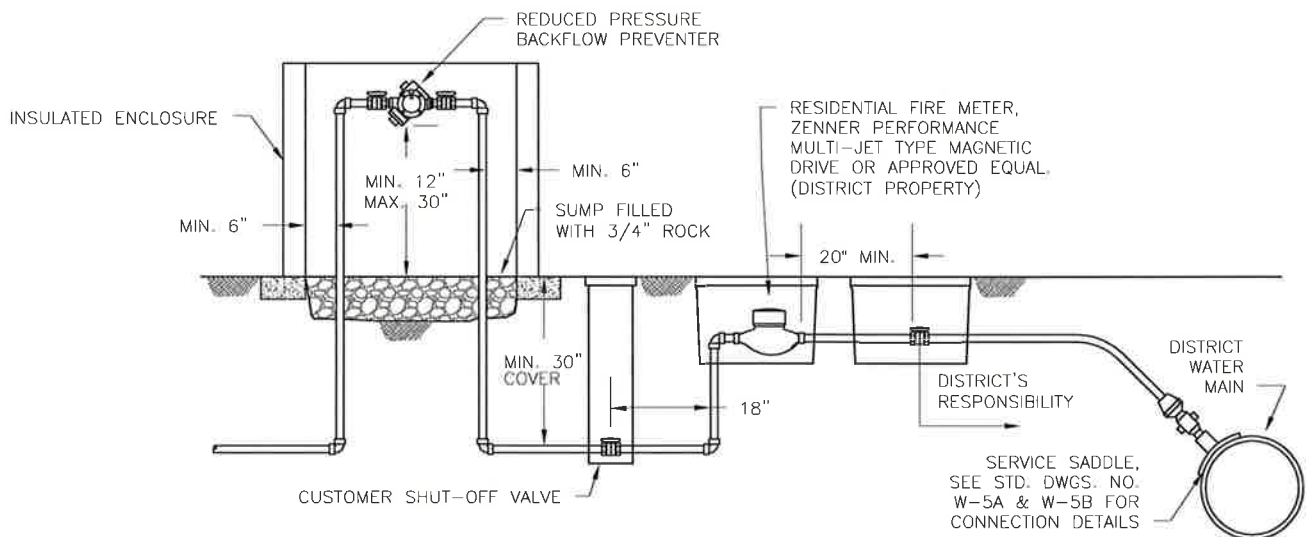




CONFIGURATION A - PLAN VIEW



CONFIGURATION B - PLAN VIEW



CONFIGURATION B - PROFILE VIEW



RUNNING SPRINGS WATER DISTRICT

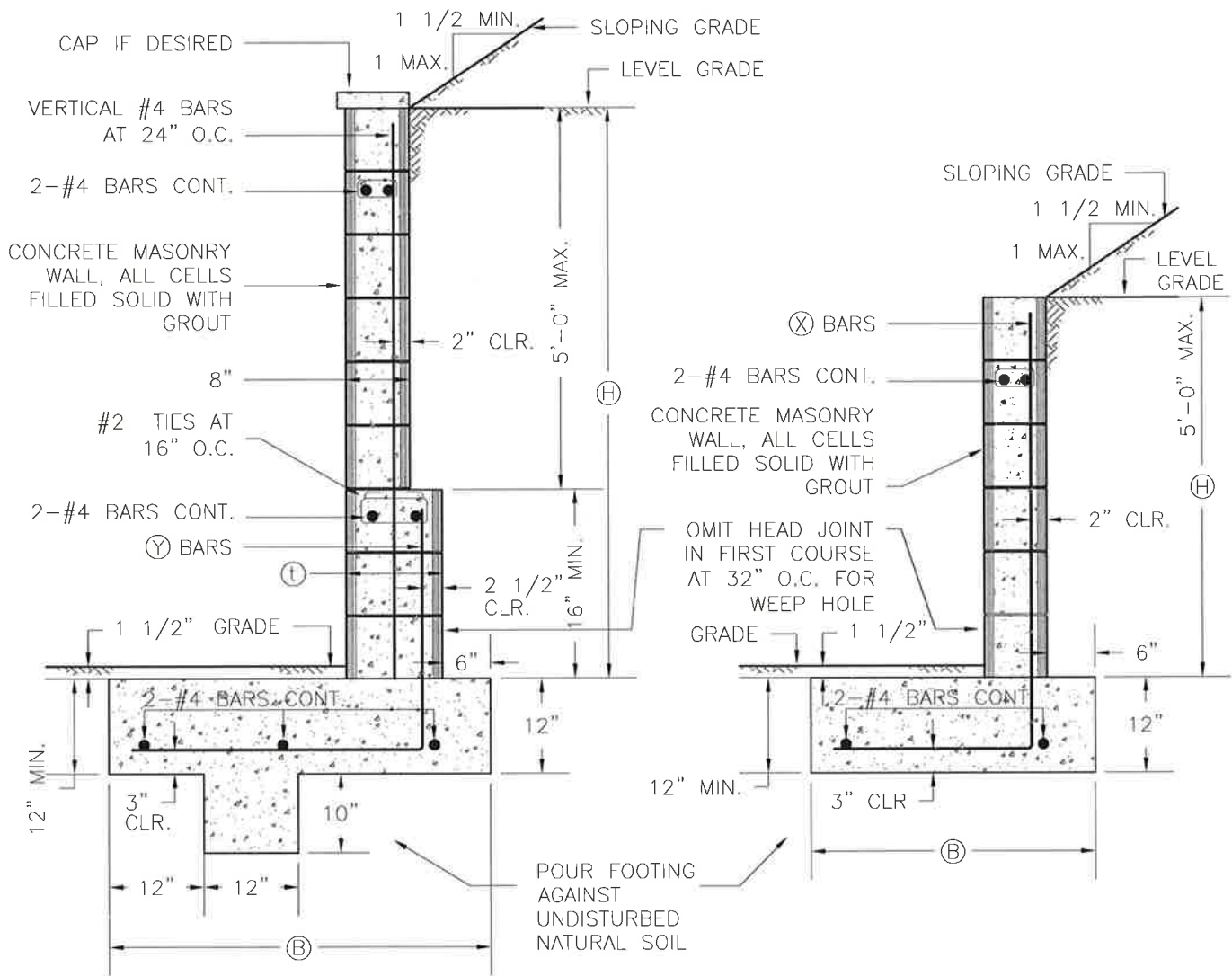
RYAN GROSS
GENERAL MANAGER

RESIDENTIAL FIRE SERVICE

STANDARD DRAWING NO.

W-22

LAST UPDATED: 3/2013



(H)	(I)	DESIGN FOR SLOPING GRADE ABOVE WALL		DESIGN FOR LEVEL GRADE ABOVE WALL	
		(B)	(Y) BARS	(B)	(Y) BARS
6'	12"	4'-0"	#5 AT 24" O.C.	3'-3"	#4 AT 24" O.C.
7'	12"	4'-9"	#6 AT 16" O.C.	3'-10"	#4 AT 16" O.C.
8'	12"	5'-6"	#7 AT 16" O.C.	4'-6"	#5 AT 16" O.C.

TYPICAL SECTION OVER 5 FT
NOT TO SCALE

(H)	(I)	DESIGN FOR SLOPING GRADE ABOVE WALL		DESIGN FOR LEVEL GRADE ABOVE WALL	
		(B)	(X) BARS	(B)	(X) BARS
3'	6"	2'-3"	#3 AT 24" O.C.	1'-9"	#3 AT 32" O.C.
4'	8"	3'-0"	#4 AT 24" O.C.	2'-2"	#4 AT 48" O.C.
5'	8"	3'-6"	#5 AT 16" O.C.	2'-9"	#4 AT 24" O.C.

TYPICAL SECTION 5 FT MAX.
NOT TO SCALE

NOTES

1. CONCRETE IN FOOTING TO TEST - 2,000 PSI AT 28 DAYS
2. CONCRETE BLOCK - GRADE "A" UNITS A.S.T.M. C-90
3. GROUT - 1 PART CEMENT, 3 PARTS SAND, 2 PARTS PEA GRAVEL
4. MORTAR - 1 PART CEMENT, 1/2 PART LIME PUTTY, 4 1/2 PARTS SAND

MAXIMUM STRESSES

1. $f_s = 18,000$ PSI
2. $f_m = 225$ PSI
3. SHEAR $V = 15$ PSI
4. BOND $U = 100$ PSI
5. SOIL PRESSURE = 1,000 LBS PER SQ. FT
6. CONCRETE TO SOIL FRICTION COEFFICIENT = 0.4



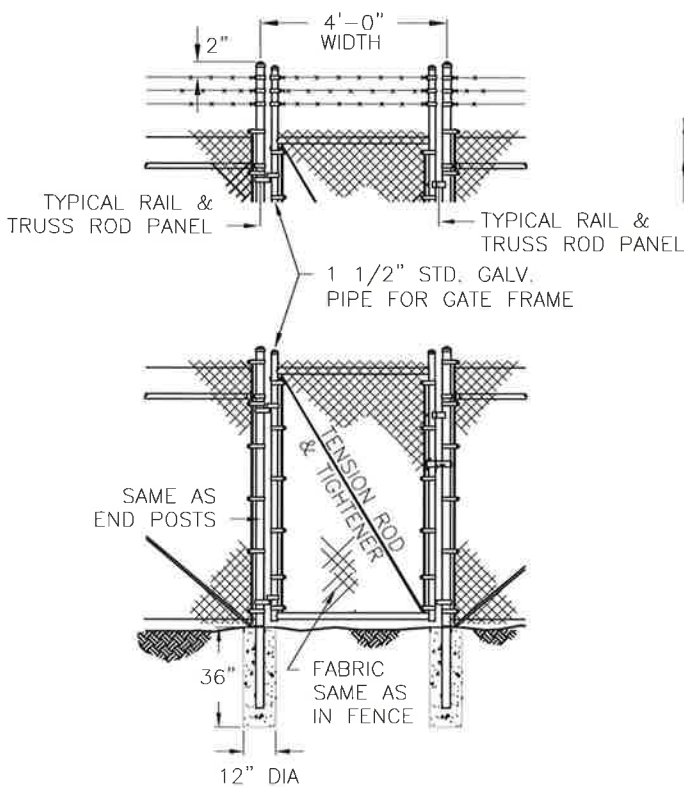
RUNNING SPRINGS WATER DISTRICT

RYAN GROSS
GENERAL MANAGER

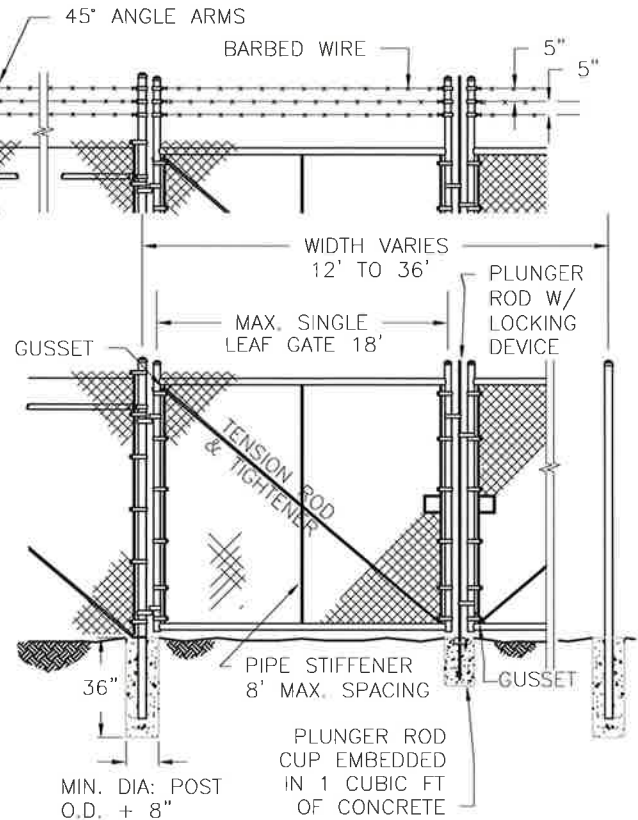
RETAINING WALL

STANDARD DRAWING NO.

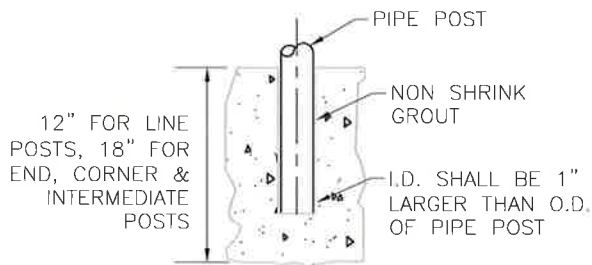
M-1



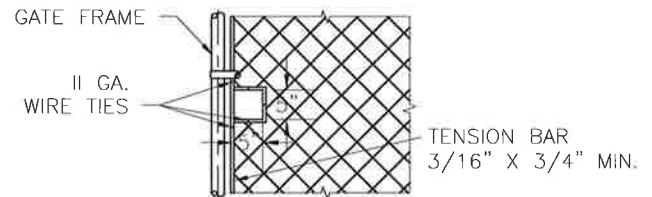
TYPICAL FENCE WITH WALK GATE



TYPICAL FENCE WITH DRIVE GATE



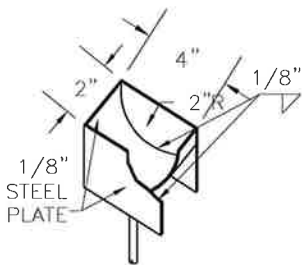
POST EMBODIMENT DETAIL IN CONC. HEADWALLS, RETAINING WALLS, CHANNEL WALLS, ETC.



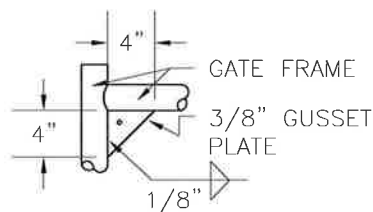
DETAIL OF CUT-OUT FOR CHAIN AND LOCK

NOTES:

1. SECURE DRIVE FIT GALVANIZED CAP TO POST WITH 1/4" ROUND HEAD RIVET.
2. NOMINAL FENCE HEIGHT SHALL BE 5' UNLESS OTHERWISE SPECIFIED.
3. IF CHAIN-LINK FENCE WITH TOP RAIL IS SPECIFIED, DELETE STEEL TENSION WIRE AT THE TOP AND THE PIPE RAILS AT INTERMEDIATE, END AND CORNER POSTS. EXTEND TENSION ROD TO THE TOP RAIL.
4. BARBED WIRE SHALL BE USED ONLY WHEN SPECIFIED.
5. ALL DATA SHOWN ON TYPICAL DETAILS SHALL BE APPLICABLE TO OTHER PERTINENT DETAILS.



PLUNGER ROD CUP DETAIL



GUSSET DETAIL



RUNNING SPRINGS WATER DISTRICT

RYAN GROSS
GENERAL MANAGER

CHAIN-LINK FENCE AND GATES

STANDARD DRAWING NO.

M-2

LAST UPDATED: 3/2013