

**PART III  
TECHNICAL SPECIFICATIONS  
WATER CONSTRUCTION**

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# TECHNICAL SPECIFICATIONS

## WATER CONSTRUCTION

### ***Section 1 – Materials for Construction of Water Facilities***

#### **1.01 General**

All materials shall conform to sizes, capacities, qualities and quantities as shown on the drawings or described in these specifications. Materials shall be from new stock, delivered in good condition and no damaged stock shall be used.

Where no method of test materials is specified, the latest method of test specified by the ASTM or AWWA shall be followed.

Nothing in these specifications shall prevent the Contractor from using materials that exceed the minimum requirements set forth in the specifications, subject to approval of the Engineer.

After delivery to the site, all materials shall be properly protected against breakage, rusting, accumulation of foreign matter, disintegration and injury. The Contractor shall be responsible for all loss or damage to material supplied and work done under this contract. Piping shall be protected from sunlight, scoring, distortion, and discoloration.

Allowable water main pipe materials include ductile iron pipe (DIP) and polyvinyl chloride (PVC) pipe. Specifications for individual pipe materials are given below, along with applicable published standards. All water pipe shall be designed for a minimum internal working pressure of 150 psi or the external load conditions. Only 200 psi PVC water pipe will be allowed where pipe is in conflict with other facilities as detailed on the plans or where water pressures are determined to require such pipe.

#### **1.02 Pressure Water Main – Polyvinyl Chloride Pipe (PVC)**

Polyvinyl chloride pipe (PVC) shall conform to the latest revision to AWWA Standards C-900 and C-905 and ASTM D-2241 for 4-inch through 12-inch pressure water pipe as manufactured by Johns-Manville, Certain-Teed, or equal. Minimum working pressure rating shall be 150 psi. At least 25 percent of the total footage shall be supplied in standard lengths of 20 feet. Random lengths comprising the remaining 15 percent shall not be less than 10 feet long.

Joints shall be bell and spigot type with Rubber Ring gaskets, "Ring-Tite", or equal. The bell shall consist of an integral wall section with a solid cross-section elastomeric ring which meets ASTM D-3139 and F-477. Gaskets and lubricants for joint assembly shall be compatible for PVC pipe and approved by the manufacturer. Field cuts and service connections shall be in accordance with manufacturer's specifications.

PVC pipe fittings larger than 4 inches shall be cast iron or ductile iron, Class 200. Fittings shall be as specified by the Manufacturer for use with PVC pipe. Joints in fittings and adapters shall be of the type with a seal ring groove for positively holding the rubber ring gasket in place against the water pressure.

All testing requirements of the specifications shall be conducted by the pipe manufacturer or his representative within the State of California and the resulting test shall be certified by an established reputable firm operating in the testing materials field. Each length of pipe and integral bell shall be tested four times the class pressure of the pipe for a minimum of five seconds. All pipe and appurtenances shall be manufactured and tested in the United States of America.

### **1.03 Pressure Water Main – Ductile Iron Pipe (DIP)**

Ductile iron pipe shall conform to the latest revision to ANSI Specifications A-21.50, A-21.51, and AWWA Standards C-115, C-150, and C-151. The pipe shall be cement mortar-lined and seal-coated according to ANSI Specifications A-21.4. Rubber gasket joints shall conform to ANSI A-21.11.

Ductile or cast iron fittings shall conform to ANSI A-21.10 and A-21.11, and shall be cement-lined the same thickness as the pipe and shall be coated outside with a standard bituminous coating. Fitting shall be mechanical joints or rubber gasket type joints underground and flanges above ground. All joints shall be properly anchored or blocked as required for this service. Thrust blocks or flanged fittings shall be provided at all valves, or changes in flow direction or velocity.

Joints shall be restrained to withstand the maximum pressure that will be developed in the pipe during testing. Ductile iron water pipe shall be rated for a minimum working pressure of 150 psi.

Joints shall be bell and spigot type with Rubber Ring gaskets, "Ring-Tite", "Super Bell Tite", or equal. Gaskets and lubricants for joint assembly shall be compatible for ductile iron pipe and approved by the manufacturer. Field cuts and service connections shall be in accordance with manufacturer's specifications.

All testing requirements of the specifications shall be conducted by the pipe manufacturer or his representative within the State of California and the resulting test shall be certified by an established reputable firm operating in the testing materials field. Each length of pipe and integral bell shall be tested four times the class pressure of the pipe for a minimum of five seconds. All pipe and appurtenances shall be manufactured and tested in the United States of America.

### **1.04 Water Service Piping**

Allowable water service materials shall be polyethylene (PE) or galvanized steel unless otherwise indicated on the plans. Non-metallic service connection pipe shall be three-fourths inch diameter and shall be laid with locating wire as specified herein. Tubing and fittings shall be tested by the National Sanitation Foundation Testing Laboratory or other

testing agency acceptable to the California Department of Public Health.

A. Polyethylene Pipe (PE)

Polyethylene pipe (PE) shall be 3408 SIDR-7 PE, UHMD, and rated 200 psi minimum. Pipe shall conform to the latest revision to AWWA Standards C-901 and C-906 and ASTM D-2239 and shall be iron pipe size. Acceptable manufacturers are WestFlex Pipe Manufacturing, Phillips Driscopipe, Inc., Yardley Pipe Division, or equal as approved by the Engineer.

B. Galvanized Steel Pipe (GSP)

Galvanized steel pipe shall conform to the requirements of ASTM Specification A-120. The pipe shall be Schedule 40, hot dipped zinc coated, and shall have ends prepared with male iron pipe threads.

Galvanized steel pipe fittings shall be 150 lb., malleable iron, banded fittings with the material conforming to ASTM Specifications A-47 and the dimensions and threads conforming to ASA Specifications B-16.3 and B-2.1. The fittings shall be hot dipped galvanized in accordance with ASTM Specification A-153. Ends shall be prepared with female iron pipe threads.

## **1.05 Valves, Appurtenances and Fittings**

A. Gate Valves

Gate valves larger than 3 inches shall be Mueller Company Series A-2370 resilient seat type, or equal, conforming to the latest revision to AWWA Standards C-500, C-509 and C-515, with non-rising stem and "O" ring seal. Valves shall have ends corresponding to connecting pipe joints. Valves for buried locations shall be furnished with 2-inch square operating nut rather than hand-wheel. Valves shall be bronze mounted including stem. Valves shall open by turning stem counter-clockwise.

B. Air Release Valves and Combination Air Release Vacuum Valves

Air release valves and combination air release vacuum valves shall be APCO valves 200A Series or equal, conforming to the latest revision to AWWA Standard C-512, with cast iron body and cover. The needle shall be Buna-N for tight shut-off and be resilient to prevent seepage due to pipeline or pump vibrations. The compound internal lever mechanism shall be all stainless steel. All other internals, including the float, must be stainless steel. The stainless steel float must be concave and sufficiently buoyant to operate water and be spurt free. The valve shall withstand 500 psi test pressure and have a 3/16" orifice for operating (opening) pressure up to 150 psi. The venting capacity at 150 psi shall be 55° CFFAM. Size shall be as called for on the drawings.

C. Fire Hydrants

Fire hydrants shall be AWWA-approved Waterous 5-1/4" WB67-250 DDP Pacer, conforming to the latest revision to AWWA Standard C-502, dry barrel type and with safety flange and drain valve. The District wishes to standardize the type of hydrants used in the District.

Hydrants shall be bronze mounted including seat ring, drain valve and breech locked nozzles. Hydrant nuts and threads shall be National Standard Hose Thread (NST). Hydrants shall be painted Federal Safety Yellow.

Hydrants shall be three way design with two hose nozzles 2-1/2 inch diameter NST and one 5 inch pumper nozzle compatible with Storz hose coupling, complete with nozzle caps and non-kinking chains. The pump nozzle shall be an integral part of the hydrant and furnished by the manufacturer or authorized distributor. Stem threads and operating collar shall be provided between the operating nut and the bonnet. Main valve shall be of the compression type, 4-1/2 inch size opening or larger, which closes with the pressure.

Hydrants shall be furnished with bury and stem length for setting bottom flange of hydrant section a minimum of 4 inches and a maximum of 12 inches above finished grade. Inlet connections shall have flanged outlet for connection to hydrant bury and push-on inlet for 6-inch size main connection.

Hydrants shall be installed with steamer connection faced towards the road unless otherwise directed by the Engineer. They shall open by turning stem counter-clockwise.

D. Valve Boxes

Valve boxes shall be Christy Concrete Products, Inc. No. F8C or equal concrete valve box with cast iron face and lid for use with 6" inside diameter PVC SDR35 pipe sections with PVC SDR35 caps that have the rubber gaskets removed. Extension sections shall be provided as shown on the Drawings. Covers shall be lettered "Water".

E. Meter Boxes

Meter boxes where called for on the drawings shall be Christy Concrete Products, Inc., or equal. Boxes shall be furnished complete with extension sections to extend minimum of 4" below the service pipe elevation. Covers shall be cast iron or steel checker plate. Size shall be as called for on the plans or as specified in the Special Provisions.

F. Flanged Coupling Adapters

Flanged coupling adapters shall be Romac Type 501 meeting the specifications set forth in the AWWA Standard C-219 coupling specification, or equal, cast from ductile (nodular) meeting or exceeding ASTM A-536, with flanges compatible with ANSI Class 125 and 150 bolt circles, gaskets made from virgin styrene butadiene rubber (SBR) compounded for water and sewer service in accordance with ASTM D-2000 MBA 710, and shop coated corrosion resistant high strength low alloy steel bolts and heavy hexagonal nuts. Steel shall meet AWWA C-111 composition specifications. The 10" size uses electro-galvanized mild steel flange bolts and nuts with a hex head, and ductile iron through bolts. The 12" size uses electro-galvanized mild steel flange bolts and nuts with a hex

head, and mild steel through bolts. Couplings shall be furnished with anchor studs to prevent separation due to internal water pressure where indicated.

G. Flexible Couplings

Flexible couplings shall be Smith-Blair Type 431 or 433, or equal, with cast iron sleeves, ductile or malleable iron flanges, specially compounded rubber gaskets and high strength ductile iron bolts and nuts.

H. Push-On Restrained Plugs

Push-on restrained plugs shall be Clow F-1159 solid plug, or equal.

I. Miscellaneous Fittings

All miscellaneous fittings shall be furnished and installed by the Contractor to make the installations complete and operative as shown. Fittings not specifically specified shall be of the same quality, materials and construction as specified for similar items.

J. Service Saddles

Service saddles shall be Romac, Smith-Blair or approved equal; double strap type with iron pipe thread. Single strap types may be used only if approved by the Engineer. Service Saddles shall be complete with neoprene gasket and appurtenances.

K. Service Fittings

1. Corporation stops shall be of brass construction as manufactured by Ford or approved equal with 300 psi working pressure. Inlet threads shall be iron pipe threads.
2. Curb stops shall be of brass construction as manufactured by Mueller, so as to allow the District to use a uniform, locking, shutoff device throughout the service area. Outlet shall be of iron pipe threads. Curb stops shall have 300 psi working pressure.
3. Meter re-setting equipment shall be shall be Ford 40 Series V42-12WW (for ¾" water meters) or Ford 40 Series V44-12W (for 1" water meters) with brass male iron pipe union swivel connections or approved equal.

L. Jointing Materials for Pipelines

1. Flexible Couplings

Flexible couplings shall be as herein specified, or approved equal. Where the installation is such that piping will be subject to separation forces due to pressures within the line and such separation is not restricted by the nature of the installation without placing stresses in fittings or equipment, the flexible couplings shall be of a type with positive lock against pulling apart, or other approved means of preventing separation shall be approved. Where couplings are buried, they shall be cast iron furnished with bolts and nuts cathodic to the couplings and pipe and the entire coupling shall

be painted with two (2) coats of Bitumastic paint.

2. Screwed Joint Material

Screwed joint material shall be Teflon tape or pipe joint compound.

3. Gaskets, Bolts and Nuts

Gaskets for flanged joints shall be best quality cloth inserted rubber packing not less than 1/16" (one-sixteenth inch) thick, or an approved metallic packing. All gaskets shall be the full width of the flanges to which applied.

Bolts and nuts shall be made of the best quality of refined iron or milled steel and shall have sound, well-fitting threads. Bolts shall be provided with hexagonal chamfered heads and nuts. The underside of all bolt heads and nuts shall have true surfaces at right angles to the axis of the bolts. The lengths of the bolts shall be such that after joints are made up, the bolts shall protrude through the nuts, but in no case shall they protrude more than one-half (1/2") inch. Where flanged joints are buried, the bolts and nuts shall be cathodic to the pipe material and shall be painted with two (2) coats of Bitumastic paint after tightening.

4. Joints for Polyethylene Pipe

Joints for polyethylene pipe shall be made by Mueller Insta-Tite Fittings, for 3/4" and 1" pipe or by using Mueller or Ford Compression Adaptors for 1 1/2" and 2", iron pipe size. Fitting size shall be as called for on the plans.

5. Rubber Gaskets

Rubber gaskets shall be best quality rubber of type suitable for the particular joint, and shall be as recommended by the pipe manufacturer.

M. Locating Wire and Tape for Water Lines

All runs of water main piping shall have a No. 10 gauge solid, coated, soft drawn copper wire laid along the pipe and location tape placed one foot above the pipe to facilitate later pipe location. Wire shall be stubbed up inside valve boxes. Coated wire shall be #10-AWG copper wire as specified above, with 20 mil polyvinyl chloride insulation. Connection of coated wire to bare wire shall be approved splice, soldered to give permanent, secure electrical joint. Location tape shall be flexible 4 mil polyethylene. The tape shall be colored in safety precaution blue and imprinted with "CAUTION BURIED WATER LINE BELOW" in black along its entire length. Tape shall be a minimum of 3 inches wide.

Wire shall be placed directly over the pipe and shall be "snaked" in place to prevent excessive tension in wire. Tape shall be placed one foot above the pipe, directly over the pipe.

Where a valve with valve box is not located at the ends of water lines installed



under the project, a valve box and cover shall be installed over the end of the new water main and a coated locating wire extended up into the valve box. Valve boxes for this purpose shall be the same as specified herein for valves. Care shall be taken that the locating wire does not contact steel mains or other metal materials.

The intent of this specification is that a copper wire be installed the full length of all water lines installed under this project and that the locating wire be brought to the surface at all ends of such lines, either through an existing valve box or a valve box installed for that purpose. The locator tape will be placed above the pipe to warn of the existing water main. Upon completion of the water main and service installation, and before paving work commences, the District will test the conductivity of the locating wire to ensure that it meets District standards.

N. Tapping Sleeves and Valves

Tapping sleeves shall be Romac SST with ductile iron flange, or equal. Tapping valves shall have a standard flange for bolting to the sleeve and a push-on bell for PVC pipe. Valves shall conform to the latest revision to AWWA standards C-500, C-509, C-513, C-515, and C-550 for gate valves in regards to operation and materials.

**1.06 Specific Installation Requirements**

A. Joints in Pipes or Fittings

The detailed instructions contained in the manufacturer's installation guide shall be followed. In addition, the pipe and accessories shall be inspected for defects prior to lowering into the trench. Any defective, damaged or unsound pipe shall be replaced. All foreign matter or dirt shall be removed from the interior of the pipe and accessories before lowering into the trench.

1. Mechanical Joints

The mating surfaces of the joint shall be wiped clean of dirt and foreign matter and lubricated in accordance with the manufacturer's recommendations. The gland shall then be placed over the spigot end of the pipe with correct orientation. The rubber gasket shall be lubricated in accordance with manufacturer's recommendations and placed on the spigot end of the pipe with the proper orientation. The entire section of the pipe shall be pushed forward to seat the spigot in the bell keeping the pipe lengths in proper alignment. The gasket shall then be pressed into place within the bell; care shall be taken to locate the gasket evenly around the entire joint. The gland shall be slid into position and bolts inserted and nuts taken up finger tight.

All nuts shall be tightened with a torque wrench in alternate 180 degree spacing to the following limits:

<u>Size</u>	<u>Torque Limits</u>
5/8 inch	40-60 foot-pounds

3/4 inch	60-90 foot-pounds
1 inch	70-100 foot-pounds
1-1/4 inch	90-120 foot-pounds

2. Push-On (Tyton) Joints

The mating surfaces of the joint shall be wiped clean of dirt and foreign matter. The rubber gasket shall be inserted and/or checked for proper placement in its retention groove. The spigot shall then be lubricated in accordance with the manufacturer's recommendations. The spigot shall then be positioned into the bell and keeping the pipe length in proper alignment push the spigot in until it is seated properly. Care shall be exercised not to disrupt previously connected joints. Stabbing shall not be used when jointing.

3. Flanged Joints

Cast iron flanged pipe shall be laid as indicated on the drawings. All flanges shall be clean and be made up square, with even pressure on the gaskets which shall be watertight. Gaskets shall be 1/16 inch (one sixteenth inch) thick, designed specifically for the unique surface of cast ductile iron. Flat rubber gaskets are NOT considered equal in performance and may not provide the sealing capability required. Additionally, the use of flat rubber gaskets could result in unintended damage to the flanges and threads of the fabricated pipe by applying excess torque to the bolts/flanges in order to seal the joint. The flanges shall be bolted up evenly and tight.

4. Threaded Joints

Threaded joints in G.S.P. shall be made up with Teflon tape or pipe joint compound, carefully and smoothly placed on the male threads only. All screwed joints shall be made tight with tongs and wrenches and caulking of any kind will not be permitted. Use of thread cement or caulking to make joints tight is prohibited. All cut ends shall be reamed to full bore before assembly.

B. Insulating Bushings

Insulating bushings shall be installed at all service connections to water mains, and at all connections between pipes of different metal types. Electrical check shall be made between copper services and water mains to assure that discontinuity is maintained. Wherever electrical contact is demonstrated by such tests, the Contractor shall locate the point or points of contact and make corrections as necessary.

C. Service Clamps

Service clamps shall be used on all pipe regardless of size of service off main.

D. Valve Installation

Buried valves in water mains shall correspond to pipe joints, as herein specified.

All valves shall be installed complete with valve boxes unless otherwise specified. Valves shall be set with stems truly vertical, braced in that position and the points made as specified for pipe laying. After valves have been installed and adjusted, they shall be watertight, and shall operate smoothly. Valve boxes shall be adjusted to proper depth.

Valves in fire hydrant assemblies shall be installed complete with valve box, all as shown on the plans. Valves for fire hydrants shall be located as shown on the plans.

E. Fire Hydrants

Fire hydrants shall be installed at edge of property line in road easements and at property lines or other locations as called for on the plans. All fire hydrant installations shall be valved as detailed on the plans. Length of bury shall be such that the bottom flange of hydrants shall be minimum of 4 inches and a maximum of 12 inches above the finished grade at the fire hydrants. Installation shall conform to the details shown on the plans. Protective posts shall be included as part of the hydrant installation.

F. Service Installation

Service lines and appurtenances shall be furnished and installed in accordance with the details shown on the plans. The tap shall be made with a cutter specifically designed for tapping PVC or ductile iron pipe. The coupon shall be completely removed and no shavings will be allowed to fall within the pipe. The use of standard drill bits or hole saws is not an acceptable method of tapping.

Service clamps shall be installed concentric to the tap. The Contractor shall place PE tubing to the meter at a depth of 30 inches minimum and 36 inches maximum. The meter shall be lowered where necessary to connect to the new service line. All the necessary fittings for meter relocation shall be provided by the Contractor. Locator wire shall be installed as shown in the detail and must terminate inside the meter box. Prior to reconnecting, the service line shall be flushed for debris and air removal.

Remote head wire and conduit shall be continuous between the meter head and read head. No splices will be allowed. If there is insufficient wire when the meter is relocated new wire shall be pulled and reconnected to the meter head according to District specifications. Connection grease will be provided by the District. The District will test all remote reads prior to completion of the project.

G. Air Release Valves

Air release valves shall be installed at high points in lines as shown on the plans. Installation shall be complete with valve box, insulating couplings, vent pipe and protective posts as shown.

H. Blowoffs

Blowoffs shall be installed at low points of mains where called for on the plans. Blowoffs shall be installed complete with tapped caps and valves on, as shown on the plans.

I. Cutting Pipe

The Contractor shall perform all work of cutting the pipe and special castings necessary to the assembly, erection and completion of the work. All pipe shall be cut to fit accurately with smooth edges and faces. The Contractor shall be responsible for the correctness of cutting and shall stand the loss for any materials which are injured or incorrectly cut.

J. Miscellaneous

All pipe work, fittings and appurtenances installed not specifically specified in these specifications shall be furnished as shown on the plans and shall be installed in accordance with the specifications for similar work.

K. Connections to Existing Facilities

Connections to existing facilities shall be made as indicated on the drawings and shall be scheduled and coordinated to result in a minimum interruption in functioning of existing units. Property owners shall be notified at least 48 hours prior to shutting off services for reconnection.

The District shall be notified in advance of making connections to existing water lines and such connections shall be made only at a time approved and authorized by the Engineer. When connecting to an existing pipe, the Contractor shall verify the type and size of pipe and its location, prior to laying new pipe to that location. Work of connecting to existing mains shall include all work of removing existing caps, plugs or thrust blocks, cutting, excavating, pumping and furnishing necessary fittings and materials to make the connections where indicated.

L. Thrust Blocks

Concrete thrust blocks (Class 2000 psi) shall be provided at all bends, fittings and valves in water mains. Thrust blocks shall be poured between the pipe or fitting and the undisturbed trench walls and shall be sized as shown on the plans.

Thrust blocks are required at all caps, valves, reducers, tees, and fittings used to change the pipe direction, and shall be placed in accordance with the District's Construction Standards. Thrust blocks for each location shall be designed by the design engineer to account for allowable soil bearing capacity, main size, main pressure and change in direction. If the allowable soil bearing capacity is unknown, thrust block design shall be based on an assumed soil bearing capacity of 1,500 psf; however, the design engineer must verify soil conditions at the time of construction and make adjustments as required. Thrust block design shall provide suitable support under test pressure conditions (the greater of 150 psi or two times the working pressure of the main). Vertical and horizontal thrust blocks shall be made of concrete having a compressive strength of not less than 2500 psi after 28 days. A thrust block schedule shall be included on all water main design

drawings, or the plans shall clearly state that the Authority's thrust block schedule, or noted portions thereof, are suitable for the project. If uncompacted or unclassified backfill material is present; then mechanical restraint joints shall be required in addition to a thrust block.

Heavy duty plastic (at least four mil thickness) shall be wrapped around the fittings and pipe, in order to prevent the concrete from sticking to the pipe valves, fittings, or other appurtenances.

M. Pipe Threads

Pipe ends shall be reamed to the full bore of the pipe. Threads shall conform to ANSI B-2.1. In making up threaded joints, an accepted thread lubricant shall be applied to the make threads only.

N. Flanged Joints

Flanged joints shall be made up square with even pressure upon the gaskets and shall be perfectly watertight.

O. Flexible Couplings

Flexible couplings shall be installed in accordance with the recommendations of the Manufacturer. The finished joint shall be watertight under the test pressure of the piping.

P. Reconnection of Water Services

Existing and new water services are to be connected to the new main where shown on the Plans. The Contractor shall supply all the materials, except for water meters, necessary to construct a water service in conformance to Standard Specification Details W-05, W-06, W-06A, W-06B, and W-11. Existing water meters are ¾ inch or 1 inch and shall be installed into new meter re-setters. Meter re-setters supplied by the Contractor shall be Ford 40 Series V42-12WW (for ¾" water meters) or Ford 40 Series V44-12W (for 1" water meters) with brass male iron pipe union swivel connections or approved equal.

The Contractor shall install one continuous piece of PE from the main to the meter box, which is outfitted with locating wire, in conformance to the Standard Specification Details referenced in the above paragraph. The Contractor shall avoid using extra fittings, elbows, valves, nipples, and couplings.

Existing valves inside the meter box on the customer side of the meter shall be relocated outside the meter box and installed in a separate valve box.

The Contractor shall maintain electrical continuity between the customer side of the water and the house, if existing. The Contractor shall use connecting pipes and fittings of similar metals to connect to the existing service. This will allow the connection of a welder to thaw the service should it freeze. However, if the service to the house is galvanized steel pipe (GSP), the Contractor shall use a dielectric union to connect to the meter tailpiece to protect the District's facilities

from corrosion.

Sewer and water service lines may be placed in the same trench provided that both of the following requirements are met:

- (1) the bottom of the water pipe, at all points, shall be at least 12 inches above the top of the sewer line; and
- (2) the water pipe shall be placed on a solid shelf excavated at one side of the common trench and 12 inches horizontally from the sewer line.

Q. Construction of New Front yard Water Services

New front yard water services are to be connected to the new main where shown on the Plans. The Contractor shall supply all the materials, except for water meters, necessary to construct a water service in conformance to Standard Specification Details W-05, W-06, W-06A, W-06B, and W-11.

Existing water meters are  $\frac{3}{4}$  inch or 1 inch and shall be installed into new meter re-setters, at a later date by District crews. However, the Contractor shall supply and install meter re-setters for these properties, per the Standard Specification Details W-06 and W-06B. Meter re-setters supplied by the Contractor shall be Ford 40 Series V42-12WW (for  $\frac{3}{4}$ " water meters) or Ford 40 Series V44-12W (for 1" water meters) with brass male iron pipe union swivel connections or approved equal.

The Contractor shall install one continuous piece of PE from the main to the meter box, which is outfitted with locating wire, in conformance to the Standard Specification Details referenced in the above paragraph. The Contractor shall avoid using extra fittings, elbows, valves, nipples, and couplings.

The Contractor shall install customer side valves on the customer side of the meter, outside the meter box in a separate valve box, per the Standard Specification Details W-06B and W-06D.

Sewer and water service lines may be placed in the same trench provided that both of the following requirements are met: (1) the bottom of the water pipe, at all points, shall be at least 12 inches above the top of the sewer line; and (2) the water pipe shall be placed on a solid shelf excavated at one side of the common trench and 12 inches horizontally from the sewer line.

## **Section 2 – Installation of Water Facilities**

### **2.01 Scope**

This section covers the methods of installation and other requirements for construction of water facilities and appurtenances. This work shall consist of performing all operations necessary to excavate earth and rock or other material, of whatever nature, including removing water, regardless of character and subsurface conditions necessary for the construction of the project facilities; to place backfill for all project facilities, including site grading, structures, transmission piping, electrical underground conduit, ditch and channel excavation, culverts, minor concrete structures, roadwork, removal and replacing unsuitable material and other work all as shown on the plans and indicated in the specifications. This work includes excavation and backfill of all structures, trenches and depressions resulting from the removal of obstructions; removal and replacement of unsuitable material and slide material which has come into trenches; all work as shown on the plans and as specified in these specifications and as directed by the Engineer; and furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work that may be required to construct and maintain excavation and backfill until it is accepted by the District.

### **2.02 Safety Requirements**

The Contractor shall be responsible for and shall furnish such watchmen, guards, fences, railings, barricades, lights and other safety devices as necessary to prevent damage or injury to persons or property. Standard "Men at Work" signs, other appropriate signs, flags and barricades are to be placed to warn traffic of work zones. Flagmen shall be used as necessary to protect the public and prevent unnecessary delays in movement of traffic. Contractor shall comply with the requirements of the Construction Safety Orders of the State Division of Industrial Safety.

### **2.03 Bracing and Shoring**

To insure the safety of workmen and protect and facilitate the work, sufficient bracing and shoring shall be installed in all excavations. All bracing and shoring shall comply with rules, orders and regulations of the California Department of Industrial Relations, Division of Occupational Safety and Health (Cal/OSHA). The District or Engineer shall in no way be responsible for supervising shoring installation or maintenance. Trenching below five feet (5') depth will require the Contractor to secure the appropriate D.I.S. permit and evidence said permit to the District. Insofar as possible, sheeting shall not extend below the bottom of pipe barrel. All sheeting, timbering, lagging and bracing shall, unless otherwise required by the Engineer, be removed during backfilling in such a manner as to prevent any movement of the ground or damage to the piping or to other structures. When the Engineer requires that sheet piling, lagging, and bracing shall be left in place, such materials shall be cut off where designated and the upper part withdrawn. If steel sheet piling is utilized, it may be withdrawn; compacting is to proceed as it is removed.

Attention is directed to the provisions of Section 6422 of the Labor Code of the State of California.

## **2.04 Use of Explosives**

Use of explosives shall be prohibited unless express written permission is obtained from the Engineer.

## **2.05 Existing Utilities**

In general, the locations of existing utilities are indicated on the drawings. This information has been obtained from sources of varying reliability, and is not guaranteed as to accuracy or completeness.

Unless otherwise indicated on the drawings or specified herein, the Contractor shall maintain service in all water, gas or sewer lines; lighting power, telephone, cable television, and communications conduits; and other surface or subsurface structures of any nature that may be affected by the work. Should it be necessary in the performance of the work to disconnect or reroute any such facility, the Contractor shall make satisfactory arrangements with property owners and/or utility owners. Satisfactory arrangements shall include at least forty-eight (48) hours notice to property owners and utility companies. The Contractor will be held liable to the owners of utilities and other improvements and to property owners for any damage or interference with service resulting from the Contractor's operations. All expenses of whatever nature arising from disconnection, rerouting, damage or replacement of such facilities shall be borne by the Contractor.

The utility company will be required to locate its facilities only once at no cost to the Contractor. Additional locations may result in a charge by the utility company to the Contractor. When relocation of existing utilities is required as determined by potholing, the work will be done by Change Order and the agreed upon cost thereof will be paid by the District. Relocation of facilities shown on the plans, but not relocated in advance will be the responsibility of the Contractor.

If existing facilities not shown on the plans are required to be relocated or replaced, the work will be done by Change Order and the agreed upon cost thereof will be paid by the District. The District may make minor adjustments in locations to avoid such conflicts. Whenever a domestic water line is installed, relocated, replaced, disconnected and reconnected, or altered in any way so as to expose the line to contamination, it shall be flushed and disinfected in accordance with the Standard Specifications of the North Tahoe Public Utility District, AWWA, and the California Department of Public Health.

## **2.06 Removal of Obstructions**

The Contractor shall remove at the Contractor's expense all rock, stone, debris, and obstructions of all kinds and character, natural or artificial, as and when required by the plans or where required for the proper prosecution of work. Such material shall be disposed of by the Contractor at the Contractor's expense, unless it is designated on the plans to be saved or is obviously part of a structure or improvement installed for some purpose. All fences, posts, mail and paper boxes, culverts, structures, pipe lines and



miscellaneous improvements which are required to be removed shall be replaced by the Contractor to at least their original condition, unless otherwise indicated on the plans. Where items are so indicated to be removed and saved they shall be carefully removed and stockpiled as directed by the Engineer. Lawns, hedges, shrubs, trees, etc., encountered in the line of work shall be carefully removed, kept moist, and returned to their former location and watered until well established, unless the plans indicate such items are to be removed permanently, or unless some other satisfactory arrangement is made with the owner. Unless indicated on the plans, no trees, plants or other ornamental vegetation shall be removed without the written permission of the Engineer. The Contractor shall comply with Section 4 – “Existing Vegetation” of these specifications.

## **2.07 Hauling, Unloading, and Distributing Pipe**

During loading, transportation and unloading, every precaution shall be taken to prevent injury to the pipe. No pipe shall be dropped from the cars or trucks or allowed to roll down slides without proper restraining ropes. Each pipe shall rest on suitable pads, strips, skids, or blocks during transportation and installation and shall be securely wedged or tied in place. Padding shall be used on car or truck stakes, skids, etc., to prevent damage to the pipe during transportation and handling. Any pipe damaged shall be replaced at the expense of the Contractor. Piping shall be protected from sunlight, scoring, distortion, and discoloration.

Pipe shall be delivered to the location directed by the Contractor. Pipe may be strung along the trench inside of the working area, provided the pipe is lifted and placed and no existing vegetation is present. If there is existing vegetation, the pipe may still be strung along the trench inside of the working area provided the pipe is lifted and placed on pallets, railroad ties or other similar devices that will give a maximum clearance of eight inches between the bottom of the pipe and the existing ground. All locations where the stringing of pipe is planned must have prior approval by the Engineer. Where it is necessary to move the pipe longitudinally along the trench, it shall be done in such a manner as not to damage the pipe. Pipe shall not be rolled or dragged on the ground. No equipment shall operate outside of the working area or highway traveled ways and shoulders.

## **2.08 Cutting of Pavement**

When the trench is in an existing paved area, the pavement shall be saw cut ahead of the trenching operations. The proper tools and equipment shall be used so that the pavement will be cut accurately on neat and parallel lines. The width of the pavement cut shall be sufficient to avoid further pavement breakage during trenching operations.

## **2.09 Trench Excavation**

Trench excavation shall include the removal of all materials or obstructions of any nature, except as otherwise specified to be protected, the installation and removal of all sheeting and bracing, and the control of water, necessary to construct the work as shown. Unless otherwise indicated on the drawings or permitted by the Engineer, excavation shall be by open cut. Trenching machines may be used, except where their use will result in damage to existing facilities or where hand trenching is required to prevent damage to trees, tree roots, or other utilities. Trenches shall be excavated to provide for the bedding hereafter

specified.

### **2.10 Trench Width for PVC Pipe**

For a narrow, vertical wall, unsupported trench, the minimum trench width for PVC pipe shall be pipe outside diameter (O.D.) plus twelve inches (12"). The maximum trench width shall be pipe outside diameter (O.D.) plus twelve inches (24"). Trench width shall be measured at top of pipe. In supported trenches, the minimum trench widths must be increased to allow the same amount of clearance described above, between the pipe and the inner face of the trench support. In supported trenches, compaction of foundation and embedment materials should extend to the trench wall or sheeting left in place. When using movable sheeting, trench boxes or shields, care should be exercised not to disturb the pipe location, jointing or embedment. Any voids left in the embedment material as a result of trench protection removal should be carefully filled with granular material which is adequately compacted. Removal of bracing between sheeting should only be done where backfilling proceeds and bracing is removed in a manner that does not relax trench support. When advancing trench boxes or shields, care should be exercised to prevent longitudinal pipe movement or disjointing.

### **2.11 Trench Width for Ductile Iron Pipe**

The maximum trench width for Ductile Iron Pipe shall be pipe O.D. plus twenty-four inches (24"). If this width is exceeded by any amount for any reason, the Contractor shall at his own expense provide stronger pipe or improved bedding conditions, as approved by the Engineer, to meet the load requirements of the changed condition. The minimum trench width shall be pipe O.D. plus twelve inches (12"). Trench width shall be measured at top of pipe. This shall only be applicable for pipe depths of twenty feet (20') or less.

### **2.12 Pipe Depth**

Minimum depth to top of pipe shall be thirty-six inches (36"), unless noted on the plans. Maximum depth to top of pipe shall be sixty inches (60"). Installations outside these depth limitations shall require the approval of the Engineer unless such depths of installation are indicated on the drawings.

### **2.13 Maximum Length of Open Trench**

At the end of each working day, the trench shall be completely backfilled, unless otherwise specified in the Special Provisions or directed by the Engineer. Approved open trenches shall be covered with steel sheeting or equal. Barricades and appropriate erosion control measures shall be installed and maintained.

### **2.14 Control of Water**

When water is encountered, the Contractor shall furnish, install, maintain and operate all necessary machinery, appliances and equipment to keep excavations free from water until the placing of the bedding material, laying and jointing of the pipe, pouring of concrete, and placing of the bedding material has been completed, inspected and approved, and all danger of flotation and other damages is removed. Groundwater pumped from the trench shall be disposed of in such a manner as will not cause injury to public or private

property or constitute a nuisance or menace to the public, and shall be subject to the approval of the Engineer and the California Regional Water Quality Control Board, Lahontan Region. Dewatering and disposal of groundwater shall be in accordance with the Special Provisions.

## **2.15 Special Foundation Treatment**

Whenever the bottom of the trench is soft, yielding or in the opinion of the Engineer otherwise unsuitable as a foundation for the pipe, the unsuitable material shall be removed to a depth such that when replaced with crushed rock or gravel as specified for Type II bedding (see Section 2.19 "Bedding and Haunching") and as determined by the Engineer, it will provide a stable and satisfactory foundation. Whenever the trench bottom is in **rocky material**, the trench shall be excavated to eight inches (8") below the flow line and backfilled with bedding material as herein specified. If material more than two feet below the flow line of the pipe is ordered removed by the Engineer, the excavation below that point and the imported material required to backfill the trench to that elevation shall be paid for as extra work. Special compaction of the imported material may be required.

The Contractor's attention is invited to the fact that the method of construction can affect the suitability of underlying material and the extent of required removal and replacement. Factors which are involved are as follows:

- A. The amount of water allowed to remain in the bottom of the trench immediately after excavation; the more water present, and the longer it remains, the greater amount of stabilization required.
- B. The greater the amount of traffic by workmen on the trench bottom, the greater the problem.
- C. The longer the trench is open, the greater the problem.

To prevent unnecessary problems and expense, the Contractor shall make every effort to dewater trenches which encounter groundwater and shall avoid unnecessary traffic by workmen on wet trench bottoms. Unsatisfactory trench conditions caused by unnecessary workmen traffic or improper dewatering, as determined by the Engineer, shall be corrected by the Contractor at his expense.

## **2.16 Over Excavation**

If the trench is over excavated, the Contractor shall use bedding material as specified to bring the trench bottom to the elevation required, compacted to a density of at least ninety percent (90%) relative compaction.

## **2.17 Disposal of Excess Excavated Material**

Excess excavated material, unsuitable backfill material or not, shall be the property of the Contractor and disposed of legally in a location that complies with the environmental requirements of these specifications and as outlined in the Special Provisions.

## **2.18 Pipe Laying Procedure**

The pipe shall be laid in strict conformity to the prescribed line and grade. Three (3) consecutive points on the same rate of slope shall be used at all times to detect any variations for a straight grade. In case any discrepancy is discovered, the work shall be stopped and the discrepancy immediately reported to the Engineer. Each pipe length shall be checked for conformance to the prescribed line and grade.

The preferred methods of establishing and checking line and grade are by use of laser beam grade instrument or optical surveying instrument and sight rod.

Pipe laying shall proceed upgrade with the bell ends of the pipe placed upgrade, unless otherwise authorized by the Engineer. Each section of pipe shall be laid true to line and grade and in such a manner as to form a watertight, concentric joint with the adjoining pipe. The end of the pipe shall be protected at all times to prevent entrance of foreign matter and the pipe interior shall be continuously cleared of all dirt and debris as the work progresses. Pipe shall not be laid when the condition of the trench or the weather is unsuitable. All open ends of pipe and fittings shall be adequately and securely closed whenever the work is discontinued for more than one-half hour.

All pipe jointing, including the maximum deflection of joints in curved alignment, shall be in accordance with the manufacturer's recommended practice. Care shall be used to prevent chipping or cracking of either end of the pipe during installation. Both joint surfaces shall be clean before the joints are made.

## **2.19 Pipe Bedding and Haunching**

Unless indicated otherwise on the drawings, pipe shall be placed on a firm, prepared bed. Bedding shall extend at least six inches (6") below the outside of the pipe barrel. In all cases, the bedding shall extend to a level at least six inches (6") below the outside surface of the pipe bell. Pipe shall be bedded uniformly throughout its length. The specified bedding shall be placed to give the required minimum thickness after placing the pipe and shall be compacted to give a uniform surface for laying the pipe. The Contractor shall place bedding material to the spring line of the pipe, compacting it to provide haunch support. Care shall be used to fill all spaces under the haunches while not disturbing the pipe. Pipe shall not bear on bells, couplings or joints. No wedging or blocking of the pipe will be permitted. The trench shall be excavated at these locations as necessary to provide at least six inches (6") of bedding material beneath the bells, couplings, or joints. Bedding material shall extend to both sides of the trench walls or side supports in the case of a supported trench. All bedding material shall be compacted to a relative density of ninety percent (90%) relative compaction, maximum. Where solid rock is encountered and blasting is necessary, the rock shall be excavated to a minimum depth of eight inches (8") below the bottom of the pipe, and the trench backfilled with bedding material. Flooding is permissible, but jetting is prohibited. This bedding procedure shall apply to main line construction as well as house service installation associated with such main line construction.

- A. Type I Bedding Material – Type I bedding material shall be imported clean sand. All material must pass a No. 35 sieve with no more than six percent (6%) passing

a No. 200 sieve. Excavated material may not be used as Type I bedding material. Material shall be free of ice, clay, organic matter or other objectionable material, and shall conform to the following standards:

1. Gradation per ASTM C136:

SIEVE SIZE	PERCENT BY WEIGHT PASSING SIEVE
3/8"	100%
#4	90-100%
#50	10-40%
#100	3-20%
#200	0-15%

2. Sand Equivalent per ASTM D2419: 25 minimum.
3. Plasticity Index per ASTM D4318: Non Plastic.
4. Moisture-Density per ASTM D1557: Max. +2% of optimum, Min. -5% of optimum.
5. Any water pipe sand bedding material retained on a #4 or #8 sieve shall not contain angular material as described in ASTM D2488. Water pipe sand bedding material that contains sub-angular, sub-rounded or rounded material, and conforms to Paragraphs 5.4.1.A and 5.4.1.B is acceptable.

B. Type II Bedding Material – The material used for Type II bedding material shall be imported crushed rocks or gravel of predominately granitic origin and shall be a grain size analysis within the following limits.

Passing 3/4 inch sieve	100%
Passing #4 sieve	90-100%
Passing #50 sieve	10-40%
Passing #100 sieve	3-20%
Passing #200 sieve	0-15%

Crushed gravel backfill shall be a crusher-run, mineral aggregate free of ice, clay, organic matter, or other objectionable material, and shall conform to the following standards:

1. Gradation per ASTM C136:

SIEVE SIZE	PERCENT BY WEIGHT PASSING SIEVE
1"	100%
3/4"	90-100%
# 4	35-65%
#16	15-40%
#200	2-10%

2. Liquid Limit per ASTM D423: 35 maximum
3. Plasticity Index per ASTM D424: Maximum Allowable Plasticity Index (PI) shall be determined by the formula:  $PI = 15 - (S \times 100)$  where "S" is the percent by weight passing the # 200 sieve.

#### 4. Resistance R-Value per ASTM D2844: 70 minimum.

Where designated on the drawings the Contractor shall use the bedding material specified and no other. Type II bedding shall be used in all locations where the trench bottom is wet or shows evidence of having been wet, rocky, cobbled or when directed by the Engineer if trench conditions vary from that shown on drawings. In all other cases, Type I bedding may be used.

### **2.20 Initial Backfill**

Initial backfill shall be the material placed on the bedding after pipe joints have been completed, inspected and preliminarily approved by the Engineer, and shall extend to a point 12 inches (12") above the top of the pipe. The material shall be carefully placed, brought up evenly on both sides of the pipe, and compacted to a relative density of 90 percent (90%) relative compaction, maximum, all done so as not to disturb or damage the pipe or joints. Jetting will not be allowed. The initial backfill shall be finely divided imported material free from debris, organic matter, and clods, rocks, or clumps larger than one inch (1") and conforming to the specifications herein set forth.

Where Type I bedding is used, the initial backfill shall be made with the same materials as specified for this type bedding.

Where Type II bedding is required for structural reasons, as shown on the plans, the initial backfill to at least the spring line of the pipe shall consist of material as specified for Type II bedding, placed with care to completely fill all spaces under the haunches. Compaction shall be to a relative density of 90 percent (90%) maximum, using care not to disturb the pipe. The remainder of the initial backfill shall be as specified for either Type I or Type II bedding, and shall be carefully placed, brought up evenly on both sides of the pipe, and compacted to a relative density of 90 percent (90%) maximum, all done so as not to disturb the pipe or damage it. Jetting will not be allowed.

Where Type II bedding is not required for structural reasons but is required because of wet or rocky trench conditions, initial backfill may be made with either Type I or II bedding material, placed as specified above for either case.

Bedding and initial backfill may deviate from the above only as described in the plans for specific locations, or as approved by the Engineer.

### **2.21 Intermediate Backfill**

Intermediate backfill is above initial backfill and below top backfill and surface restoration. Intermediate backfill shall be placed at the various locations as shown on the plans and as follows:

- A. Within paved Placer County rights-of-way and within other paved areas, except for those within State rights-of-way, the intermediate backfill shall extend from the top of the initial backfill to the bottom of the top backfill. Per Placer County requirements, the top nineteen inches (19") of intermediate backfill shall be compacted to a density of not less than ninety-five percent (95%) relative

compaction. Any intermediate backfill between the initial backfill and the top 19” of intermediate backfill shall be compacted to a density of not less than ninety-two percent (92%) relative compaction.

- B. Within unpaved Placer County rights-of-way and within all other unpaved areas, except for those within State rights-of-way, the intermediate backfill shall extend from the top of the initial backfill to the bottom of the top backfill. Per Placer County requirements, the intermediate backfill may be excavated native earth if it is friable and suitable for compaction. This backfill material shall be 100 percent (100%) less than three inches (3”) in diameter and shall be clean and free from vegetable matter, debris, and other deleterious substances and shall be of such a nature that it can be compacted to ninety-five percent (95%) relative compaction. If the excavated native material cannot be compacted to the required density, suitable material capable of such compaction will have to be imported.
- C. Within paved State rights-of-way, the intermediate/top backfill shall extend from the top of the initial backfill to the bottom of the structure (asphalt concrete or concrete) section. Per State requirements, the intermediate/top backfill shall consist of a minimum of twenty-one inches (21”) of concrete slurry, 2-sack mix.
- D. Within unpaved State rights-of-way, the intermediate backfill shall extend from the top of the initial backfill to the bottom of the top backfill. Per State requirements, the intermediate backfill may be excavated native earth if it is friable and suitable for compaction. This backfill material shall be 100 percent (100%) less than three inches (3”) in diameter and shall be clean and free from vegetable matter, debris, and other deleterious substances and shall be of such a nature that it can be compacted to ninety percent (90%) relative compaction. If the excavated native material cannot be compacted to the required density, suitable material capable of such compaction will have to be imported.
- E. In easements, not in traveled county road or street rights-of-way, the intermediate backfill may be excavated native earth if it is friable and suitable for compaction, else it shall consist of imported material. This backfill material shall be 100 percent (100%) less than three inches (3”) in diameter and shall be clean and free from vegetable matter, debris, and other deleterious substances.

## **2.22 Top Backfill**

Top backfill shall be placed at the various locations as follows:

- A. Within paved Placer County rights-of-way and within other paved areas, except for those within State rights-of-way, the top backfill shall extend from the top of the intermediate backfill to the bottom of the structure (asphalt concrete or concrete) section. Per Placer County requirements, the top backfill shall consist of eight inches (8”) of Class 2 Aggregate Base compacted to a density of not less than ninety-five percent (95%) relative compaction.
- B. Within unpaved Placer County rights-of-way and within all other unpaved areas,

except for those within State rights-of-way, the top backfill shall extend from the top of the intermediate backfill to the top of the trench. Per Placer County requirements, the final eight inches (8") of backfill shall be of Class 2 Aggregate Base compacted to a density of not less than ninety-five percent (95%) relative compaction.

- C. Within paved State rights-of-way, the intermediate/top backfill shall extend from the top of the initial backfill to the bottom of the structure (asphalt concrete or concrete) section. Per State requirements, the intermediate/top backfill shall consist of a minimum of twenty-one inches (21") of concrete slurry, 2-sack mix.
- D. Within unpaved State rights-of-way, the top backfill shall extend from the top of the intermediate backfill to the top of the trench. Per State requirements, the final eight inches (8") of backfill shall be of Class 2 Aggregate Base compacted to a density of not less than ninety-five percent (95%) relative compaction.
- E. Within all other areas, the final 6 inches (6") of backfill shall be essentially the original top soil which shall have been removed and stockpiled separately. No specific compaction will be required. However, the Contractor will be required to wheel roll the backfill; the number of passes required will vary between two to five passes per tire width. Upon completion of wheel rolling, additional backfill material shall be placed and slightly mounded over trench (about 2" high) and contoured for proper drainage if appearance does not detract from surrounding area.

## **2.23 Trench Backfill Compaction**

Compaction of backfill shall be performed in layers not exceeding eight inches (8") loose thickness and shall be compacted to a density as shown on the plans. Equipment to be used for compaction shall be approved by the Engineer. Wheel rolling shall not be a suitable means for compacting.

When mechanical means are used to obtain the required compaction, the Contractor must exercise extreme caution so as not to damage or disturb the pipe. This is particularly true when compacting directly over top of pipe in the placing of initial backfill.

When, in the opinion of the Engineer, compacting equipment is adversely affecting the pipe, the Contractor will be required to change his method of compaction and restore or replace any defective pipe at the Contractor's sole expense.

When excavated material cannot be compacted to the required compaction, imported material will have to be used. The type of imported material shall be at the Contractor's option as long as the required compaction can be achieved, except as noted in the following paragraph.

When groundwater is encountered and Type II bedding is required, imported material cannot be of such a nature that fines will wash into the initial backfill material, unless an impervious layer of imported material is placed immediately above the initial backfill material. Imported material, of which less than twenty percent (20%) will pass the Number 8 sieve, will be acceptable for use as imported material without the requirement



of the impervious layer.

The Contractor's attention is directed to the type of material used for initial backfill; if crushed rock of the specified gradation is used, compaction by shovel slicing and light tamping may produce the desired compaction.

Compaction tests shall be performed by the Engineer. The Contractor shall cooperate with the Engineer in taking the tests. If a test fails, the area shall be reworked to the satisfaction of the Engineer. Two tests shall be allowed at any location of work. The Contractor shall be responsible for the cost of additional testing if required.

## 2.24 Testing

In connection with these specifications, tests shall be made in accordance with the State of California Standard specifications and the following requirements:

<u>Tests</u>	<u>ASTM</u>	<u>California Test Method</u>
Relative Compaction	D-1557-70	216 or 231
Sand Equivalent		217
Resistance (R-Value)		301
Sieve Analysis		202

## 2.25 Other Backfill Requirements

Where cribbing is used in the trench, the fill shall be carried to a height sufficient to prevent the surrounding ground from cracking or caving into the trench before the cribbing is removed. Backfill around valves, other structures, and the pit excavated for boring operations shall be made in the same manner as above specified for trenches. However, whenever the excavated space between the edge of a valve and the undisturbed earth is twelve inches (12") or less, the backfill will be sand, or well-compacted Type II bedding material.

## 2.26 Groundwater Cutoffs

Where indicated on the drawings or when groundwater is encountered within street rights-of-way, private traveled ways or parking areas to such a degree that water flows along the excavated trench, an impervious cutoff section shall be provided in the trench a short distance downstream from the source of the groundwater. If the groundwater is entering the trench more or less continuously along its length within a given reach, more than one cutoff section will be required. The spacing and location of such sections will be determined by the Engineer. The purpose of the cutoff section is to prevent the travel of water along the trench when Type II bedding material is required. The cutoff section shall consist of relatively impervious imported materials, approximately three feet (3') long at the bottom, placed at an interruption in the bedding and initial backfill material, and extending to the full height of the trench. This cutoff section shall be placed as nearly as practicable at the middle of a pipe length and shall be compacted in place by hand tamping to a density of ninety-five percent (95%).

## 2.27 Surface Restoration

Surface restoration shall be defined as that work necessary to restore the excavated area above intermediate backfill and the scarred surrounding work areas to a condition equivalent or better than existing prior to the construction. This may include pavement replacement as shown on the plans, or mentioned in these specifications, seeding, shrub and plant replacement, and restoration of ditches and drainage areas. All surface restoration shall be done to the satisfaction of the Engineer.

- A. All curbs, gutters, driveways, sidewalks, road shoulders and pavement which are broken or damaged by the installation or construction of the work shall be reconstructed by the Contractor. Reconstruction shall be as specified herein, in Section 2.28 "Roadway Structure Sections", or as shown on the plans. If an item is not covered elsewhere, the reconstruction shall be of the same kind of material and at least the same dimensions as the original work. All work shall match the appearance of the existing improvements as nearly as practicable. When pavement restoration is shown as a lump sum bid item, it shall be understood that payment for this item shall include compensation for damaged or broken pavement caused directly or indirectly by the work.

All concrete pavement crossings shall be neatly saw cut with a pavement saw. Asphalt pavement crossings shall be trimmed to neat lines parallel and perpendicular to the trench prior to pavement replacement. The width shall be the minimum width necessary to excavate the required trench depth. Pavement replacement shall be made flush to the saw line with a slight crown to ensure drainage. The saw lines shall receive a final bituminous seal coat, material, and application rate to be approved by the Engineer.

- B. The replacement of grass shall be accomplished by seeding. The kind and type of seed is to be determined by the Engineer. Replacement of plants and shrubs shall be required only where the easement travels through a developed parcel. In this case, the Engineer, Owner, and Contractor shall agree before proceeding as to which plants and shrubs shall be saved or replaced.
- C. The restoration of trench surfaces shall include measures to prevent surface erosion of the trench. This shall include seeding, cutoff walls, surface header board, interceptor dike, gravel filter dike, or rip rap energy dissipater. These measures shall be used as required or as directed by the Engineer to prevent surface erosion.

## 2.28 Roadway Structure Sections

Structure sections shall conform to the indicated sections of the State Specifications as to materials and application, and shall be placed at the various locations as follows:

- A. Within paved Placer County rights-of-way, the minimum structure section shall consist of not less than three inches (3") of asphaltic concrete, or match the existing thickness of asphaltic concrete, whichever is greater, and a fog seal coat; the latter applied to the full width of the asphaltic concrete replacement required

for the trench excavation plus twelve inches on each side. The asphaltic concrete shall extend in neat lines parallel to the trench excavation. The limits of asphaltic concrete replacement will vary according to field conditions and damage caused to existing pavement by the Contractor's operations. The minimum replacement must be in accordance with trench construction as called for on the drawings.

Aggregate base shall be Class II, conforming to Section 26 of State Specifications. Asphaltic concrete shall be Type B, 1/2 inch maximum, conforming to Section 39, fog seal coat shall conform to Sections 37 and 94.

- B. Within paved State rights-of-way, the minimum structure section shall consist of not less than three inches (3") of asphaltic concrete, or match the existing thickness of asphaltic concrete, whichever is greater, and a fog seal coat; the latter applied to the full width of the asphaltic concrete replacement required for the trench excavation plus twelve inches on each side. The asphaltic concrete shall extend in neat lines parallel to the trench excavation. The limits of asphaltic concrete replacement will vary according to field conditions and damage caused to existing pavement by the Contractor's operations. The minimum replacement must be in accordance with trench construction as called for on the drawings.

Aggregate base shall be Class II, conforming to Section 26 of State Specifications. Asphaltic concrete shall be Type B, 1/2 inch maximum, conforming to Section 39, fog seal coat shall conform to Sections 37 and 94.

- C. Within private traveled ways or parking areas, the structure section shall be equal to or better than the existing structure section.

## **2.29 Repairs Required For Trench Settlement**

If at any time during a period of two years from the date of final acceptance of the project, there shall be any settlement of the trenches requiring repairs to be made, or should any other defect appear in the system due to negligence or carelessness on the part of the Contractor, the Engineer shall notify the Contractor to immediately make such repairs as may be deemed necessary, at the Contractor's expense. If the Contractor fails to undertake the repairs with due diligence, the District is authorized to make said repairs and bill the Contractor for the District's efforts.

## **2.30 Boring and Jacking**

The work contemplated under this heading consists of installing pipe, in a conductor pipe, under a paved roadway, street or railroad to a true line and grade as shown on the plans, by means of jacking operations. The equipment and method of operation shall be approved by the Engineer before proceeding with the work. Approval of the proposed method by the Engineer will not relieve the Contractor of the responsibility for making a satisfactory installation meeting the criteria set forth herein. Only workmen experienced in the jacking of conduit shall be used in performing the work.

Water pipe to be jacked shall be installed in a conductor pipe of the size and in the manner shown on the plans.

A. Bores:

Where a conductor or water pipe is installed in a bored hole, the hole shall be bored by use of a machine which will cut a true circular bore to the required line and grade. Bored tunnels shall be no more than one inch larger than the outside limits of the conductor pipe to be placed therein. If so required, bracing and shoring shall be provided to adequately protect the workmen and the roadway or railroad. The conductor pipe shall be placed closely behind and in conjunction with the boring operation.

B. Placing Pipe in Conductor:

Pipe shall be strapped to two redwood skids with steel straps. The redwood skids shall be near the center of each pipe section and shall be large enough to prevent any part of the joint from bearing on the conductor. Skids may have to be adjusted in height to hold the pipe on correct line and grade. In lieu of redwood skids, the Contractor may use conductor pipe spacers as herein specified.

After installation of the pipe, clean, dry sand shall then be blown into the conductor pipe on both sides to the full depth of the conductor pipe. A redwood headwall, made up from 2" redwood planks and 1" x 4" cleats on both sides, shall be provided at each end of the conductor pipe to contain sand. Headwalls shall be neatly cut out to fit around the installed pipe.

Casing seals may be used as an alternative to redwood headwalls, casing seals shall be Plico Type 660 or PSI Model "W", or equal.

C. Jacking Heads:

Whenever the nature of the soil indicates, in the opinion of the Engineer, the likelihood of ground loss during the driving of the conduit, the use of a steel jacking head will be required. The jacking head shall be fitted to the leading section of the conduit in such a manner that it extends around the outer surface of the upper two thirds of the circumference of the conduit and projects at least 18" beyond the driving end at the top of the conduit but does not protrude over 1/2" outside of the outer conduit surface. This head shall be securely anchored to prevent any wobble or alignment variation during the jacking operation. Excavation shall be carried out entirely within the jacking head and no excavation in advance thereof will be permitted. Every effort shall be made to avoid any loss of ground outside of the perimeter of the jacking head.

D. Backpacking Voids:

In general, excavated material shall be removed from the conduit as jacking progresses and no accumulation of excavated material within the conduit will be permitted. Should appreciable loss of ground occur, the voids shall be backpacked promptly to the extent practicable with soil cement consisting of a slightly moistened mixture of one part cement to five parts of granular material. When material selected from the spoil is not suitable for this purpose, the Contractor shall import suitable material at his sole expense. The soil cement

shall be thoroughly mixed and rammed into place as soon after the loss of ground as possible.

After jacking is completed, the Contractor shall drill holes in the conduit at the locations of ground loss and elsewhere where voids behind the conduit are suspected. If such holes disclose void spaces in existence, the Contractor shall force grout into such voids to refusal at pressure as directed by the Engineer, but not to exceed 50 pounds per square inch. He shall then repair the drilled holes, including any plastic lining. Grout shall be a lean mixture of sand and cement. Backpacking of the one inch annular space in the case of bores will not be required, unless specifically called for on the plans.

E. Conductor Pipe Spacers:

Insulating casing spacers, where used, will be installed at not over 10 foot spacing, prior to inserting pipe in the casing. Spacers will be similar and equal to "Plico" Type 412M or PSI Model A-12 with insulating skid, 12" bolted spacer with 6 skids. Segment with 4 skids will be placed on the bottom, with skids sized to give equal bearing pressure on the casing without deformation of the pipe.

## **2.31 Clean Up**

During the progress of the work the Contractor shall keep the entire job site in a clean and orderly condition. Excess or unsuitable backfill material, broken pipe or other waste material shall be removed from the job site within one week. Spillage resulting from hauling operations along or across existing streets or roads shall be removed immediately by the Contractor. All gutters and roadside ditches shall be kept clean and free from obstructions. Any deviation from this practice shall have prior approval from the Engineer. In areas where excessive dust is a nuisance to property owners, the Contractor shall, as often as necessary, wet down the area to prevent dusty conditions. This includes weekends and holidays.

Before final acceptance of the work, the Contractor shall carefully clean up the work and the premises, remove all temporary structures built by or for the Contractor, remove all surplus construction materials and rubbish of all kinds from the grounds which the Contractor has occupied and leave them in a neat condition.

## ***Section 3 – Performance Specifications for Water Facilities***

### **3.01 Tests for Leakage in Pipelines**

After completion of the installation, the Contractor shall test all piping and pipe work, including house services, as herein specified.

The Contractor shall furnish all materials, equipment and labor for testing the piping system at 200 psi, or at 50 psi over the expected working pressure.

Each system may be tested as a unit or in sections as shown on plans, or as directed by the Engineer, but each complete system shall successfully meet the requirements specified herein before acceptance by the District.

The test shall be made by closing valves and filling the pipelines with water, provision having been made for release of all air in the lines.

A pressure of 200 psi shall be maintained for three hours and the leakage determined. Where there is a significant difference in elevation between ends of section being tested, the pressure at the lower end shall not exceed 225 psi. Leakage shall not exceed 25 gallons per day per inch diameter per mile of pipe, nor shall the pressure be allowed to drop more than 5 psi.

The volume of leakage after three hours shall be determined by the following method: fill a large container (e.g., a clean garbage can) with water to a marked level. Re-pressurize the water line using water from the container, until the pressure in the water line is back to 200 psi. The water line will pass the pressure test if less than the allowable leakage is needed to refill the container to the marked level.

All leaks that are found shall be immediately corrected and the system again subjected to the same test for a period of one hour, with no leakage.

The Contractor shall inform the Engineer at least two days in advance of the time set for testing the piping system.

The Contractor shall take all necessary precautions to prevent any joints from drawing while the pipe lines and their appurtenances are being tested and he shall, at his own expense, repair any damage to the pipes and their appurtenances, or to any other structures, resulting from or caused by these tests.

### **3.02 Disinfection of Water Lines**

After all other work has been completed and prior to placing them in service, domestic water lines, including all house service lines, hydrant laterals and piping to appurtenances installed under this contract shall be completely disinfected in accordance with American Water Works Association procedures as contained in the latest revision to AWWA Standard C-651 for disinfecting water mains.

When starting the disinfection test, the Engineer will take a courtesy sample initially to ensure that the water line contains water with a minimum concentration of 50 ppm free  $\text{Cl}_2$ . The water line shall sit full and undisturbed for 24-hours. At the end of the 24-hour test period, the District inspector shall take another sample and test for free  $\text{Cl}_2$ . This sample must be greater than or equal to at least 50 ppm free  $\text{Cl}_2$  in order to pass the disinfection test. The disinfection test may take place at the same time as the test for leakage in pipelines.

### **3.03 Bacteriological (Bac-T) Test**

After the water line has been successfully disinfected, in accordance with the above requirements, the Contractor shall flush the new main and services until the background chlorine level of the water system is reached. When flushing the water line, the Contractor shall not discharge chlorinated water to a stream environment zone (SEZ) or into any body of water. The highly chlorinated water shall be discharged into the sanitary sewer system, in accordance with the District's Discharge requirements, via an air gap so as to provide backflow prevention.

The environment into which the chlorinated water is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will cause damage to the environment, then a neutralizing chemical shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water. Where necessary, federal, state, provincial, and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

The chlorine concentration level in the new water facility must be greater than or equal to 0.2 ppm free  $\text{Cl}_2$  and less than or equal to 3 ppm free  $\text{Cl}_2$ . Once flushed, the water line must sit undisturbed for 24-hours. At the end of 24-hours, the Engineer will take a set of Bacteriological (Bac-T) samples and deliver it to the Tahoe Truckee Sanitation Agency (T-TSA) laboratory for testing. At least one set of samples shall be collected from every 1200 ft (366 m) of the new water main, plus one set from the end of the line and at least one set from each branch. Samples for bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulfate as required by *Standard Methods for the Examination of Water and Wastewater*. No hose or fire hydrant shall be used in the collection of samples. A suggested combination blow off and sampling tap is recommended.

T-TSA will read the sample 24-hours later and report the results to the District. If the Bac-T test results indicate "Absent" for both E. coli and Coliform bacteria, then the water line has passed the testing process and can be placed in service and connected to the existing distribution system.

### **3.04 Notification of Defects**

Upon offering of the work for acceptance and after all inspections are made by the District, the Engineer shall prepare a written list of defects in the work and present such list to the Contractor within five (5) working days.

## **Section 4 – Existing Vegetation**

No grading or operation of heavy equipment shall take place within the area bounded by the drip line of any tree on or off the property. This does not apply to those trees which are within the actual construction area and are to be removed according to the plans.

Work within easements shall be performed with the utmost care. Under no circumstances are trees to be removed unless so noted on the plans, without express written permission from the Owner and/or Engineer. Equipment used in easement areas will be limited to the smallest practicable size necessary for the job. Trucks delivering pipe and other materials shall be of the minimum practicable size and will be restricted to areas where they will not damage existing vegetation and foliage. All operations within easements will be subject to prior approval of Engineer to the end that a minimum disturbance to the existing terrain and culture results.

Only those trees designated on the plans to be removed or those mentioned in written authorization from the Engineer, shall be removed to facilitate project construction. Any fees or fines imposed on the District for unauthorized tree removal shall be borne by the Contractor. The above penalty shall apply to all trees fourteen inches (14”) or greater in diameter measured at a breast height, four and a half feet (4.5’) above the ground.

The Contractor must take extreme care to prevent permanent damage to root systems of trees to be saved.

Major roots (four inches (4”) or greater in diameter) encountered in the course of excavation from trees which are not to be removed shall be exposed but not severed and they shall be wrapped in burlap as a protective measure while exposed. Minor roots (two to four (2” to 4”) inches in diameter) that are severed in the course of excavation, and major roots that are accidentally cut, shall be neatly trimmed back to an undamaged area and coated with a heavy coat of approved tree seal.

When working through manzanita the following procedure is suggested and shall be used unless an alternative procedure is approved by the Engineer:

An eight to ten foot wide path shall be cut to the ground, disturbing the roots as little as possible. The centerline of the pipe shall be located approximately 2.5 feet from the downslope side of the path so that the excavated material can be placed on the uphill side of the path. During excavation, a reasonable attempt shall be made to separate the major roots from the material that is to be used for backfill.

Equipment may work or drive over standing manzanita if necessary, provided that upon completion of the work broken branches are removed.

Work within manzanita shall be confined so as to cause a minimum amount of disturbance. After operations are completed, the area shall be cleaned up and left in a neat and satisfactory condition and revegetated as detailed herein.



## ***Section 5 – Erosion Control***

Temporary erosion control facilities shall be in place prior to the start of construction or grading and shall remain in place and be maintained until slope stabilization has been completed. The Contractor is responsible for installing and maintaining Temporary BMPs within the project area and any staging areas used as a part of this project. Temporary BMPs shall be a type and configuration approved by the Engineer and the Tahoe Regional Planning Agency.

Straw bales or other straw materials are no longer preferred for temporary erosion control.

During construction, soil disturbances shall be minimized and limited to those areas specifically required for the project as shown on the plans. Disturbed areas shall be stabilized as soon as completed. Stockpiled materials shall be centralized in an area free from potential flooding or washout and able to be protected from scattering by the elements in anticipation of a storm or temporary cessation of construction activities.

Upon completion of the improvements, all trenches within the roadway section shall be patched with asphalt concrete according to the plans. All trenches outside the roadway section shall be replaced to the original condition or better as determined by the Engineer. All other areas disturbed by construction activities shall be stabilized as called out on the plans or within these specifications.

The Contractor shall not deposit surplus or waste material in street or highway right-of-way without written permission from the County or State. Waste disposal sites shall be approved in writing by TRPA prior to construction.

No construction activities involving ground disturbance shall take place between October 15th and May 1st.

## ***Section 6 – Water Quality***

Work under this Contract shall comply with applicable requirements of the California Regional Water Quality Control Board, Lahontan Region.