



## **DIVISION IV - WATER FACILITIES**

### **401 TRENCH EXCAVATION, BEDDING AND BACKFILL**

#### **401.1.00 DESCRIPTION**

Minimum general standards for water facilities shall be as set forth in the current *American Water Works Association Standards (AWWA)* and *current Oregon Standard Specifications for Construction*. The following special provisions are the minimum construction standards for the City of Sisters and are intended as a supplement to the above standards.

#### **401.2.00 TRENCH EXCAVATION, BEDDING, AND BACKFILL**

See Division I - Trenches

#### **401.3.00 CONSTRUCTION**

The Contractor shall secure and comply with applicable State, County, or City street cutting permits. The Contractor shall comply with all City, County, State and Federal Highway Construction Safety and Health Standards. Prior to installing a water facility in an unimproved street, the street shall be brought to sub-grade to assure that adequate bury, depth of cover, and utility separation is acquired.

#### **401.4.00 MEASUREMENT AND PAYMENT**

Measurement and Payment shall conform to the requirements of Subsection 301.4.00.

### **402 WATER PIPE AND FITTINGS**

#### **402.1.00 DESCRIPTION**

##### **402.1.01 GENERAL**

This section covers the work necessary for furnishing and installing water pipe and fittings normally used for water distribution systems.

##### **402.1.02 CERTIFICATION**

The Contractor shall furnish material certifications for pipe, fittings, and appurtenances incorporated in the work when requested by the City Engineer or City Representative.

##### **402.1.03 CORROSION PROTECTION**

The method of corrosion protection shall be as specified when required.

## **402.2.00 MATERIALS**

**Pipe used for water mains shall be C900 PVC meeting the requirements of Section 402.2.01 unless alternate pipe is approved by the City Engineer.** Where more than one type of material is specified, the type required will be designated on the plans. Material used on pump stations, meter vaults, or control valve applications shall be approved by the City Engineer on a case by case basis. All appurtenances shall be of the same manufacture. Materials shall be manufactured or produced in the United States of America, or as permitted under NAFTA. Materials manufactured outside of the USA shall meet all applicable standards required per AWWA, ASTM, ANSI, NSF, UL, and shall be the product of manufacturing facilities having current ISO 9000 or QS9000 certifications. All fittings and materials coming in direct contact with drinking water must meet NSF-61 standards. At the discretion of the City, the contractor and/or material supplier shall provide certified manufacture date of pipe and fittings. Any pipe or fittings with visible cracking, discoloration or other defects or with age older than one year may be rejected.

### **402.2.01 C-900 PVC WATER PIPE**

PVC water pipe shall only be used for repair of existing PVC lines and with approval of the City Engineer. PVC water pipe shall meet the requirements of ANSI/AWWA Standard C-900-97 or latest edition for PVC pressure pipe and fabricated fittings for water distribution. Joints (couplings) shall be fitted with elastomeric gaskets conforming to the requirements of ASTM F477. Assembled pipe (bell end joints or couplings) shall meet the performance requirements of ASTM D3139. Pipe shall have a minimum pressure class of 150 psi (DR 18).

At the sole discretion of the City, the contractor and/or material supplier shall provide certified manufacture date of any PVC pipe with visible cracking, discoloration and/or fading due to ultraviolet light exposure. Pipe which is one year or older may be rejected. The City also reserves the right to reject pipe material for cause regardless of age of pipe.

### **402.2.02 DUCTILE IRON PIPE**

Ductile iron pipe shall be centrifugally cast in metal molds and cement mortar lined in accordance with ANSI/AWWA Standards C151/A21.51-02 and C104/A21.4. Tyton joint pipe shall be used except where conditions require mechanical type joints as shown and approved on plans. Care shall be taken in handling the pipe. No material shall be shipped inside coated pipe. Pipe shall as manufactured by U.S. Pipe, Pacific States Pipe, American Pipe, or Griffin Pipe and shall meet the following specifications:

- 1) 6" through 12" I.D., Class 52 Ductile Iron Pipe, ANSI/AWWA Standard C151/A21.51-02
- 2) 14" I.D. and larger, Class 50 Ductile Iron Pipe, ANSI/AWWA Standard C151/A21.51-02

### **402.2.03 CAST OR DUCTILE IRON PIPE FITTINGS**

Cast or ductile iron pipe fittings for C900 or ductile iron pipe shall meet the requirements of AWWA C110 or C153 and shall have a minimum working pressure rating of 250 psi. Joints shall meet the requirements of AWWA C111. Fittings shall be cement mortar lined and seal coated, meeting the requirements of AWWA C104. Gaskets for flat faced or raised face flanges shall be 1/8 inch thick neoprene having a Durometer reading of 60, +/- 5 as approved for use with potable water. The type, material and identification marks for bolts and nuts shall be provided.

### **402.2.03 PIPE RESTRAINT**

#### **402.2.03A GENERAL**

Refer to Section I.D.1.h of the Design Standards and Section 402.3.09E for joint restraint requirements.

**402.2.03B PUSH ON PIPE JOINT RESTRAINT**

Where required, push-on joints shall be restrained using Field-Lok gaskets for Tyton joint pipe, and Fast-grip gaskets for Fastite joint pipe, utilizing stainless steel locking segments vulcanized into the gaskets to prevent joint separation.

**402.2.03C EXTERNAL MECHANICAL RESTRAINTS**

Mechanical restraints shall be installed where shown on the plans, and as directed by the Engineer. Approved manufacturers are as follows: Ebba Iron 1100 Series "Mega-Lug", or Romac RomaGrip.

**402.2.10 SERVICE PIPE**

Service piping from the water main to the meter and 4 feet beyond meter assembly shall be as follows:

Size	Material
3/4"	Type K Soft Copper
1"	Type K Soft Copper
2"	Type K Hard Copper

**402.2.11 SERVICE CONNECTION**

Refer to latest version of City of Sisters, Water Service and Meter Installation Manual which supersedes these standards and specifications.

**402.2.11A GENERAL**

All brass fittings shall be manufactured in accordance with ANSI/AWWA Standard C-800-05, or latest edition, and meet the requirements of Standard Drawing 4-5.

**402.2.11B 1½" - 2" SERVICE SADDLES**

Service Saddles for 1½" and 2" services shall be stainless steel or cast double strap service clamp with iron pipe threads meeting ANSI/AWWA Standard C-800-05. Saddles shall be Mueller or approved equal. Brass or bronze nipple between saddle and valve is to be installed level; bolts to be torqued to manufacturer's specifications.

**402.2.11C ¾" to 1" SERVICE SADDLES**

Direct taps are permitted on ductile iron pipe only. Where required, service saddles shall be stainless steel band service clamp with iron pipe threads as manufactured by Mueller, Romac, or approved equal.

**402.2.11D SADDLE TAP**

Bit size shall be as follows:

- ¾" tap – 11/16" bit
- 1" tap – 15/16" bit.

All bits to be Mueller or equal, and be approved for tapping PVC, ductile iron, cast iron, galvanized and steel pipe. The tapping machine shall be a Mueller #E-5, #D-5 or equal. Equipment to be water tight and capable of boring a straight center hole.

**402.2.11E DIRECT TAP**

All bits to be Mueller AWWA taper thread combined drills and taps or equal, and must be approved for tapping cast iron and ductile iron water mains. The tapping machine shall be a

Mueller B-101 Drilling and Tapping Machine or equal.  
Equipment to be water tight and capable of drilling a straight center hole.

**402.2.11F CORPORATION STOPS** Corporation Stops shall be manufactured by Mueller or Ford with part numbers matching the list provided in the latest version of the City of Sisters Water Service and Meter Installation Manual. Inlet threads shall be iron pipe if a saddle is used. Inlet threads for direct tapped ductile iron pipe shall be AWWA CC Taper Thread. Outlet threads shall be copper pack.

**402.2.11G ANGLED METER STOPS**

Angled meter stops shall be as shown on the Standard Drawings. Part number shall match those provided in the current version of the City of Sisters Water Service and Meter Installation Manual.

**402.2.11H COUPLINGS and UNIONS**

Couplings and unions, if required, shall be copper couplings and unions with part numbers matching those provided in the current version of the City of Sisters Water Service and Meter Installation Manual

**402.2.11I SERVICE GATE VALVES**

1½" and 2" service gate valves shall be AWWA approved resilient seated with 2" square operating nut.

**402.2.11J DUPLEX SERVICES**

Duplex Services shall not be installed.

**402.2.11K METER BOXES**

Water meter box and lid part numbers shall match those provided in the current version of the City of Sisters Water Service and Meter Installation Manual. Cast iron and steel lids are not allowed. Meter boxes shall be equipped with concrete polymer lid rated to 10,000 lbs in sidewalks and 20,000 lbs. in traffic areas.

**402.2.11L METERS**

Water Meters and Automated Meter Reading MXU's will be purchased by the City and installed at the request of the plumber/property owner as part of the Building Permit Process. Meters 3-inches and larger will be purchased and supplied by the City and installed by the Contractor/builder. Any adjustments required to the water service, meter box, or plumbing must be completed by the Contractor prior to meter installation.

**402.2.15 PIPE FITTINGS**

**402.2.15A BURIED FITTINGS**

Buried ductile or cast iron, long bodied fittings with mechanical joints or flanged, shall meet ASA specification 21.10, 250 psi working pressure, with glands, bolts and gaskets in accordance with ASA 21.11. Mechanical joints shall be so designed to completely accommodate star brace bolts, if required. A non-toxic vegetable soap lubricant shall be supplied in sufficient quantities for installing the pipe furnished. Lube must be approved by the City Engineer, or representative, prior to use.

#### **402.2.15B ABOVE GROUND INSTALLATIONS**

Above ground ductile iron fittings with threaded flanged joints shall meet ANSI/AWWA Standards C115/A21.15, latest edition, 250 psi working pressure, with stainless steel bolts and gaskets in accordance with ANSI/AWWA Standards.

#### **402.2.15C COUPLINGS**

Couplings 6" to 12" diameter must be ductile iron, long barrel couplings, Romac Style 501, Pacific States (Union Foundry) or U.S. Pipe M.J. ductile iron sleeve. Appurtenances shall be of same manufacture.

#### **402.2.15D PLUGS and CAPS**

Plugs shall be of Tyton joint type with internal set screws. Caps shall be of M.J. type.

#### **402.2.16 SPECIAL COATINGS AND LININGS**

For special conditions, other types of coating and linings may be available. Such special coatings and linings shall be approved by the City Engineer prior to the time of purchase.

#### **402.2.17 PIPE INSULATION**

Bridge crossing shall be ductile iron pipe, and shall be insulated with a urethane or fiberglass pipe wrap system specifically designed for pipe insulation purposes, minimum 2-inch thickness, CPR Upjohn-Trymer bun material, Mansville Micro-Lok, or equivalent, covered with an aluminum roll jacketing, 0.016-inch minimum thickness, Pabco Surefit Aluminum Jacketing, Mansville Micro-Lok, or equivalent. Insulation shall have a maximum conductivity ("K") of 0.40. Insulation at pipe supports shall be calcium silicate or other approved rigid insulation adequate to support the pipe. Jacketing joints shall be sealed within silicone caulk. Pipe supports and hangars shall be plated or hot dipped galvanized after fabrication.

#### **402.2.18 TAPPING SLEEVE**

The tapping sleeves shall be constructed of heavy welded steel. The outlet flange shall be AWWA 207, Class D, ANSI 150 lb. drilling, recessed for tapping sleeve. The body finish shall be a fusion-applied epoxy coating. Gasket shall have a resistance to water, oil and hydrocarbon fluids. Bolts shall be corrosion resistant, stainless steel 18-8 type 304. A "test plug" shall be installed for testing prior to drilling pipe. A minimum service rating of 150 psi shall be required. Tapping sleeves shall be stainless steel sleeve, JCM 432, Romac SST III with stainless steel flanges, Mueller H304, Smith-Blair 665, or equal.

#### **402.2.19 DETECTION WIRE**

Detection wire shall be blue clad 16 gauge UF bury solid copper wire.

#### **402.2.20 DETECTION TAPE**

Detection tape shall be a 6" wide blue metallic tape manufactured by Allen System or an approved equal.

#### **402.3.00 CONSTRUCTION**

##### **402.3.01 HANDLING AND STORAGE**

All material shall be handled with care using straps to avoid damage to coatings and linings. Material shall not be dropped, bumped, or allowed to impact concrete, paved, or metal surfaces. The Contractor shall provide safe storage for material until it has been incorporated into the completed project. Storage shall be on skids, off the ground.

No more pipe shall be strung out on job than can be installed in one shift. The interior of all pipe, couplings, rings, fittings, and other accessories shall be kept free from dirt and other foreign matter at all times. Valves and hydrants shall be drained and stored in such a manner that will protect them from damage by freezing. Material that is supplied by the Contractor and rejected at the point of delivery because of defects or damage shall be removed from the project site and replaced by the Contractor. Material damaged subsequent to acceptance by the Engineer shall be removed from the work and replaced by the Contractor.

#### **402.3.02 INSTALLATION, ALIGNMENT AND GRADE**

Installation of C900 water mains and appurtenances shall generally conform to ANSI/AWWA Standard C600-99, or latest edition, and APWA Standard Specifications for Public Works Construction, latest edition.

All pipe shall be laid to and maintained at the lines and grades shown on the plans or directed by the Engineer. Fittings, valves, air release vents, and hydrants shall be installed at the designed locations with joints centered, spigots fully inserted, and valve and hydrant stems plumb. No deviation shall be made from the required line and grade without approval from the Engineer or City representative.

Pipe shall be laid on firm support made with pipe bedding and pipe zone material. Bedding shall be excavated for pipe bells to provide continuous support along length of pipe. The use of wood, concrete or stone blocking to support pipe is not allowed.

Pipe shall be plugged or capped to maintain a water-tight seal at the end of pipelines during construction at the end of the shift/day, or whenever the trench is to be left open for an extended period of time. The intent is to minimize the possibility of contamination from surface runoff or construction watering.

Each section of pipe shall be lowered into the trench by means of slings or straps of a type approved by the Engineer. The pipeline shall be assembled piece by piece with the pipe barrels bearing evenly along its length on the bottom of the trench. Where necessary to properly locate valves and fittings, pipe shall be neatly and squarely cut to length. Fittings shall be set in place to accurate line and grade and centered. In pipelines not encased in concrete, all fittings and bends 11- $\frac{1}{2}$  degree or more shall have thrust blocks. Restrained joint fittings may be used in lieu of thrust blocks where conflicts with other utilities or structures prevent proper thrust block placement or construction. Collars and rods or thrust blocks shall be used on all cast iron plugs and at the other locations as indicated on the drawings and as directed by the Engineer.

Minimum cover above water pipelines shall be 36". Where the street profile drawings indicate an uneven grade creating high points in the pipeline, the pipe shall be laid to a uniform slope. Hydrants are generally placed at high points in the pipeline.

#### **402.3.02A PIPE ALIGNMENT**

Pipe shall be laid accurately in conformity with the prescribed lines and grades. Gradual curvature, both horizontal and vertical, may be obtained by deflecting the pipe, but in no case shall such deflection exceed the manufacturer's stated allowable deflection angle. Pipe fittings shall be used for deflections in excess of that stated above. Bends shall have thrust blocks or joint restraint.

After each length of pipe has been laid to line and grade, there shall be no movement of the pipe to disturb its alignment.

#### **402.3.02B GROUND WATER**

Care should be taken to clean joints and to keep them free of water during construction. Whenever water is excluded from the interior of the pipe, adequate backfill shall be deposited on the pipe to prevent water excluded from the interior of the pipe, adequate backfill shall be deposited on the pipe to prevent floating. In the event of any flotation occurring, the pipe so affected shall be removed from the trench, replaced and relayed at the Contractor's expense.

Groundwater in the area may not be above the invert of the pipe. No pipe or fitting shall be lowered into a trench containing water. Water shall be pumped from wet trenches. The trenches shall be kept dry until the joints have been completed and the open ends of the main have been closed with watertight plugs or bulkheads. The plug or bulkhead shall not be removed unless the trench is dry. Every effort shall be made to keep the trench dry at all times.

#### **402.3.02C PIPE CLEANING**

Each section of the pipe and each fitting shall be thoroughly cleaned before it is lowered into the trench. Cleaning of each pipe or fitting shall be accomplished by swabbing out, brushing out, blowing out with compressed air and washing to remove all foreign matter.

#### **402.3.02D CONSTRUCTION RECORDS & SERVICE CONNECTION LOCATION**

A true and accurate record of the location of the lines, valves, services, connections and appurtenances shall be kept by the Contractor. Such record shall be furnished to the City upon completion of the work.

#### **402.3.02E DETECTION TAPE & WIRE**

Detection wire and tape shall be installed on all mainline and service lines. Detection wire shall be installed on all service lines two-inch and smaller. Detection tape shall be as manufactured by Allen Systems or an approved equal. One course of detection tape shall be installed twelve-inches above the pipe. Detection wire shall be a blue-clad 16 gauge UF bury solid copper wire located within six-inches of the top of the pipe. The wire shall be continuous in continuity and a lead shall be brought through to above the top of each valve stack. Where there is a splice, it shall be repaired with a King KWC 100 tan watertight connector or equivalent as approved by the Engineer. When installing ductile iron pipe, detection tape is required, detection wire is not.

### **402.3.03 FITTINGS, COUPLINGS, AND JOINTS**

#### **402.3.03A SETTING VALVES and FITTINGS**

Valves, fittings, plugs, and caps shall be set and jointed in pipe in the manner prescribed by these specifications, or by the approval of the City Engineer, or City representative.

#### **402.3.03B COUPLING PIPE**

##### **402.3.03B (1) RUBBER GASKET JOINT PIPE.**

Pipe with rubber gasket type joints shall be laid and jointed in strict accordance with the manufacturer's recommendations and shall be in accordance with the requirements of these Specifications. Lubricant for the pipe gaskets shall be furnished by the pipe manufacturer. Rubber gaskets shall be new and cannot be reused.

MAXIMUM DEFLECTION OF RUBBER GASKET JOINT DUCTILE IRON PIPE  
Based on 18-Foot Pipe Length

SIZE OF PIPE	BEND IN ONE JOINT ANGLE A	DEFLECTION IN INCHES D	APPROX. RADIUS IN FEET OF CURVE PRODUCED BY SECESSION OF JOINTS
6" fire hydrant	2°00'	8"	450'
6" through 12"	4°00'	15"	258'
14" through 16"	3°00'	11"	343'
18" through 24"	2°00'	8"	450'

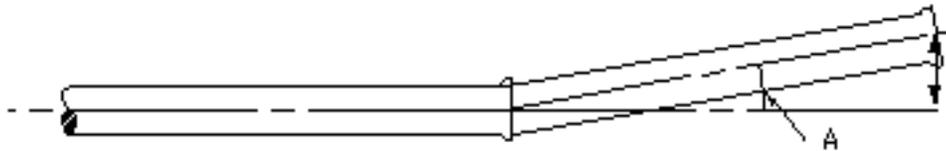


Fig. 1- Pipe Deflection

**402.3.03B (2) DUCTILE IRON PIPE**

Ductile Iron Water Pipe shall meet the requirements of ANSI/AWWA Standard C-151/A21.51-02, or latest edition. Joints shall be gasketed 'TYTON' type or mechanical type as shown on the plans. Gaskets shall conform to the requirements of ASTM F477 and ASTM D1869. Unless otherwise specified, pipe shall be minimum pressure Class 150. Minimum size for mainlines shall be 8". Hydrant lines may be reduced to 6" for runs under 400' in length

**402.3.03B (3) SCREW JOINT PIPE**

The threads of the screwed joints shall be thoroughly cleaned by wire-brushing, swabbing, or other approved method. Approved joint compound shall be applied to the threads prior to making the joint. Joints shall be water tight at test pressures before acceptance.

**402.3.03C INSTALLATION of MECHANICAL and FLEXIBLE COUPLINGS**

Mechanical and flexible couplings shall be provided where required for proper installation and as indicated on the plans, and shall be installed in accordance with the manufacturer's recommendations. Before couplings are installed, the end of the pipes shall be thoroughly cleaned of oil, scale, rust, and dirt for a distance of at least 8 inches back from the end to provide a seat for the coupling gaskets. Care shall be taken that the gaskets are wiped clean before they are installed. If necessary, they may be lubricated with pipe lubricant for installation on the pipe ends. Coupling bolts shall be tightened progressively, drawing up bolts on opposite sides a little at a time until all bolts have a uniform torque as recommended by the manufacturer.

Worker tightening bolts shall be equipped with torque-limiting wrenches or other approved

wrench capable of indicating the bolt torque. Mechanical and flexible couplings shall be tested with the pipeline. Couplings that do not pass the requirements of the leakage tests shall be removed and reassembled on the pipe, and the leakage test shall be repeated.

**MAXIMUM DEFLECTION OF MECHANICAL JOINT PIPE**

Safe Deflection for 150 PSI<sup>1</sup>  
 Based on 18-Foot Pipe Length  
 (See fig. 1)

SIZE OF PIPE	BEND IN ONE JOINT ANGLE A	DEFELCTION IN INCHES D	APPROX. RADIUS IN FEET OF CURVE PRODUCED BY SECESSION OF JOINTS
8"	4° 21'	20"	195'
10"	4° 21'	20"	195'
12"	4° 21'	20"	195'
14"	3°35'	13.5"	285'
16"	3°35'	13.5"	285'
18"	2°00'	11"	340'
20"	2°00'	11"	340'
24"	2°23'	9"	450'
30"	2°23'	9"	450'
36"	2°05'	8"	500'
42"	2°00'	7.5"	510'
48"	2°00'	7.5"	510'

<sup>1</sup> For pressures above 150 PSI, reduce the tabulated deflection by 10% for each additional 150 PSI.

**402.3.03D MECHANICAL JOINT VALVES, FITTINGS and APPURTENANCES**

Mechanical joint valves, fittings, and appurtenances vary slightly with different manufacturers, and the particular fittings furnished shall be installed in accordance with the manufacturer's recommendations as approved by the Inspector. All appurtenances attached to fittings and/or valves shall be of the same manufacture and material.

The ends of the valves and fittings shall be thoroughly cleaned of all dirt, mud, and other foreign matter by washing with water and scrubbing vigorously with a wire brush. The gland and gasket shall be slipped on the plain end. If necessary, the gasket may be lubricated with approved pipe lubricant to facilitate sliding in place. The end of the pipe shall then be guided carefully into the bell of the fitting. The spigot shall be centered in the bell, the gasket placed in position, and the bolts inserted in the holes.

Torque ranges to be applied to cast iron bolts, shall be as follows:

Diameter of Bolt (in.)	Torque Range (Ft.-lbs.)	
5/8	40	60
3/4	60	90
1	70	100
1-1/4	90	120

When tightening bolts, the gland should be brought up to the flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This shall be done by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, and lastly, the remaining bolts. This cycle shall be repeated until all bolts are within the required recommended range of torques. If effective sealing is not attained at the maximum torque, the joint shall be disassembled thoroughly cleaned and checked for irregularities, and reassembled using the same procedure.

**402.3.03D (1) FLANGED DUCTILE IRON PIPE and FITTINGS:**

Flanged ductile iron pipe and cast iron fittings shall be furnished and installed as shown on the plans.

The flanges shall be thoroughly cleaned by washing or other approved method. The pipe shall be carefully aligned and faces brought together so that the bolt holes are lined up. The gaskets shall be inserted and bolts slipped in place. Bolts shall be drawn up gradually so that the tension is equal and the faces of the flanges are in close contact over the entire area.

Flanges, where required, shall be steel ring flanged, conforming to A.W.W.A. C207, Class D. Flanges shall be faced and drilled 125 pound or 250 pound U.S.A.S. as directed. Steel blind flanges for use on welded steel pipe shall be as shown.

**402.3.03D (2) FLANGED JOINTING MATERIALS:**

All nuts, bolts, and gaskets required for jointing the flanged pipe, fittings, and appurtenances shall meet the requirements of AWWA. C207. Gaskets shall be ring or full-cut with holes to pass the bolts, of rubber or neoprene composition, . inch thick.

Prior to joining flanged valves the flange faces shall be thoroughly cleaned. After cleaning, insert the gasket and tighten the nuts progressively and uniformly. If flanges leak under pressure, loosen the nuts, reset or replace the gasket, retighten the nuts, and retest the joint. Joints must be watertight at test pressures before acceptance.

**402.3.03E RUBBER GASKET JOINT PIPE**

Pipe with rubber gasket type joint shall be laid and jointed in strict accordance with the manufacturer's recommendations as approved by the Inspector and in accordance with the requirements of the Special Specifications (if applicable). The Contractor shall provide all special tools and devices such as special jacks, chokers, and similar items required for the installation. Lubricant for the pipe gaskets shall be of the type recommended by the pipe manufacturer, and no substitute will be permitted under any circumstances.

**402.3.03F ELECTRICAL CONTINUITY**

When so stated in the Specifications, the Contractor shall provide adequate means to permit an electric current to pass across all pipe joints without excessive voltage drop. The electrical connection shall be made by driving silicon-bronze wedges between the barrel of the pipe and the mouth of the bell where joints using rubber rings are employed.

Two such wedges shall be installed per joint on opposite sides of the pipe on the horizontal

centerline. The wedges shall be approximately one inch square and shall be tapered from . inch to 1/16 inch approximately. The wedges shall have serrated edges to provide good contact. The voltage drop at 500 amperes current flow shall not exceed 1.0 volt per joint.

#### **402.3.03G TIE RODS**

Tie rods and/or thrust blocks are required on all mechanical joint branch valves and fittings. Tie rods shall be of such a diameter and strength of material to prevent separation of valves or fittings from the mainline under test pressures. Tie rods shall be a minimum of two (2) 3/4 – inch diameter all-thread ASTM Grade 304 (18-8) stainless steel rods. On pipe sizes 10” diameter and larger, a minimum of 4 rods or more may be required as determined by the Engineer for the test pressures anticipated. Rods shall be of sufficient length to provide that all threads on any tightened nut are in contact and seated with rod threads. Additional mainline tie rods, or other restraint, may be required in certain instances at the direction of the City Engineer or City representative.

Note: Tie rods may be used in lieu of thrust blocks as an alternate means of restraint only with the Engineer's approval (See 402.3.08C). Tie rods may be required to supplement thrust blocking for proper installation. Tie rods shall be used in conjunction with 3/4 -inch high strength low alloy steel eye bolts in conformance with AWWA C111-80. Use of Tie rods through MJ flange bolt holes is not permitted.

#### **402.3.03H CUTTING PIPE**

- 1) Ductile Iron, rubber-gasketed joint pipe shall be cut in the field as recommended by the pipe manufacturer. The pipe may be cut cold in the field using rolling pipe cutters or Carborundum cutting wheel. The cut end shall be reconditioned so that it may be used for the next joint. On rubber gasket joint pipe, the outside of the cut shall be tapered back, or dressed as recommended by the pipe manufacturer, and approved by the Inspector prior to installation.
- 2) PVC Pipe: All cuts on C900 pipe shall be made by proper pipe cutting tools designed specifically for that purpose. Cuts shall be made in accordance with the pipe manufacturer's recommendations.
- 3) Flame Cutting: Cutting pipe with an oxyacetylene torch or electric arc shall not be allowed.

### **402.3.04 HYDROSTATIC TESTING/LEAKAGE**

#### **402.3.04A HYDROSTATIC TESTS**

Once the new pipe has been disinfected and all of the required number of bacteriological tests have come back negative a hydrostatic test shall be performed on buried pipe after the trench has been backfilled, and before permanent pavement is placed over the trench. Contractor shall be responsible for securing pipe and fittings during testing. Where any section of pipe is provided with concrete thrust blocking, the pressure test shall not be made until at least 5 days have elapsed after the concrete blocking is installed. If high-early cement is used for the concrete thrust blocking, the time may be cut to 2 days instead of the 5 previously specified.

Duration of the hydrostatic test shall be 1 hour with an allowable leakage not greater than that calculated from the formulas in Section 402.3.04B. All visible leaks shall be repaired and re-tested before the pipe trench is completely backfilled.

Any and all testing necessary for final acceptance shall be performed by a certified individual

under the supervision of the City of Sisters. This work shall conform to procedures specified by the City of Sisters (see 402.3.06 Leakage/Hydrostatic Testing & Disinfection Procedures).

#### **402.3.04B LEAKAGE**

Leakage is defined as the quantity of water necessary to restore the specified test pressure at the end of the test period. No pipe installation will be accepted until the leakage is less than the total gallons per hour allowed as determined by the formulas below. Should any hydrostatic test disclose leakage greater than that allowed, the Contractor shall locate and repair the defective joints or pipe, and repeat the hydrostatic test, at contractor's own expense, until the leakage is within the specified allowable amount. Piping or jointing having visual leakage will not be accepted, and shall be repaired or replaced and re-tested.

**Ductile Iron:** Allowable leakage shall be determined by the formula:

$$G = LD / P / 133,200$$

Where: G=Allowable leakage (gal/hr)  
L= Length of pipe tested (feet)  
D=Nominal diameter of pipe (inches)  
P=Average test pressure (psi). Equal to two times the system pressure, but not less than 150 psi.

**C900 PVC:** Allowable leakage shall be determined by the formula:

$$G = ND / P / 7400$$

Where: G = Allowable leakage (gal./hr.)  
N = Number of joints in the section tested (pipe and fittings). In 1000' of 18' lengths, there are 55.5 pipe joints. Each fitting has 2 joints.  
D = Nominal diameter of pipe (in.)  
P = Average test pressure (psi). Equal to two times the system pressure, but not less than 150 psi.

#### **402.3.05 DISINFECTION**

Disinfection of new lines shall be completed prior to connections with existing water distribution piping systems. Approval by City Engineer, or City Representative, must be acquired prior to this work. Disinfection shall be performed by a certified individual under the supervision of the City of Sisters. This work shall conform to the procedures specified by the City of Sisters Public Works Department.

#### **402.3.06 LEAKAGE/HYDROSTATIC TESTING & DISINFECTION PROCEDURES**

##### **402.3.06A SCOPE**

The testing of water lines for conformance with the requirements for the City of Sisters and the Oregon State Health Department shall be the responsibility of the Contractor. This testing includes hydrostatic pressure testing, chlorination, flushing, and bacteriological testing. The City approved laboratory, will perform all tests according to approved procedures. The City Representative will monitor and observe all testing procedures and collection of all water samples for bacteriological testing.

#### **402.3.06B CERTIFICATION**

The Contractor or Contractor's employee shall be not less than a State of Oregon Certified Water Distribution Systems Operator I. This person shall be present during and shall supervise all phases of these procedures.

The Contractor or Contractor's representative shall demonstrate knowledge of the steps required for chlorinating/flushing/testing; and conduct a field demonstration of technique.

#### **402.3.06C MATERIALS**

Equipment used for testing shall be kept clean and disinfected at all times. Tanks, hoses, pumps or any equipment directly in contact with any potable water piping or City of Sisters water facilities shall be dedicated for potable water use only. Equipment is subject to inspection and/or testing by the City at any time to prove compliance with these specifications.

The Contractor will supply all water and chemicals used for test procedures. The chlorine used will be approved by the City of Sisters prior to use. In some cases the City may be able to provide water. The method of chlorination will be by injection. Slug chlorination will not be allowed. The Contractor will also be responsible for the safe disposal of chlorinated water at the completion of the test.

#### **402.3.06D PROCEDURES**

Testing procedures shall be performed during normal City working hours, 7:00 AM to 4:00 PM, Monday through Friday. Pressure testing will be scheduled to allow completion of all tests within the normal working hours. Chlorination and pressure tests will not be performed when the temperature is expected to be less than 33° between the hours of 8 AM and 4 PM. Chlorine residual tests require a minimum of 24 hours.

The Contractor's personnel shall not operate any valve connected to the City water distribution system.

#### **402.3.06E FLUSHING**

The Contractor will be responsible for all flushing activity, including, but not limited to, flushing air from services and main lines at time of chlorination, flushing chlorinated water after all chlorination and re-chlorination, and as directed by the City's Representative prior to chlorination in case of dirty installation conditions.

The Contractor shall thoroughly flush all lines. Flushing velocity shall not be less than 3 fps. Flushing is considered completed when the system chlorine residual matches the background chlorine residual level of the City water distribution system at the source of water used for flushing.

#### **402.3.06F CHLORINATION**

The Contractor will be responsible for chlorine taps. Taps are required on all dead ends, and may be required on high points to vent trapped air. Taps will be coordinated and observed by the City of Sisters.

Before chlorination, the City Representative will witness all valves being opened in the system being chlorinated.

The City approved representative will sample chlorine residuals as follows:

After chlorination (beginning of test initial value).

Prior to the chlorination solution being flushed at the end of the 24 hour test period (finish value).

The system water after the system has been thoroughly flushed.

A maximum of 75.00 PPM and a minimum of 25.00 PPM of free residual chlorine are the acceptable limits for the initial test. Optimum free chlorine residual for the initial test is 50.00 PPM. Any residual above or below the acceptable initial limits shall be grounds for restarting the chlorination test. If the finish residual value after 24 hours varies from the starting value by 60% or more, the test will be deemed to have failed, and the pipeline shall be thoroughly flushed and re-chlorinated in accordance with the specified procedures.

If a passing residual level is not obtained after three chlorination treatments of the system, the pipeline will be deemed to be contaminated and will not be accepted. The Contractor shall remove the contaminated pipeline and replace all pipe at his own expense.

#### **402.3.06G BACTERIOLOGICAL**

When the chlorination test has passed and been accepted, the system shall be thoroughly flushed until the chlorine residual is equal to the chlorine residual at the source of the water used for flushing. Twenty-four (24) hours after completion of flushing, a City approved representative of the testing contractor, or approved testing laboratory representative, shall draw bacteriological samples from the closed system.

There will be a minimum 48 hour period between collecting the chlorination sample and the scheduling of the beginning of the pressure testing to permit an acceptable bacteriological test to be conducted. If the bacteriological test result is negative, pressure testing of the main can proceed. However, if the bacteriological test result is positive, re-chlorination of the system is required. When re-chlorination is required because of a failed sample, a companion sample set will be taken with the second primary sample set.

#### **402.3.06H PRESSURE TESTING**

Prior to pressure testing, all air will be flushed and expelled from the system. The City Representative will witness all valves checked to be open, and all service stops and hydrants securely closed.

Pressure testing should be done from the high end of the main, unless otherwise directed by the City of Sisters. The test pressure shall be two times (2X) the system pressure, but not less than 150 psi, for a period of not less than one hour.

The Contractor's pressure testing equipment (hoses from pump to metering device and from metering device to main) will be made up to connect thru a 3/4" meter. The City will approve the meter and gauge for pressure testing.

The length of the pressure test will be one hour. The allowable leakage shall be determined from the chart in the City of Sisters Water Specifications.

In-line valves in the test section shall be open during the 1-hour test. Once the line has passed, the in-line valve farthest from the pressure gauge shall be closed and the line pressure from that point on reduced to normal system operating pressure. Pressure shall be observed for 10 minutes. If there is no drop in pressure, close the next in-line valve towards the pressure gauge, reduce pressure beyond that valve, observe for 10 minutes and repeat until all in-line valves have been tested. If the pressure drops during any of the in-line valve

tests, repair as necessary and repeat the 1-hour test for the section of line with that valve at one end.

**402.3.06I OTHER TESTS**

The City Representative may require other tests, such as Volatile Organic Chemicals, Inorganic Chemicals, Synthetic Organic Chemicals, if he has reason to believe the line has been contaminated with such compounds. The costs for these tests may be substantial and shall be borne by the Contractor/Developer. Failure to pass such other tests will be grounds to reject the work, and may require that the pipe be replaced prior to further testing and acceptance.

**402.3.06 J CLEAN-UP**

Upon completion of the testing and acceptance of the tests by the City of Sisters, the Contractor shall clean the area and set valves to closed or open as directed by the City.

**402.3.07 HOT TAPS**

When shown on the plans, or as directed by the City Engineer, branches and large services may be connected to existing City of Sisters facilities by utilizing a tapping sleeve and tapping valve. The performance of this procedure shall be completed only by a City approved contractor. Approval shall be requested from the City Engineer, or City authorized representative, 48 hours in advance of performing the hot tap. No pipe shall be exposed without a City representative on-site.

Hot taps shall be scheduled only during the hours of 7:30AM to 3:30 PM, Monday through Friday. No hot taps shall be performed in cold weather until the air temperature is 35°F and rising, and no inclement weather is forecasted.

**TAPPING SLEEVE REQUIREMENTS**

Sleeve Types as Manufactured by JCM, Mueller, Romac, or Smith-Blair

1. Epoxy coated Fabricated Steel Sleeve; JCM 532 or equal.
2. Stainless Steel Sleeve: JCM 432; Romac SST III (with stainless steel flanges); Mueller H304; Smith-Blair 665, or equal.

**Note: numbers in tables below correspond to accepted sleeve types.**

**FOR TAPS OTHER THAN SIZE- ON- SIZE**

Type of Main being Tapped	Main 8" and under	Main 10" or 12" Tap 8" & under	12" Main 10" Tap	Main 14" & up Tap 8" & Under	Main 14" & up Tap 10" & 12"
C-900 Plastic	2	2	2	N/A	N/A
Steel Size Plastic	2	2	N/A	N/A	N/A
Ductile Iron	2	2	2	1	1
Transite	2	2	2	1	1
Steel	2	2	2	1	1

N/A = Not Applicable

N/R = Not Recommended

**402.3.08 SERVICES**

1. Fittings for copper tubing shall be pack joint.
2. All services shall have minimum 30 inches of cover.
3. Approved bedding material shall be placed at least 4" below and at least 12" above all pipes. Material shall be hand tamped or water jetted to achieve 95% of maximum density.
4. Approved meter boxes with lids shall be installed at each meter location. The meter box shall be centered on the meter assembly and adjusted to existing ground level or proposed finished grade. All meter boxes shall be of the type as specified in the Water Service and Meter Installation Manual.
5. The main corporation stop shall be Copper Pack or approved equal.
6. Angled meter stops shall be Mueller or approved makes/models.
7. All services shall be blown free of all foreign objects before connecting the double check valve.
8. All services to be flushed and checked for flow.
9. Meter boxes shall be set directly behind the sidewalk or directly behind the curb where there is no sidewalk. Meter boxes are not to be located in sidewalks or driveways.
10. Where necessary, Meter boxes in traffic areas; e.g. streets, alleys, and parking lots shall be Armor, Armorcast, BES or Carson boxes fitted with concrete polymer lid rated to 10,000 lbs.
11. Commercial and industrial services, fire-lines, and all water services larger than 1" shall have an approved double check valve assembly installed on the service side of the meter.
12. Any service rising 30" or more above the top of the main shall have an approved double check valve assembly installed on the service side of the meter.
13. 3/4" Service runs shall not exceed 60 feet.
14. Service runs shall not contain fittings or unions unless approved by the City Engineer.
15. Service taps on C-900 shall be with a Ford S90 series tapping saddle or Romac 101S for 3/4" and 1" taps or 202S for 1.5" and 2" taps.
16. Electrical continuity shall be provided as shown in the standard drawings on all services.
17. All new townhomes (separate tax lots) shall have separate meters and shut offs installed in individual conventional meter boxes. These shall be served by individual 3/4" or 1" copper service lines. Triplexes, four-plexes and other multi-family buildings will be master metered. Service size to be determined by Design Engineer and/or Building Official.
18. Pressure reducing valves may be required in areas of excess pressure, PRV's shall be placed on customer side of meter. PRV's will be maintained by property owner.
19. Water service meter boxes shall be set with a minimum separation of 18-inches between each water meter box to facilitate water meter maintenance. All water services shall have a minimum of 10 feet horizontal separation from power and other utilities in the public right-of-way.
20. All property that is the subject of a site plan, or any new construction that is being served by an inadequate water service as determined by the City Engineer, shall be required to upgrade the existing water service to current City Standards.
21. All existing water services that are being abandoned must be cut and capped at the water main. All costs for abandonment shall be borne by the Developer/property owner. Whenever possible, the water service to be abandoned shall be physically removed. When a service is abandoned and left in place, its location (horizontal and vertical) shall be noted on the Record Drawings.

## **402.3.09 THRUST BLOCKING**

### **402.3.09A MATERIALS**

Concrete for thrust blocking and hydrant support shall conform to ASTM C 94, Alternate 2 and shall be proportioned to obtain a 28-day compressive strength of 2,500 pounds per square inch. Mix design with current material certifications and compressive strength test results shall be submitted prior to placement of Concrete. "Sacrete" type products are not allowed.

### **402.3.09B ANCHORAGE**

- a) Limiting Pipe Diameter and Degree of Bend: On all pipe lines 4 inches in diameter or larger, all tees, plugs, caps, 11<sup>+</sup>° or greater bends, and other locations where unbalanced force exist, shall be securely anchored by suitable thrust blocking or other restraint as shown on the Plans or hereinafter specified.
- b) Thrust Blocking: Reaction or thrust blocking shall be placed as shown on the Plans and shall consist of concrete. Concrete blocking shall be placed between the undisturbed ground and the fitting to be anchored. The quantity of concrete and the area of bearing on the pipe shall be as shown on the Plans or as directed by the Inspector. The blocking shall be placed so it will not obstruct repairs to the joint, unless specifically shown otherwise on the Plans. The pipe and fitting joints shall be wrapped with plastic sheeting before placing concrete.

### **402.3.09C METAL HARNESS**

Metal harness consisting of tie rods or clamps of adequate strength to prevent movement may be used instead of concrete blocking as an alternative means only with the Engineer's approval. Steel rods or clamps shall be stainless steel, galvanized, or otherwise rustproof treated as directed by the Inspector.

### **402.3.09D EXISTING THRUST BLOCKS**

No existing thrust blocks shall be removed by the Contractor unless a City of Sisters representative is on-site for inspection and coordination.

### **402.3.09E JOINT RESTRAINT**

On all pipelines 6 inches in diameter or larger, all tees, caps, plugs, and bends 11 ¼ degrees or greater, and other locations where unbalanced forces exist, shall be securely anchored by suitable mechanical restraints as specified on the plans or table below.

Joint restraint shall be installed on water pipelines and branches in accordance with the Joint Restraint Table below. Joint restraint shall be installed at all mechanical fittings and at pipe joints within the distance shown in the table.

## JOINT RESTRAINT TABLE

<b>FITTING</b>	<b>LENGTH -BRANCH</b>	<b>LENGTH -RUN</b>
	(Feet)	(Feet)
6" x 6" TEE	15	0
6" 90° BEND		15
6" 45° BEND		6
6" 22 ½° BEND		3
6" 11 ¼° BEND		1
8" x 6" TEE	9	0
8" x 8" TEE	26	0
8" x 4" REDUCER		33
8" x 6" REDUCER		19
8" 90° BEND		20
8" 45° BEND		8
8" 22 ½° BEND		4
8" 11 ¼° BEND		2
8" CAP		46
12" x 6" TEE	1	
12" x 8" TEE	15	
12" x 12" TEE	45	
12" x 6" REDUCER		47
12" x 8" REDUCER		34
12" x 10" REDUCER		32
12" 90° BEND		28
12" 45° BEND		11
12" 22 ½° BEND		5
12" 11 ¼° BEND		3
12" 45° BEND	ROTATED DOWN	27
12" 22 ½° BEND	ROTATED DOWN	13

Pipe Zone bedding shall be compacted to 95% of AASHTO T-99-74 Method C.

The restrained lengths are based on 150 PSI test pressure, and are the lengths required on each side of the bend or fitting.

### 402.3.10 DEADMAN TABLE

Deadman requirement: Able to withstand twice test pressure - 360 psi

#### THRUST (lbs)

Pipe (in.)	Plug	90°	45°	22-2°	11-3°
6	13,460	19,037	10,303	5,252	2,638
8	23,159	32,749	17,723	9,036	4,540
10	34,837	49,266	26,662	13,594	6,829
12	49,266	69,671	37,706	19,224	9,659
14	66,186	93,604	50,659	25,826	12,974
16	85,604	121,061	65,516	33,401	16,780

#### CONCRETE (cubic yards)

Pipe (in.)	Plug	90°	45°	22-2°	11-3°
6	3.3	4.7	2.5	1.3	0.7
8	5.7	8.1	4.4	2.2	1.1
10	8.6	12.2	6.6	3.4	1.7
12	12.2	17.2	9.3	4.7	2.4
14	16.3	23.1	12.5	6.4	3.2
16	21.1	29.9	16.2	8.2	4.1

## 402.4.00 MEASUREMENT AND PAYMENT

### 402.4.01 PIPE

Measurement and payment for water pipe will be made on a linear foot basis for the type and size of pipe installed. No reduction in length will be made for valves and fittings unless specified.

### 402.4.02 FITTINGS

Measurement and payment for fittings will be made on a per each basis for the type, kind, and size specified and installed. No separate or additional payment will be made for restrained couplings, joint lubricant, nuts and bolts, washers, and other fitting related hardware or supplies.

### 402.4.03 SERVICES

Measurement and payment for water services shall be on a per each basis for the type, kind and size specified. Measurement includes all valves, piping, fittings, jumpers, grounding strap, clamps, meter box, insulation, and backflow prevention devices required for a complete installation in accordance with the Water Service and Meter Installation Manual for the type and size indicated.

### 402.4.04 THRUST BLOCKS

Measurement and payment for thrust blocks will be made on a per each basis for each thrust block installed. No allowance will be made for additional concrete required for over-excavated areas.

### 402.4.05 INCIDENTAL BASIS

When neither specified nor listed in the proposal for separate payment, Pipe, Fittings, services, and Thrust Blocks shall be considered incidental work for which no separate payment will be made.

#### **402.4.06 TESTING AND DISINFECTION**

When neither specified nor listed in the proposal for separate payment, flushing, chlorination, and hydrostatic testing shall be considered incidental work for which no separate payment shall be made.

### **403 VALVES**

#### **403.1.00 DESCRIPTION**

##### **403.1.01 GENERAL**

This section covers the work necessary for furnishing and installing valves and appurtenances.

#### **403.2.00 MATERIALS**

##### **403.2.01 RESILIENT SEATED GATE VALVES**

Buried epoxy coated, iron body gate valves shall meet AWWA standards (C-509 or C515), have non-rising stems, be rated at 200 lbs. working pressure and 350 lbs. hydrostatic pressure, open left with 2" square operating nuts, resilient seat, with brass fittings, "O" ring stem pressure seals, non-directional, mechanical joints with full body glands (AWWA C-110); as manufactured by Mueller, Kennedy and American Flow Control, and/or approved by the City Engineer, or representative. Special attention should be made of AWWA specification, Section 10-4-3.

Above ground or in-vault gate valves shall be equipped with hand wheels.

##### **403.2.02 BUTTERFLY VALVES**

Butterfly valves shall meet the strength and performance characteristics of AWWA C 504, latest edition, Class 150-B, mechanical joint etc., except worm gear operators are not permitted. Manufacturer shall be Mueller, Pratt Groundhog, American Flow Control, CLOW or approved equal. Butterfly valves shall be required on all water lines of 10" size and larger, or where 24" of cover over the operating nut cannot be obtained on smaller mains. Variance may be obtained for special valve installation from the City Engineer, or his representative. Above ground or in-vault butterfly valves shall be equipped with hand wheels.

##### **403.2.03 VALVE BOXES**

All valve boxes shall be a two piece grade adjustable box. The valve box shall have 5-inch I.D. with a slip top section without a dirt flange on the bottom. Valve boxes shall be Tyler Model 6855 or equal as shown in the Standard Drawings. The extension piece shall be of the proper length for depth of cover. The word "WATER" shall be cast into the top of the lid. Where valve boxes are located outside of pavement they shall be provided with a 6" thick concrete collar not less than 24" square. Valve clusters may be set in a single collar provided there is not less than 12" from the edge of the valve box to the edge of concrete.

## **403.2.04 CHECK VALVES**

### **403.2.04A SWING CHECK TYPE**

Swing check valves shall be bronze mounted with cast or ductile iron body with outside lever and spring unless otherwise specified.

### **403.2.04B SPRING LOADED PLUG or DISC TYPE**

Spring loaded plug or disc type check valves shall be bronze mounted with bronze, cast, or ductile iron body, bronze plug or disc, stainless steel spring and resilient seal suitable for clear cold water service. The plug or disc of the check valve shall be easily removable and replaceable.

### **403.2.04C HYDRAULIC CUSHION TYPE**

Hydraulic cushion type check valves shall be of bronze, cast or ductile iron with bronze disc and disc faces, seat rings, and pivot pins. The valve shall provide drop-tight sealing. The valve shall be provided with an adjustable speed, integrally mounted, oil dashpot mechanical snubber system.

## **403.3.00 CONSTRUCTION**

### **403.3.01 VALVES**

#### **403.3.01A GENERAL**

Before installation, valves shall be carefully cleaned of all dirt, debris, and foreign material and inspected in open-closed position. Valves shall be installed in accordance with the applicable portions of these Specifications. Unless otherwise indicated, gate valves shall be mounted with the stem vertical. Butterfly valves shall be mounted with the stem vertical and on the 'curb' side of the main. Horizontal valves shall be mounted in such a manner that adequate clearance is provided for operation. Installation practices shall conform to the manufacturer's recommendations.

#### **403.3.01B VALVE BOXES**

A metal valve box shall be provided for every valve which has no gearing or operating mechanism, or in which the gearing or operating mechanism is not fully protected with a cast iron grease case. The valve box shall not transmit shock or stress to the valve, and shall be centered and plumb over the operating nut of the valve. The box cover shall be flush with the surface of the finished pavement, concrete pad, or such level as may be directed by the Inspector.

Valve operating nuts that are deeper than 3' from finish grade shall have a valve operating nut extension installed prior to setting the valve box. The valve operating nut extension shall be installed with a set-screw to attach the extension to the valve operating nut.

## **403.4.00 MEASURE AND PAYMENT**

#### **403.4.01 VALVES**

Measurement and payment for valves will be made on a per each basis for the type, kind, and size specified. Payment shall include all materials, labor, equipment, and incidentals required to furnish and install valves and valve boxes complete and operational.

#### **403.4.02 BACK FLOW PREVENTION DEVICES**

Measurement and payment for Backflow Prevention Devices will be made on a per each basis for the type, kind, and size specified.

#### **403.4.03 INCIDENTAL BASIS**

When neither specified nor listed in the proposal for separate payment, valves, valve boxes, and backflow prevention devices shall be considered incidental work for which no separate payment will be made.

### **404 FIRE HYDRANTS**

#### **404.1.00 DESCRIPTION**

##### **404.1.01 GENERAL**

This section covers the work necessary for furnishing and installing fire hydrants.

##### **404.1.02 CERTIFICATION**

The Contractor shall furnish material certifications.

#### **404.2.00 MATERIALS**

##### **404.2.01 HYDRANTS**

Traffic model fire hydrants will meet AWWA specifications C-502 with dry top. Hydrants shall have a center stem compression, 5<sup>1</sup>/<sub>2</sub>-inch valve opening, two 2.-inch hose nozzles with National Standard Threads and one 5" Storz by 4 1/2" NST Adapter with cap and cable, 6-inch mechanical joint inlet connection, open left (1) - 1.-inch pentagon operating nut, and gaskets in nozzles. **The hydrants shall be painted with the City approved "safety red" paint.** To reduce the number of different hydrants in the system, the preferred models are Kennedy, M & H, or Mueller. Other hydrant makes/models shall be approved by the City Engineer. The barrel length will fit 4.5, 5, or 5.5 foot trench as required. A brass seating ring is required. Hydrants must be painted with proper color before acceptance of installed water system.

##### **404.2.02 HYDRANT EXTENSIONS**

Provide the appropriate hydrant height for the installation based on the construction drawings to avoid the need for hydrant extensions. If unavoidable, hydrant extensions shall be of same manufacture as hydrant and only one extension is permitted per hydrant.

##### **404.2.03 GRAVEL FOR DRAINAGE**

Gravel for drainage under fire hydrants shall be graded river gravel free of organic matter, sand, loam, clay and other small particles that will tend to restrict water flow through the gravel.

#### **404.2.04 GEOTEXTILE**

When required to protect the drain rock from contamination, geotextile fabric shall be placed against, and to 24-inches beyond gravel or soil at the limits of the excavation for drain rock to prevent fines from migrating into the drain rock. The geotextile shall be a commercial fabric designated for this application, and shall be approved by the Engineer's representative prior to incorporation in the work.

#### **404.3.00 CONSTRUCTION**

##### **404.3.01 HYDRANTS**

###### **404.3.01A LOCATION**

Hydrants shall be located as shown on the Plans or as directed by the Engineer. The final location of all hydrants will require approval from the City Engineer and the Fire Department prior to installation. All hydrants shall have two (2) reference points (swing ties) indicating the face of hydrant, top of curb, and face of curb.

Hydrants located in areas not protected by curb shall be protected by a 6' X 6' concrete pad and bollards as shown in Standard Drawing 4-14. Hydrants located adjacent to any vehicular traffic areas shall be protected on the side facing traffic by a minimum of two (2) bollards as shown in the Standard Drawings.

###### **404.3.01B POSITION**

No hydrant shall be set within 25 feet of a dry well unless specifically permitted by the City Engineer. No hydrant shall have more than a 6 foot bury. All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb with the pumper nozzle facing the curb. Hydrants shall be set to the established grade with the bottom edge of break off flange no less than 3 inches, nor more than 6 inches, above the top of the concrete slab as shown on the plans or as directed by the Inspector. Hydrant pads shall be placed flush with sidewalks and curbs at a slope of 0.02/FT or as directed by the Inspector.

###### **404.3.01C HYDRANT DRAINAGE**

Unless otherwise specified in the Plans or Special Conditions, hydrant drainage shall be provided at the base of the hydrant by placing a geotextile mat against native earth, and graded river gravel from the bottom of the trench to at least 6 inches above the waste opening in the hydrant, and to a distance of one foot around the bowl. No drainage system shall be connected to a sewer. A concrete base of at least 12 inches square by 4 inches deep, shall be provided for all hydrants.

###### **404.3.01D ANCHORAGE of HYDRANTS**

The bowl of each hydrant shall be well braced against undisturbed earth at the end of the trench with concrete blocking, or it shall be tied to the water main pipe with suitable metal tie rods and clamps, or both if required, as shown on the plans or as directed by the Inspector.

###### **404.3.01E PAINTING**

Prior to final acceptance by the City all hydrants shall be re-painted with one (1) coat of rust preventive paint, at least 6 mils thick. Paint shall be applied with a brush. Color shall be City approved Safety Red. For a typical hydrant installation see Standard Drawings. Steel bollards shall be painted with one or more coats of 'Safety Red'.

#### **404.4.00 MEASUREMENT AND PAYMENT**

Measurement and payment will be made on per each basis for the type of hydrant specified and installed. Payment shall include all materials, labor, and equipment to furnish and install hydrant, bury and risers, drain rock, geotextile fabric, thrust blocking and tie-backs, concrete pad and bollards, and painting, complete and accepted by the Inspector.

When specified and listed in the proposal, payment shall include 6-inch hydrant valve and C900 PVC piping from the water main.

When neither specified nor listed in the proposal for separate payment, Hydrants shall be considered incidental work for which no separate payment will be made.

Buried epoxy coated, iron body gate valves shall meet AWWA standards (C-509 or C515), have non-rising stems, be rated at 200 lbs. working pressure and 350 lbs. hydrostatic pressure, open left with 2" square operating nuts, resilient seat, with brass fittings, "O" ring stem pressure seals, non-directional, mechanical joints with full body glands (AWWA C-110); as manufactured by Mueller, Kennedy and American Flow Control, and/or approved by the City Engineer, or representative. Special attention should be made of AWWA specification, Section 10-4-3.

Above ground or in-vault gate valves shall be equipped with hand wheels.

#### **403.2.02 BUTTERFLY VALVES**

Butterfly valves shall meet the strength and performance characteristics of AWWA C 504, latest edition, Class 150-B, mechanical joint etc., except worm gear operators are not permitted. Manufacturer shall be Mueller, Pratt Groundhog, American Flow Control, CLOW or approved equal. Butterfly valves shall be required on all water lines of 10" size and larger, or where 24" of cover over the operating nut cannot be obtained on smaller mains. Variance may be obtained for special valve installation from the City Engineer, or his representative. Above ground or in-vault butterfly valves shall be equipped with hand wheels.

#### **403.2.03 VALVE BOXES**

All valve boxes shall be a two piece grade adjustable box. The valve box shall have 5-inch I.D. with a slip top section without a dirt flange on the bottom. Valve boxes shall be Tyler Model 6855 or equal as shown in the Standard Drawings. The extension piece shall be of the proper length for depth of cover. The word "WATER" shall be cast into the top of the lid. Where valve boxes are located outside of pavement they shall be provided with a 6" thick concrete collar not less than 24" square. Valve clusters may be set in a single collar provided there is not less than 12" from the edge of the valve box to the edge of concrete.

#### **403.2.04 CHECK VALVES**

##### **403.2.04A SWING CHECK TYPE**

Swing check valves shall be bronze mounted with cast or ductile iron body with outside lever and spring unless otherwise specified.

##### **403.2.04B SPRING LOADED PLUG or DISC TYPE**

Spring loaded plug or disc type check valves shall be bronze mounted with bronze, cast, or ductile iron body, bronze plug or disc, stainless steel spring and resilient seal suitable for clear cold water service. The plug or disc of the check valve shall be easily removable and replaceable.

#### **403.2.04C HYDRAULIC CUSHION TYPE**

Hydraulic cushion type check valves shall be of bronze, cast or ductile iron with bronze disc and disc faces, seat rings, and pivot pins. The valve shall provide drop-tight sealing. The valve shall be provided with an adjustable speed, integrally mounted, oil dashpot mechanical snubber system.

### **403.3.00 CONSTRUCTION**

#### **403.3.01 VALVES**

##### **403.3.01A GENERAL**

Before installation, valves shall be carefully cleaned of all dirt, debris, and foreign material and inspected in open-closed position. Valves shall be installed in accordance with the applicable portions of these Specifications. Unless otherwise indicated, gate valves shall be mounted with the stem vertical. Butterfly valves shall be mounted with the stem vertical and on the 'curb' side of the main. Horizontal valves shall be mounted in such a manner that adequate clearance is provided for operation. Installation practices shall conform to the manufacturer's recommendations.

##### **403.3.01B VALVE BOXES**

A metal valve box shall be provided for every valve which has no gearing or operating mechanism, or in which the gearing or operating mechanism is not fully protected with a cast iron grease case. The valve box shall not transmit shock or stress to the valve, and shall be centered and plumb over the operating nut of the valve. The box cover shall be flush with the surface of the finished pavement, concrete pad, or such level as may be directed by the Inspector.

Valve operating nuts that are deeper than 3' from finish grade shall have a valve operating nut extension installed prior to setting the valve box. The valve operating nut extension shall be installed with a set-screw to attach the extension to the valve operating nut.

### **403.4.00 MEASURE AND PAYMENT**

#### **403.4.01 VALVES**

Measurement and payment for valves will be made on a per each basis for the type, kind, and size specified. Payment shall include all materials, labor, equipment, and incidentals required to furnish and install valves and valve boxes complete and operational.

#### **403.4.02 BACK FLOW PREVENTION DEVICES**

Measurement and payment for Back flow Prevention Devices will be made on a per each basis for the type, kind, and size specified.

#### **403.4.03 INCIDENTAL BASIS**

When neither specified nor listed in the proposal for separate payment, valves, valve boxes, and backflow prevention devices shall be considered incidental work for which no separate payment will be made.