The purpose of this appendix is to provide information regarding water supply systems to facilitate relocation design. In addition, the Special Note discussed in Section 13F.16 shall be prepared when using the pay items in Standard Specification Section 663.

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13F.1 DEFINITIONS

American Water Works Association (AWWA) provides standards that are the consensus of the water industry. They are minimum standards, not specifications. Some standards (currently those concerning ductile iron pipe and fittings) are also endorsed as an American National Standard by the American National Standards Institute (ANSI).

Ductile Iron Pipe Research Association (DIPRA) is a nonprofit association representing the ductile iron pipe industry, providing recommendations for installation and performance and conducting relevant research.

Recommended Standards for Water Works (Ten States Standards) is a collection of recommendations for the design and operation of water systems, including recommendations for pumping, distribution, and storage systems.

Uni-Bell PVC Pipe Association is a nonprofit association representing the PVC (water and sewer) pipe industry, providing recommendations for installation and performance and conducting relevant research.

Bearing Blocks are blocks of concrete poured alongside or around a water main fitting to resist thrust and prevent movement of the main due to thrust from water pressure.

Butterfly Valve is a valve commonly used in water supply systems, particularly in larger sizes.

Buy America (Standard Specification § 106-11) requires that all steel and iron used in Department construction projects be domestically produced, or that the contractor identify in the bid that the material is foreign produced. This includes ductile iron pipe, steel water pipe, iron fittings, hydrants, and valves.

Corporation Stop (sometimes referred to as a corporation) is a small valve, typically brass, that is tapped (threaded) into a water main, and used to establish a service connection from a new or existing water main.

Curb Box is a cast iron sleeve that is placed over the curb stop to allow operation of the curb stop (valve) below from ground level after the curb stop is installed and backfilled.

Curb Stop is a small valve, typically brass, that is placed in the service line between the main and the customer.

Double-Disk Gate Valve is an older, commonly used valve type used in older water systems. It is sometimes referred to as simply a gate valve. It is now rarely used, in favor of the resilient wedge valve.

Gland is a flat metal ring that fits over the plain end of a piece of pipe, and is bolted to a fitting, compressing a rubber gasket around a plain pipe end, which forms a water tight seal.
Hydrant Assembly includes the portion that is visible above ground (upper barrel), as well as the lower barrel, shoe, and valve that are below ground. A separate valve is typically installed between the main and the hydrant assembly.

Inserting Valve is an older type of valve used to insert a valve into a main without shutting it off.

Laying Length is the length of pipe from the end of the spigot (plain) end to the point inside the bell that the next length of pipe will reach when a properly made joint is assembled.

Leaded Goose Neck is an older method used to create a service connection to a water main which is no longer allowed by the Department of Health.

Mechanical (Nonrestrained) Joint requires mechanical action (clamps or bolts, etc.) to compress the gasket and form a tight seal.

Mechanical (Restrained) Joint provides a watertight seal and prevents water pressure fluctuations from forcibly pulling sections of pipe apart. This is typically provided by clamps around the bell holding a retainer ring, which is welded to the plain (spigot) end of the pipe, or wedges gripping the pipe surface. A variety of similar joint types are produced by different manufacturers.

Mechanical Wedge/Retainer Gland is a special type of gland that has bolts or wedges around the perimeter which tighten inward, gripping the pipe to restrain the joint, as well as provide a watertight seal. A variety of proprietary designs are produced by different manufacturers.

Push-On Joint is a gasketed joint that only requires sliding the plain (spigot) end of the succeeding piece of pipe into the bell. Metal serrations prevent the pipe from being withdrawn without damaging the gasket. This type of joint is not a restrained joint.

Resilient Wedge Valve is a modern valve currently used in water supply systems, often replacing the older style double disk gate valves. It is sometimes inaccurately referred to as a gate valve.

Tapping Sleeve and Valve is a two piece sleeve that bolts around a pipe with a valve attached to it to create a tee on a main without shutting the main off.

Valve Box is a multipart box, typically cast iron, that is placed over the top of a valve to allow operation of the valve after the valve is installed and backfilled.

Water Service Connection is a system that supplies water from a main to a customer. It typically includes a corporation stop, a length of pipe, a curb stop with a curb box and another length of pipe that leads to the customer’s building or meter.
13F.2 REMOVALS

Owners are often interested in retaining old hydrants, valves, etc., as a source of emergency spares and repair parts. Owners should be offered any removed items if they want them, using the remove and store item(s). If the Owner is not interested in the salvaged parts, then the remove and dispose item(s) should be used. The removal of asbestos-cement pipe must be conducted in accordance with required environmental and health permits. See Section 210 of the Standard Specifications for asbestos removal items.

13F.3 EXCAVATION AND BACKFILL

Excavation limits for a variety of standard pipe sizes are presented on the Standard Sheet “Pressure Pipe Installation Details”. Backfill for plastic water mains requires smaller particle sizes to prevent damage to the pipe (See Standard Specifications Section 203 for a sand backfill item.). Backfill for ductile iron pipe may contain larger particle sizes due to the material strength (See Standard Specifications Section 203 for a select structure fill item.). If the owner requires a separate bedding treatment, the bedding thickness and item should be stated on the Owner Requirements for Water Mains and Appurtenances Special Note. The bedding item will be paid for separately.

Excavation and backfill of plastic water main can be especially challenging. During construction, an empty plastic water main will create a buoyant force when placed under water, a common condition at low points and near wetlands. Until the main is filled with water, the buoyant force may exceed the weight of the pipe and backfill, allowing the backfill to settle under the pipe, or in a worst case, allowing the water main to float out of the ground. Sand bags or similar weights may be used to hold plastic pipe in place until installation is complete.

Laying Conditions 1-5 are presented in literature from manufacturers and others. If the details on the Standard Sheets are followed, Laying Condition 4 will apply. Select granular backfill will, conservatively, provide a friction angle of 30°.

13F.4 THRUST RESTRAINT

Thrust restraint must be provided to prevent thrust created by the water pressure from pulling the pipe segments or fittings apart. Only one method of thrust restraint is required and only one should be provided. If an owner requires that redundant restraint be provided, the redundant restraint should be treated as a betterment and paid for by the owner.
Typical types of thrust restraint are restrained joints, retainer glands, tie rods, and thrust blocks. Tie rods are not recommended due to problems with long term performance. Thrust blocks are one of the most widely presented and most misunderstood by designers. Thrust block area or volume required is based on the pressure in the pipe, the pipe size, change in direction, and soil bearing capacity. Thrust block tables showing required areas are for a specific internal pressure and soil bearing capacity. The table on Standard Sheet “Pressure Pipe Thrust Restraint Details” titled “Bearing Block Areas for Standard Conditions” is based upon a water pressure of 1380 kPa and a soil bearing capacity of 96 kPa. While these conditions are typically conservative, the thrust block area or volume may have to be adjusted to meet field conditions.

Plastic water mains are not available with restrained joints. Retainer glands are available to provide restrained joints, where desired, and to attach fittings, valves, and hydrants. Thrust blocks may be provided with plastic pipe, though the use of external glands and rods is acceptable.

<table>
<thead>
<tr>
<th>Pipe Size (NPS)</th>
<th>Dead End</th>
<th>90° (1/4) Bend</th>
<th>45° (1/8) Bend</th>
<th>22½° (1/16) Bend</th>
<th>11¼° (1/32) Bend</th>
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</thead>
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<td>6.2</td>
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<td>1,153</td>
<td>588</td>
<td>295</td>
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</tbody>
</table>

Source: Ductile Iron Pipe Research Association

To determine thrust at a pressure other than 690 kPa, multiply value above by ratio of (Pressure(kPa)/690). To determine required bearing area, divide the thrust by the soil bearing capacity.
13F.5 PIPE AND PIPE LAYOUT

All new water mains shall be minimum 6 NPS. Smaller sizes may be used to relocate short sections of existing water mains to resolve individual conflicts with new utilities. If installation of a new main to replace an existing 4 NPS main is required, the minimum size of the new main is 6 NPS. If the Owner wants an 8 NPS main installed to improve system performance, the cost differential between an 8 NPS and 6 NPS main is a betterment, to be paid for by the Owner.

Water mains should be installed with a minimum 3 m horizontal offset to sanitary or storm sewers, measured edge to edge. Where this is not possible, the water main should be installed a minimum of 450 mm vertically above or below the sewer, measured edge to edge (above is preferred). If neither of these is possible, special (water-tight) construction methods may be required by the reviewing health agency for the sewers, including drainage (storm sewers).

Ductile iron pipe is available in pressure classes 150, 200, 250, 300 and 350 and thickness classes 50 to 56. Regardless of the class, the outside diameter is always the same for a given diameter, this allows the use of any type of pipe with the same fittings. Ductile iron pipe supplied in 5.5 m and 6.1 m laying lengths. Ductile iron is available in push-on joint (POJ), mechanical joint (MJ) and restrained mechanical joint (MJ). All of the above types of joints will create a watertight seal. Restrained joint pipe has a retainer ring welded to the plain end of the pipe, and bolted clamps on the bell end of the next pipe length, which hold the retainer ring in place. Restrained joints are more expensive and require additional time and effort to install, however, restrained joint pipe does not require external thrust restraint. Individual joints in ductile iron pipe can be deflected from the horizontal by amounts shown in the table in the *Standard Specifications*, resulting in a minimum radius as shown below. If water main layout requires a radius smaller than listed below, bends should be used.

Ductile iron pipe can be installed in a length shorter than the laying length with a minimum of extra work in the field. The pipe must be gauged (checked) to ensure that the pipe barrel is not out of round, then cut to the desired length. The cut pipe end must be beveled and a new retainer ring welded on to the pipe (for restrained joint pipe that use retainer rings). The exterior coating is then repaired. Suppliers can provide a kit containing all of the parts required to cut and install a shorter length of pipe.

PVC pipe is available in DR 14, 18, 21, 25, 26, 32.5, 41, and 51. Dimension ratio (DR) is the ratio of the outside diameter to the wall thickness (OD/Wall Thickness). The pipe may also be described using a pressure rating (PR), which describes the pressure that the pipe can withstand. The preferred type of PVC pipe, which has the same outside diameter as cast or ductile iron pipe (AWWA C900 Cast Iron OD), allows the pipe to be used with iron fittings. PVC pipe is supplied in 6.1 m laying lengths. Individual lengths of PVC pipe can be bent during installation, to a minimum bending radius (R_b) of 250 OD. In addition, individual joints can be deflected up to the manufacturer’s recommended maximum, typically 2°. Plastic pipe can be installed in a length shorter than the laying length with a minimum of extra work in the field. The pipe is cut, the end deburred and beveled, and the insertion line redrawn on the pipe to identify the point to which the pipe must be inserted into a bell.
Maximum Joint Deflection and Approximate Radius for Full-Length Ductile Iron Pipe, Push-On Type Joint

<table>
<thead>
<tr>
<th>Pipe Size (NPS)</th>
<th>Max. Deflection Angle</th>
<th>Approx. Radius (m) (5.5 m Length)</th>
<th>Approx. Radius (m) (6.1 m Length)</th>
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</thead>
<tbody>
<tr>
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<td>48</td>
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</table>

Source: Ductile Iron Pipe Research Association

Maximum Joint Deflection and Approximate Radius for Full-Length Pipe, Mechanical Joint Type

<table>
<thead>
<tr>
<th>Pipe Size (NPS)</th>
<th>Max. Deflection Angle</th>
<th>Approx. Radius (m) (5.5 m Length)</th>
<th>Approx. Radius (m) (6.1 m Length)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
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<td>24</td>
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</table>

Source: Ductile Iron Pipe Research Association
Steel water pipe is different from iron or plastic. Steel pipe is typically used for very large diameters (48 NPS and larger). Steel water pipe is installed with fully welded joints and fittings shop fabricated from lengths of steel pipe, rather than gasketed joints and fittings. Steel pipe may be supplied in random lengths. Steel pipe is typically coated, on the inside and outside, and some of the coating will need to be done in the field. The use of steel water pipe normally requires a cathodic protection system to prevent corrosion.

13F.6 FITTINGS

Fittings include bends, tees, crosses, reducers, plugs, etc. Iron fittings are available in mechanical joint (MJ), push on joint (POJ) and plain end (PE). Bends are referred to as a 1/4 bend (90°), 1/8 bend (45°), 1/16 bend (22-1/2°) and 1/32 bend (11-1/4°).

Tees typically have the same size on the two ends opposite each other (run), and the same or a smaller size on the opposing end (branch). The size of a tee is written “run x branch”, i.e., a 12x6 Tee has two 12 NPS ends opposite each other (run) and a 6 NPS on the opposing end (branch). Tees are not available with three different sized legs, if this is desired, use a tee followed by a reducer on one of the legs. Crosses are generally available only with all four legs of the same size. If necessary, use a cross followed by a reducer or other fitting.

Iron fittings are paid for by weight, requiring a designer to estimate the weight of fittings. Fitting weights for payment are those listed in the appropriate AWWA Standard, when available (not all fittings or sizes are covered by the AWWA Standards). Total the weights in pounds, convert the contract total to kilograms and round to the nearest whole kilogram.

Iron fittings are available in two basic types, “full body” fittings (AWWA Std C110) and compact fittings (AWWA Std C153). Compact fittings are made from ductile iron, and are stronger and lighter than full body fittings made from gray iron. Full body fittings are also available in ductile iron, at an increased cost, and reduced availability. Due to the lighter weight, compact fittings are easier to install, and are now the fittings preferred by most Owners. Because fittings are paid for by weight, full-body fittings, which are typically less durable, yet cost significantly more, should not be substituted for compact fittings.

Ductile iron fittings may also be used with plastic pipe.

Wedge type mechanical retainer glands are commonly known by the trade name “megalug” or “Ford 1100”. The radial wedge bolts are tightened, and when the proper torque is reached, the outer portion of the bolt head snaps off, making the installation simple and reliable. These retainer glands may be used on new or existing ductile iron or PVC pipe (they are not recommended for use on cast iron pipe) and provide a fully restrained joint.
13F.7 POLYETHYLENE ENCASEMENT

Polyethylene encasement is used to prevent damage to ductile iron water mains due to corrosive soil conditions. Installation is done using either tubes or sheets. Joints in tubes or sheets must be overlapped and taped with plastic tape. Valves and fittings will require use of sheets. The AWWA recommends making taps directly through polyethylene and tape. Methodology is outlined in detail in AWWA Standard C105.

13F.8 VALVES

Valves are used to isolate sections of a main. Valves should be installed at approximately 150 m intervals in a commercial area, one block or 250 m intervals in a residential area, and at up to 1 mile intervals in rural areas with no expected development. Valves are typically installed on all three legs of a tee. This allows isolation of sections of the system to allow maintenance, repair or upgrade.

The valves typically used for water mains are resilient wedge valves, butterfly valves, and double-disk gate valves. A resilient wedge valve operates by lowering a wedge-shaped rubber or plastic-coated metal blade into a wedge shaped groove in the body of the valve. These valves are now the preferred type because they are reliable and less expensive than the double-disk gate valves.

A butterfly valve operates by rotating a metal plate around a stem or shaft running vertically through the plate and centered in the pipe. The valve is closed by rotating the plate so that the surface of the plate faces the pipe, or flow direction. The valve is opened by rotating the plate so that the edge of the plate faces the pipe, or flow direction.

A double-disk gate valve operates by lowering two machined metal disks straight down on edge, and then pushing them apart from the center against machined surfaces in the body of the valve. These valves are often referred to as simply gate valves, and were the preferred valves of most Owners for many years. These valves require significant amounts of precision machining during manufacture, making them more expensive than the preferred resilient wedge valve.

A tapping sleeve can be installed with a valve to create a tee on a live main without shutting down the system. A tapping sleeve is sometimes used to install a large diameter (larger than 2 NPS) service connection. The valve is installed on the tee.
13F.9 VALVE BOXES

A valve box is a cast iron box that fits over, but should not rest on, the top of a valve, providing access to the operating nut. The base unit fits over the operating nut, and a center section provides a shaft to the cover, (visible on the surface) which typically identifies the utility. The center section is available in a screw-type and a slide-type. The screw-type is easier to set and install, but may transmit wheel loads to the valve. The slide-type is harder to install, but prevents transmission of wheel loads to the valve stem or body. The slide-type is recommended in order to prevent damage to the valve.

13F.10 HYDRANTS

Hydrants should be installed at intervals of 110 m -185 m, in order to provide fire flows to structures within 185 m (measured along streets). Hydrants are typically installed off of a tee placed in a main. Hydrants must be installed using a minimum of 6 NPS main. Hydrants should be dry-barrel, traffic types. Dry-barrel hydrants have no water in the barrel when not operating, which prevents freezing of water in cold weather. Traffic model hydrants have frangible (breakaway) coupling on the base of the upper barrel and the operating rod that break if the hydrant is struck by an errant vehicle or a snowplow blade. Repair kits are readily available to replace the couplings with a minimum of effort.

To facilitate installation, manufacturers make a hydrant tee and an anchor pipe. A hydrant tee is a tee with an elongated stub and a ring and retainer gland factory installed on the end. A connecting piece is a short length of pipe with rings and glands factory installed. These allow the installation of a complete hydrant assembly without field cutting pipe. A hydrant tee can be attached directly to a valve, and a valve directly attached to the hydrant with no additional thrust restraint rods or bearing blocks. The anchoring pieces are available in a variety of standard lengths, including 0.3 m, 0.6 m, 0.9 m, 1.2 m, and 1.5 m.

A hydrant can be installed close to a main by using a tee and a 90° elbow, installing the valve, anchor pipe, and hydrant parallel to the main. Typical installations are shown on the appropriate standard sheets.

In order to correctly specify the items for a hydrant installation, a designer should include the hydrant item, a gate valve (typically NPS 6), and the weight of a hydrant tee (typically main size x 6 NPS). Excavation and backfill should be considered in the same manner as for normal pipe.

Relocations of hydrant assemblies requires one of several operations. If the valve and the hydrant is to be relocated, then the main must be isolated and/or shut down in order to remove the valve and plug the tee off of the main. The reinstallation will require that a new tee or a tapping sleeve be installed on the main at the new location. If the valve is to remain, the valve should be closed, the stub after the valve should be removed, and the back side of the valve capped or plugged. A stub should not be left in water mains, as it creates an isolated pocket where stagnant water remains, and bacteria and other undesirable conditions may flourish.
13F.11 SERVICE CONNECTIONS

A service connection normally consists of a corporation stop threaded into a water main, a piece of water supply pipe, a curb stop with curb box above it, and another piece of water supply pipe to the customer. For highway purposes, a service connection will typically stop at the ROW, where the customer assumes responsibility. The Owner is typically responsible for the water main and the service connection to the curb stop, though individual situations will vary.

A leaded goose neck is a piece of soft lead pipe that was “goose necked”, or bent from the two o’clock position out of a water main down to the horizontal. These are particularly fragile and are no longer permitted by health codes, and should be eliminated wherever encountered.

The corporation stop can be direct-tapped into a main without shutting the main off. Typical sizes are from ½ NPS to 2 NPS. Care must be taken to ensure that the water main is large enough to accept a direct-tapped corporation stop. (A minimum number of threads must be fully engaged, which is affected by the pipe curvature.) Direct tapping of plastic pipe may be done on PVC pipe meeting the AWWA C900 standards only up to 2 NPS. A tapping/service saddle or service clamp provides additional support and bearing area around the pipe circumference. Owners may require the use of a service saddle for any tap of a plastic main. Any service larger than 2 NPS will require a tapping sleeve and valve or similar fitting to establish a connection.

Maximum Recommended Direct-Tap Size for Ductile Iron Pipe

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<th>Pipe Size (NPS)</th>
<th>Pressure Class</th>
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</tr>
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Source: Ductile Iron Pipe Research Association
APPENDIX 13F
WATER SUPPLY SYSTEMS

The corporation stop is typically installed with the valve closed, and the valve is opened only after the service connection is installed as far as the curb stop. The curb stop is then closed, and the corporation stop opened. After construction, the corporation stop is not accessible without excavation. Water supply pipe is available in two types; type K copper and polyethylene. Polyethylene water supply pipe shall be installed with a coated tracing wire wrapped around the pipe to facilitate location. A portion of the wire should be stripped and firmly connected to the corporation stop and the curb stop.

A curb stop allows a service connection to be shut off at the street. The curb stop is operated using a T-handled wrench that fits down the curb box shaft to reach a stem that sticks up from the top of the curb stop (valve). The standard stem is made of steel, though stainless steel stems may be required by some owners.

In order to correctly specify the items for a water service connection, a Designer must include the water service connection item and water supply pipe from the water main to the ROW or the customer’s meter pit, whichever is less. Excavation and backfill are paid for separately along the length of the water service pipe. The excavation and backfill required for a water service connection is insignificant in comparison with the water service pipe.

13F.12 CURB BOXES

Curb boxes are available in two types, the two-hole type, which is intended to be placed in vegetated areas, and a plug type that is intended to be cast into a hard surface such as a sidewalk. The two types are shown on the Standard Sheets. The plug-type cap is removed with a special wrench which operates a pentagon-shaped nut similar to the operating nut on a hydrant. The cap is removed, exposing an open shaft that allows access to a curb stop valve.

13F.13 ADJUSTING ELEVATIONS

Valve and curb boxes are often located in the roadway or adjacent areas, and require that the elevation of the boxes be adjusted. Boxes may be manually adjusted, or through the use of adjustment rings.

13F.14 TESTING AND DISINFECTION

Plugging and leaving pipe stubs isolated can cause problems with disinfection and water quality. If a long stub of isolated pipe remains, it provides a location for accumulation of sediments, accretion on the pipe walls and bacteriological growth. System owners and/or Department of Health (DOH) reviewers may require that stubs be eliminated and tees be capped in order to prevent these problems. Testing and disinfection is included in the price for the water main installation.

13F.15 ELECTRICAL CONNECTIVITY

6/6/03
Electrical connectivity between water system components is desired for two reasons. The first reason for connectivity is to allow subsurface location using an applied electronic signal. The second reason is to allow thawing. While not recommended, thawing of a metal service connection is accomplished by connecting a transformer (often a welder is used) to the inside of the structure and to the curb stop or the nearest valve or hydrant. Electric thawing is dangerous and can result in damage to gaskets in valves, water mains, and hydrants; damage to electrical systems if grounded to the water service, and at most extreme a fire hazard in the structure. Electrical connectivity is typically enhanced through the use of bronze wedges driven into the joints between components. Bronze wedges are often lost due to movement caused by freeze-thaw cycles and pressure surges.

13F.16 SPECIAL NOTE “OWNER REQUIREMENTS FOR WATER MAINS AND APPURTENANCES”

The special note entitled “Owner Requirements for Water Mains and Appurtenances” should be completed by the designer, with input from the Owner, and shall be prepared for use in conjunction with the pay items provided in Section 663 of the Standard Specifications. When completing the note, it is not necessary or desired to cite references to any AWWA or ANSI Standards that are already provided in the Standard Specifications. The primary dimensions shall be in metric, or Nominal Pipe Size (NPS) designations. English equivalents may be added in parentheses, if desired.
Special Note
Owner Requirements for Water Mains and Appurtenances

The following are the requirements of the owner of the water system for this contract. All manufacturer or proprietary material designations are the requirement of the Owner. Approval of an equal item other than that specified must be granted by the Owner.

Owner:
Address:
City, State, ZIP:
Contact: Phone #:

The Owner [does not] requires review and approval of materials and details. The estimated time required for approval by the Owner of materials and details during construction is __________

Pipe:
Type of Material: Pressure/Thick Class or DR:

Lining:

Type of Joint

Bedding Requirements: (Dimensions and item)

Fittings: (Compact Ductile Iron (C153) required unless otherwise noted)
C110 Full Body Required For Size _____ NPS To _____ NPS

Special Requirements: ________________________________

Thrust Restraint Type:
Horizontal Bends - __Restrained Joint or __Thrust Block or __Retainer Gland or __Tie Rod
Vertical Bends - __Restrained Joint or __Thrust Block or __Retainer Gland or __Tie Rod
Tees & Crosses - __Restrained Joint or __Thrust Block or __Retainer Gland or __Tie Rod
Valves - __Restrained Joint or __Thrust Block or __Retainer Gland or __Tie Rod
Hydrants - __Restrained Joint or __Thrust Block or __Retainer Gland or __Tie Rod

Tie Rods:
Type: Size:

Valves:
Manufacturer:

Type: (Different types may be required for different uses.)

Open: _____Left (Counter-Clockwise) or _____Right (Clockwise)

Valves may [may not] be operated by personnel other than Owner's staff.
Special Note
Owner Requirements for Water Mains and Appurtenances

Valve Boxes: (Slide type adjustable required unless otherwise noted)
Type:

**Hydrants:**

Manufacturer: Model:

Pumper nozzle: Qty Thread & Size NPS
Hose nozzle: Qty Thread & Size NPS

Open: Left (Counter-Clockwise) or Right (Clockwise)

Size / shape of operating nut:

Depth of Bury:

Color:

**Service Connection Materials:**

*Corporation Stop*
Type:
Manufacturer: Connection Size:

*Curb Stop*
Type:
Manufacturer: Connection Size:

*Curb Box*
Type:
Manufacturer: Connection Size:
Location:

**Fittings**
Manufacturer:

**Taps**
Wet Taps Required? Yes / No Tap Fee:
If dry taps allowed, Allowable water main shut down time:

**Water Meter Pits**

Dimensions (LxWxH):
Roof Loading:
Knockouts, etc.: