# Part VII - Water Mains and Service Laterals

# ARTICLE 701 - GENERAL

## 701.1 Definition.

Whenever the term Engineer is used with respect to water main or water service lateral construction, it shall be understood to include the General Manager of the Madison Water Utility and all duly authorized representatives thereof.

## 701.2 Description.

Water main and water service lateral construction consists of excavating the required trenches and tunnels; laying the required pipe, fittings, special castings, valves, valve boxes, hydrants, structures and appurtenances; at the locations and to the required lines and grades; backfilling and compacting the trenches; and restoring the site of the work; all as shown on the drawings and provided by the Contract.

The work consists essentially of the following items:

1. Making the necessary excavations, preparing the necessary foundations, inspecting materials, laying pipe, doing the necessary bracing, pumping, backfilling, compacting, installing polyethylene encasement, etc.

2. Furnishing all tools, equipment, and material (except such as are specifically excepted herein) necessary for the laying in complete working order the mains and services described.

3. Cutting pipes, making joints and all required connections, connecting bonding straps, providing concrete thrust blocking; setting and adjusting all valves, hydrants, and other appurtenances described in these Specifications.

4. Making the tap, installation of corporation stops, laying of pipe, installation of curb stop and curb box or valve box, as required, and all compaction and backfill necessary to complete the installation of service laterals two (2) inches in diameter and smaller.

5. Providing the ditch for the Water Utility to make the tap, setting valve box, laying the pipe, and all compaction and backfill necessary to complete pressure taps four (4) inches in diameter or larger.

6. Repairing any and all damage caused to sewers, gas, telephone, or power facilities, or any other obstructions encountered in the prosecution of the work.

7. Testing and disinfecting the mains.

8. Backfilling and compacting trenches, clearing roads and grounds of all rubbish and refuse caused by the above work, resurfacing all gravel or stone roadways, and providing concrete and asphalt concrete street patches as directed.

## 701.3 Equipment.

Equipment and tools necessary for performing all parts of the work shall be satisfactory as to design, capacity, and mechanical condition for the purposes intended. Any equipment which is not

maintained in full working order, or which as used by the Contractor is inadequate to obtain the results prescribed, shall be repaired, improved, replaced or supplemented to obtain the progress and quality of work contemplated by the Contract.

## 701.4 Tests.

On completion, the water main will undergo water quality testing and hydrostatic pressure testing. The water main may also be tested for electrical conductivity through the joints. Repair all defective work at no additional cost to the City.

## 701.5 Finishing Work and Maintenance.

Maintain all trenches in an acceptable and safe condition suitable for traffic throughout the work. At the completion of the work, the condition of all trenches shall be satisfactory to the Engineer.

Repair all concrete, asphalt, and gravel pavements; stone flagging or paving; sidewalks, curbs and gutters; culverts; fences; or other structures damaged or displaced during construction. Surfaces shall be rebuilt or re-laid properly to the original line and grade in accordance with pertinent parts of these Specifications, or in the absence of applicable specifications, to original condition.

Maintain all repaired, restored, or replaced asphalt and gravel surfaces until final acceptance of the project by the Common Council. Repair, restore or replace all failures occurring during the guarantee period at no additional cost to the City.

Prior to final acceptance by the Engineer, clean and grade the project area.

Unless otherwise provided, costs of the work included in this Article shall be included in the unit prices bid for the Contract items with which such work is associated. Final payment will be withheld until such work is completed in a manner satisfactory to the Engineer.

## 701.6 Repairs and Replacement.

Unless noted otherwise herein, all pipe repairs shall be made by replacement of the defective pipe section with new pipe meeting these Specifications. Alignment, grade, bedding and backfilling shall conform to the requirements of these Specifications. Notify the Water Utility a minimum of twenty-four (24) hours prior to beginning any repair or replacement work, including the raising or facing of hydrants.

Make all field cuts of all types of pipe with an approved mechanical pipe cutter or with a power saw in order to make a straight, true cut without chipping and cracking the pipe.

For joining the replacement sections, use approved fittings conforming to the requirements of Section 702.6 and Section 702.8 of these Specifications. In no case will concrete encasement of defective pipe be allowed. These repairs shall include total and complete restoration of any disturbed surface to original or better than original condition, regardless of improvements on lands where the repair is required. Unless otherwise provided, the cost of the work included in this Article shall be included in the bid price.

## 701.7 Emergency Telephone Number.

Furnish the Engineer with a local telephone number where a duly authorized representative can be contacted in case of an emergency at night or on weekends.

# ARTICLE 702 - MATERIALS

## 702.1 General.

Unless otherwise shown on the drawings or specified in the Contract, the materials furnished and installed in the work shall conform to the requirements specified herein for the type and class of material named. Inspect all materials when delivered to the job site. Materials found to have cracks, flaws, or other defects will be rejected, and shall be promptly removed from the site of the work.

Unless otherwise directed by the Engineer, all pipes and accessories furnished by the Contractor shall be unloaded, hauled, and distributed to the point of installation by the Contractor. Pipes and accessories furnished by the City will be unloaded in an area designated by the Contractor and acceptable to the City that is accessible and convenient to the job site. The Contractor shall distribute materials to the actual point of installation as a part of the work.. All pipe and fittings shall be protected from dirt, dust and contamination during storage on the job site. Handle the materials with care to avoid damage. Do not drop or bump materials against the ground, other stored pipes and accessories, or any other objects on the ground.

Unless otherwise specified, references to various standard specifications and test methods shall be understood to mean the specification or test method which is current on the date of advertisement for bids.

Prior to use, all proposed substitutions of equivalent material must be approved in writing by the Engineer. The Engineer reserves the right to reject any materials not meeting these Specifications as being defective.

## 702.2 Ductile Iron Water Pipe.

1. Materials:

    a. The pipe and accessories shall be of ductile iron and shall conform to the requirements of American National Standard for Ductile Iron Pipe, Centrifugally Cast, for Water (ANSI/AWWA C151/A21.51 - Latest Revision).
    b. Class 52,
    c. Cement lined,
    d. Push-on gasket pipe,
    e. Furnished with the necessary accessories
    f. Plain rubber gaskets
    g. Bonding straps to provide electrical conductivity without field welding.

2. Joints:

    a. Joints shall be rubber gasket joints
    b. Conform to the requirements of American National Standard for Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings (ANSI/AWWA C111/A21.11 - Latest Revision).

3. Fittings:

   a. Conform to the requirements of American National Standard for Ductile Iron and Gray Iron Fittings, three (3) inch through forty-eight (48) inch, for Water (ANSI/AWWA C110/A21.10 - Latest Revision).
   b. Class 250 mechanical joint pipe fittings,
   c. Cement lined
   d. All bells,
   e. Entire fitting tarred,
   f. Conductive mechanical joint (no lead) rubber gaskets, flanges and bolts.

## 702.3 Valves and Valve Boxes.

Valves twelve (12) inches and smaller:

Resilient wedge gate valves meeting the requirements of AWWA C509-Latest Revision.

Acceptable models include:

Resilient Wedge Gate Valves

| Brand | Model |
|---|---|
| Kennedy | K4571 or equal |
| Mueller | A2360 or equal |
| Clow | F6100 or equal |
| AFC | Series 500 or equal |

Note: Valves shall be supplied with mechanical joints with conductive mechanical joint (no lead) gaskets. Valves shall open left and have a non-rising stem, O-ring packing, and a 2-IN square operating nut.

Valves sixteen (16) inches and larger:

Rubber seated butterfly valves meeting the requirements of AWWA C504 - Latest Revision.

Acceptable models include:

Rubber Seated Butterfly Valves

| Brand | Model |
|---|---|
| Kennedy | B4500 or equal |
| Mueller | B3211-20 or equal |

Note: Valves shall be supplied with mechanical joints with conductive mechanical joint (no lead) gaskets. Valves shall open left.

Valve boxes:

1. Tyler or Bingham and Taylor cast-iron, size “DD” fifty (50) inches to seventy (70) inches,

2. Three (3) piece screw type

3. No. 6 round base

4. 5-1/4 inch shaft

5. With stay-put covers marked “WATER.”

Valve Box Extensions:

1. Tyler, or equal

2. Screw type

3. 5-1/4-IN shaft

4. No. 58 - 12-IN long,

5. No. 59 - 18-IN long,

6. No. 60 - 26-IN long.

## 702.4 Hydrants.

Acceptable models include:

Fire Hydrants

| Brand | Model |
|---|---|
| Kennedy | Guardian K-81 |
| Mueller | Super Centurion A423 |
| Waterous | Pacer WB-67 |

Hydrant Design:

1. “Breakaway” design.

2. Two 2-1/2-IN diameter nozzles.

3. One 4-1/2-IN diameter pumper nozzle.

4. The nozzles shall have National Standard threads and the nozzle caps shall have chains attaching the caps to the hydrant.

5. The word OPEN and an arrow showing that the hydrant opens left shall be embossed on every fire hydrant.

6. The hydrant valve opening shall be 5-1/4-IN with National Standard operating nut shape.

7. Hydrants shall be painted red with white nozzle caps.

8. 360 degree top rotation.

9. "Dry top"- operating threads to be sealed when open.

10. The hydrant shall have a six (6) inch mechanical joint bottom connection with conductive mechanical joint (no lead) gasket and necessary accessories.

11. The upper valve plate shall be brass with a brass-to-brass foot valve.

## 702.5 Materials for Service Lateral Installation.

All materials used for the installation of service laterals, corporation stops, and curb stops shall be in accordance with the following tables. Couplings shall be copper-to-copper fittings, Mueller H15400, Hl5405 or equal. The use of any other materials may be permitted only with the written approval of the Engineer.

Service Laterals

| Size of Service (diameter) | Material |
|---|---|
| 2-IN and smaller | Type K soft copper tubing (straight length sections for 1-1/2-IN and 2-IN Services) |
| 4-IN and larger | Class 52 ductile iron pipe |

Note: All Class 52 ductile iron pipe shall conform to Section 702.2

Corporation Stops

| Size of Service (diameter) | Brand/Model | Service Fitting (1/8 bends) |
|---|---|---|
| 1-IN* | Mueller H - 9971 or equal | Mueller H - 15485 or equal |
| 1-1/2-IN and 2-IN | Mueller H - 10003 or equal | Mueller H - 15470 or equal |

Note: The service fittings (1/8 bends) must be supplied with a fiber gasket.

Curb Stops

| Size of Service (diameter) | Brand/Model |
|---|---|
| 1-IN | Mueller H1502-2 or equal |
| 1-1/2-IN and 2-IN | Mueller H15201 or equal (Oriseal type) |

Curb Boxes

| Size of Service (diameter) | Brand/Model | Description |
|---|---|---|
| 1-IN | Bingham and Taylor 94 F or equal | - brass screws<br>- 54-IN rods and guide rings<br>- 2-1/2-IN screw type shaft<br>- 37-IN bottom section<br>- 29-IN top section<br>- 16-IN center section |
| 1-1/2-IN and 2-IN | Tyler or Bingham and Taylor (standard valve box) | - no rod or rings |

Note: All curb boxes shall be complete with covers marked "WATER."

## 702.6 Mechanical Joint Restraints.

Mechanical Joint Restraints: EBAA Iron Inc. - MEGALUG® Series 1100 or approved equal.

## 702.7 Saddles.

All 1-1/2-IN and 2-IN service laterals shall require A.Y. McDonald - Series 3825 saddles (double strap), or equal.

## 702.8 Solid Sleeves.

All solid sleeves shall be Rockwell 441, Ford FCI Bolted Flex Coupling, or Powerseal 3501.

## 702.9 Pipe Casing.

1. Steel:

    a. Use steel casing pipe with a minimum yield strength of 35,000 psi
    b. Minimum wall thickness of the casing pipe is as follows:

| Pipe Diameter (inches) | Wall Thickness (inches) |
|---|---|
| 18 | 0.31250 |
| 20 | 0.34375 |
| 24 | 0.37500 |
| 30 | 0.46875 |

2. Reinforced Concrete Pipe: Class V minimum.

## 702.10 Disinfection Chemicals.

1. Dry chemicals:

    a. Chloride of Lime
    b. HTH
    c. Pittchlor
    d. or equal (65 % available Chlorine), granular form only.

2. Liquid (Only used with written authorization of the Engineer):

    a. Sodium hypochloride

## 702.11 Polyethylene Encasement.

1. Conform to the requirements of the American National Standard for Polyethylene Encasement for Ductile Iron Pipe Systems (ANSI/AWWA C105/A21.5 - Latest Revision).

2. Thickness: eight (8) mil minimum.

## 702.12 Styrofoam.

1. Minimum thickness: Two (2) inch

2. Minimum strength 25 psi.

3. High-density polystyrene board as manufactured by Dow Chemical Company, or equal.

4. Styrofoam shall be furnished in four (4) foot by eight (8) foot sheets.

# ARTICLE 703 - CONSTRUCTION METHODS

## 703.1 General.

All water main construction shall comply with AWWA C600 - Latest Revision.

Whenever, because of trees, fences, buildings or shrubbery, etc., it is impossible to dig the water main ditch with normal excavating machinery, the Engineer may order the ditch to be dug by hand.

The construction of concrete valve access structures shall conform to the requirements of Article 507 of these Specifications.

The construction of pipe supports and utility line supports shall conform to the requirements of Subsection 508.1(b) of these Specifications.

The construction of utility trench patches shall conform to the requirements of Subsection 502.1(f) of these Specifications.

## 703.2 Excavation.

All excavation shall be in accordance with the Wisconsin Administrative Code for "Trench, Excavation, and Tunnel Construction" and any additional requirements included in the Contract Documents.

Unless otherwise provided in the Contract or permitted by the Engineer, complete the work of constructing water mains and appurtenances in open trenches and in a manner to protect the pipe and appurtenances from unusual stresses. When provided in the Contract or permitted by the Engineer in writing, the construction of mains may be installed by tunneling and/or jacking in lieu of open trenching. Details of construction shall be developed by the Contractor and submitted to the Engineer prior to beginning the work of tunneling and/or pipe jacking. Contractor shall take full responsibility for the means and methods of installing pipe by tunneling and/or pipe jacking. The length and grade of the tunnel shall meet the requirements of the project and shall be reviewed by the Engineer. The Engineer may require the use of a casing. After the installation of the water main, the remaining space in the tunnel shall be backfilled with sand or like material properly tamped, so as to minimize subsequent settlement of the material over the tunnel.

Excavate trenches in conformity with the required alignment and grades as shown on the drawings and as laid out in the field by the Engineer. It shall be understood that the elevations for water mains as shown on the drawings are subject to revisions as may be necessary to fit field conditions. The Engineer reserves the right to adjust the profile grades from those shown on the plan. No adjustment in compensation will be made for grade adjustments of two (2) feet or less above or below the elevations shown on the drawings.

Remove all vegetation along the trench line to the width of the proposed trench before beginning excavation. The materials excavated from the trench shall be deposited on the sides of the trenches and excavations, beyond the reach of slides, or transported to spoil banks.

Surplus material shall be considered to include vegetation from the trench line, excavated rock or cobbles and boulders larger than six (6) inches in diameter, and all other material from excavation

not needed or suitable for backfilling trenches. Unless otherwise specified, surplus material shall be the property of the Contractor, and shall be disposed of at no additional cost to the City.

For water main construction, the width of the trench shall be such as to leave a clear space of not less than six (6) inches nor more than twelve (12) inches between the earth wall, or the supporting sheeting or bracing where such is used, and the sides of the pipe. The trench width established by this pipe clearance, measured at the spring line, shall be applicable to that portion of the trench from one (1) foot above the top of the pipe to the bottom of the trench. On streets opened to traffic, on restricted easements, and in such other locations as noted by the Engineer, the width of the trench at the ground surface shall be limited to the outside diameter of the pipe plus two (2) feet, plus the amount necessary for sheeting or bracing. The Engineer reserves the right to limit the extent of excavation depending on the nature of the soil and other conditions.

### 703.2(a) Rock Excavation.

Rock excavation shall include all hard solid rock in ledges, bedded deposits, unstratified masses, conglomerate deposits or any other material so firmly cemented as to present all the characteristics of solid rock. If determined by the Engineer that such material is so hard or so firmly cemented that it is not practical to excavate and remove such material with a power shovel, it shall be thoroughly and continuously drilled and blasted prior to removal. Power shovels as referred to above shall be taken to apply to a modern track mounted power shovel or backhoe of not less than three-quarter (3/4) cubic yard manufacturer's rated capacity, having adequate power and being in good running condition in the hands of an experienced operator.

Rock excavation shall also include all rock boulders necessary to be removed having a volume of one cubic yard (27 cubic feet) or more. Rock excavation shall not apply to plain or asphalt-bound bases or surface courses of macadam, gravel, or broken stone.

When rock excavation is necessary, all rock shall be removed to provide a clearance below and on each side of all pipe, valves and fittings of at least 6 inches for nominal pipe sizes 24-IN or smaller (and 9 inches for nominal pipe sizes 30-IN or larger). When rock excavation is complete, refill this portion of the trench with select fill and mechanically compact the select fill prior to laying the pipe. In every case, the pipe shall have a uniform bearing along its entire length and never shall be laid directly on rock. The width of rock excavation shall be limited to the outside diameter of the pipe plus two (2) feet.

### 703.2(b) Excavation in Poor Soils.

If, in the opinion of the Engineer, an artificial foundation is necessary because of the nature of the excavated material, excavate to a point a minimum of six (6) inches below the bottom of the pipe. Any work involved in forming a satisfactory foundation at depths of six (6) inches or less below the bottom of pipe will be considered as incidental to the work. Excavate to such depth as directed by the Engineer. Refill this portion of the trench with select fill and mechanically compact the select fill prior to laying the pipe. Limit the width of the trench excavation to the outside diameter of the pipe plus two (2) feet, plus the amount necessary for sheeting and/or bracing.

## 703.3 Sheeting, Bracing and Shoring.

Unless otherwise provided, provide all the sheeting or bracing needed to protect the work, existing property, utilities, pavement, etc., and to provide safe working conditions in the trench. Such sheeting

and bracing shall be according to the Contractor's design and shall comply with the "Wisconsin Administrative Code." Removal of any sheeting or bracing from the trench shall be accomplished in such a manner as to fulfill the above requirements. Sheeting and bracing shall be removed, unless specific permission is given by the Engineer in writing to leave it in place. All costs of sheeting, shoring and bracing is considered to be incidental to the work.

## 703.4 Dewatering.

In accordance with Subsection 502.1(c), remove by pumping, bailing, or otherwise, any water that may accumulate or be found in the trenches and other excavations made under the contract. Form all dams, flumes or other works necessary to keep the trenches or excavations entirely clear of water while the water mains and their appurtenances are being installed. Direct all water from excavations, so as not to flow over or damage private property. All costs of dewatering are considered to be incidental to the work.

## 703.5 Underground Utility Line Openings.

When ordered by the Engineer, uncover utility lines within the proposed construction limits. Complete this work a minimum of three (3) days prior to any work being anticipated in the immediate area of the utility line opening, to allow sufficient time for redesign of the affected utility. Backfill and maintain the openings until completion of project.

## 703.6 Connecting to Existing Water Mains.

There are three (3) types of connections to existing mains:

1. A plug-removal connection will be a connection that only requires the removal of a slip or mechanical joint plug from an existing fitting or the end of a water main.

2. A cutting-in connection will be a connection that requires the installation of a new fitting in an existing water main. For all planned shut-offs, provide a minimum of 24-hour notice to all water users before water is shut off. Be responsible for all valve turning and be properly equipped at all times for doing such work. For unplanned shut-offs, provide reasonable notification to all water users prior to shutting off water. All valves or hydrants shall only be operated in the presence and with the authorization of Water Utility personnel.

3. A pressurized tap will be a connection in which the main is tapped under pressure and a tapping valve is installed. Furnish the ditch necessary for the Water Utility to make the tap.

## 703.7 Polyethylene Encasement.

Encase all ductile iron pipe in polyethylene. The polyethylene shall be furnished in either tube or sheet form. Installation shall be per the requirements of the American National Standard for Polyethylene Encasement for Ductile Iron Pipe Systems (ANSI/AWWA C105 - Latest Revision).

All joints and fittings (valves, tees, bends, reducers, offsets, etc.) shall have polyethylene encasement lapped and taped sufficiently to prevent soil from coming into contact with the pipe. Carefully place the polyethylene encasement around the pipe and fittings and carefully backfill to prevent tears and punctures. Promptly repair all tears and punctures in the polyethylene.

When connecting to or tapping into an existing or new polyethylene encased pipe, prepare the site per ANSI/AWWA C105 requirements. All cuts and repairs to the polyethylene wrap shall be per ANSI/AWWA C105. Polyethylene wrap cut away to allow the connection or tap shall be replaced and the repair material shall have the required lap and shall be taped securely to the pipe.

## 703.8 Pipe Laying and Bedding.

Lay the pipe to the line and grade as shown on the approved drawings. Lay all pipes with a minimum of six (6) feet and a maximum of seven (7) feet of cover from final grade unless otherwise shown on the drawings or ordered by the Engineer. Any variance from the approved drawings or from the amount of cover to be placed must be authorized in writing by the Engineer prior to construction.

Construct bedding or foundation for water mains and water services to minimize settlement of the pipes and to avert excessive pressure on the pipes in order to avoid rupture, leakage or deformation of the pipes. Before laying the pipe, grade the bottom of the trench so that the pipe lays on a flat surface and has uniform bearing along its entire length.

Inspect all pipe and fittings for damage and cleanliness prior to lowering into the trench. Any and all costs due to the repair of damaged valves and hydrants caused by sand or silt in the pipe will be assessed to the Contractor. Never roll or push the pipe into the trench from the bank. Always lower the pipe into the trench using mechanical equipment.

After the pipe is laid, deposit bedding material around the pipe consisting of Select Fill Sand (Subsection 202.2(b)) to an elevation at least one (1) foot above the top of the pipe. Other suitable bedding materials include limestone screenings, washed gravel and crushed stone (Subsection 502.1(d)). Compact bedding material for the full length of the pipe using a hand operated mechanical compactor. This portion of the backfill is considered to be part of the required bedding for the installation of water mains and is incidental to the cost of the work.

### 703.8(a) Slip Joints.

A slip joint is made by compressing a rubber gasket between a bell cast in the end of one pipe and the plain end of the pipe to be joined. Assembly of the joint shall be in accordance with AWWA C600 - Latest Revision, including:

1. Thoroughly clean the groove and the bell socket of the pipe or fitting, and the plain end of the mating pipe. Using a clean gasket of the proper design for the joint to be assembled, make a small loop in the gasket and insert it in the socket, making sure the gasket faces the correct direction and that it is properly seated.

2. Apply lubricant to the gasket and plain end of the pipe in accordance with ANSI/AWWA C111/A21.11 - Latest Revision. Only use lubricant supplied by the pipe manufacturer.

3. Be sure that the plain end of the pipe is beveled, as square or sharp edges may damage or dislodge the gasket and cause a leak. Push the plain end into the bell of the pipe, keeping the joint straight while pushing. Deflect the pipe as required only after the joint is assembled.

4. Connect the bonding straps after the pipe is in place to ensure electrical conductivity across the joint.

### 703.8(b) Mechanical Joint Pipe and Fittings.

A mechanical pipe joint is made by compressing a rubber gasket between a bell, cast on the end of one pipe, and a gland that slides along the plain end of the pipe to be joined. The joints are tightened using nuts and bolts. Assembly of the joint shall be in accordance with AWWA C600 - Latest Revision, including:

Before slipping the gland and the gasket onto the plain end for joint assembly, lubricate both the gasket and the plain end of the pipe with an approved pipe lubricant meeting the requirements of ANSI/AWWA C111/A21.11 - Latest Revision.

1. Place the gland on the plain end with the lip extension toward the joint, followed by the gasket with the narrow edge toward the joint.

2. Insert the pipe into the bell and press the gasket firmly and evenly into the gasket recess in the bell keeping the joint straight during assembly.

3. Push the gland toward the bell and center it around the pipe with the flange lip against the gasket. Insert bolts and hand tighten nuts. Deflect pipe after assembly, but before tightening bolts.

4. All nuts and bolts must comply with AWWA C111/A21.11. - Latest Revision. Bolts shall be of sufficient length such that a minimum of 1/2-IN of threads are exposed beyond the end of the nut when tightened. The number, diameter, and length of bolts to be used is as follows:

| Pipe Diameter (inches) | No. of Bolts Required | Bolt Diameter (inches) | Bolt Length (inches) | Bolt Length for MEGALUG® (inches) |
|---|---|---|---|---|
| 3 | 4 | 5/8 | 3 | 3-1/2 |
| 4 | 4 | 3/4 | 3-1/2 | 4 |
| 6 | 6 | 3/4 | 3-1/2 | 4 |
| 8 | 6 | 3/4 | 4 | 4-1/2 |
| 10 - 12 | 8 | 3/4 | 4 | 4-1/2 |
| 14 | 10 | 3/4 | 4-1/2 | 5 |
| 16 - 18 | 12 | 3/4 | 4-1/2 | 5 |
| 20 | 14 | 3/4 | 4-1/2 | 5 |

5. Tighten the bolts to the normal range of bolt torque in accordance with AWWA C600 - Latest Revision. For restrained joints using MEGALUG® Series 1100 or equal mechanical joint restraints, tighten bolts to the manufacturer's specifications.

### 703.8(c) Valve Installation.

Locate all main line valves at property lines, unless otherwise shown on the drawings or authorized by the Engineer. Prior to installation, inspect all valves and fittings for cracks, handling damages, direction of opening, number of turns to open, freedom of operation, and cleanliness of valve ports, especially seating surfaces.

Set and join valves and fittings to the pipe in the manner described above (Subsection 703.8(b)). Check all nuts on valves for tightness before the valve is lowered into the ditch. To prevent foreign

material from entering the valve and causing damage always install valves in the closed position. Adjust valves following installation so they will work easily and properly.

A valve box is required for every valve. The valve box shall not transmit shock or stress to the valve. Center the valve box over the operating nut of the valve, with the box cover flush with the surface of the finished area. Reset any valve boxes that have shifted at any time throughout construction until formal acceptance of the project by the City so they are plumb and centered over the valve at final acceptance; thus, allowing the proper operation and functionality of every valve.

### 703.8(d) Hydrant Installation.

The Engineer or Water Utility Inspector shall be present when all hydrants are set, any hydrant extension is installed, and when hydrants are disassembled for adjustment or maintenance. The Engineer or Water Utility Inspector shall inspect the hydrant setting before backfilling. Be responsible for the proper operation of all hydrants on the project until the City formally accepts the water mains and the warranty period has expired.

Install hydrants at the locations and grade shown on the drawings. The Engineer or Water Utility Inspector must authorize in writing any variation from the locations or grades shown on the drawings. Unless otherwise ordered, set all hydrants so the back of the hydrant is eight (8) feet from the property line.

Restrain the full length of all hydrants lead from the tee on the water main to the hydrant, including the hydrant valve and any associated fittings, with mechanical joint restraints - MEGALUG® Series 1100 or equal. Set all hydrants per the requirements of Standard Detail Drawing 7.04. Install a 4-IN x 8-IN x 16-IN solid concrete masonry unit, laid flat, in the excavation to provide as a firm base for the hydrant. Set the hydrant in a truly vertical position and securely brace it until backfilling is complete. In a three-nozzle hydrant, the small nozzles shall be parallel with the curb, and the pumper nozzle shall be perpendicular to the curb. Install the required MEGALUG® restraints and concrete thrust blocking to fully secure the hydrant.

Backfill the space around the lower portion of the hydrant with clear gravel and stones up to three (3) inches in size. Cover the two weep holes in the hydrant elbow with clear gravel backfill. When placing the clear gravel, take special care to keep the drain holes open for drainage. Cover the clear gravel with six (6)-mil polyethylene, or suitable geotextile fabric to prevent loose dirt from filling in the voids in the stones. Place a wooden block or a brick under the hydrant lead to prevent the hydrant from leaning after being set. Fill the remainder of the excavation with the excavated material and compact it evenly in 12-inch lifts, so that the pressure of the backfill on the stem is equally distributed.

### 703.8(e) Pipe Casing.

Determine actual installation means, methods, techniques, and equipment used to install pipe casing.

A. Weld the full circumference of steel casing joints.

B. After installing the carrier pipe in the casing, plug the ends of the casing in such a manner to prevent the backfill material from the open excavation from seeping into the casing.

## 703.9 Cut Off Existing Water Main.

Provide concrete thrust blocks per the requirements of Standard Detail Drawing 7.03. Thrust blocking is required behind all hydrants, tees, caps, plugs and bends. On hydrants and mains six or eight (6 or 8) inches in diameter, the thrust blocking shall be either cast-in-place concrete or solid concrete blocks with Quickcrete® placed between the appurtenance and the undisturbed wall of the trench. The required bearing area of the thrust block per the table below shall be provided against undisturbed soil. For mains less than six (6) inches in diameter, the thrust restraint shall be as authorized by the Engineer or the Water Utility Inspector. For mains and fittings ten (10) inches in diameter and greater all thrust blocks shall be cast-in-place concrete.

| Required Undisturbed Bearing Area of Thrust Blocking (Square Feet) | | | | | |
|---|---|---|---|---|---|
| **Fitting Size(Inches)** | **Tee, Wye, Plug or Cap** | **90º Bend or Plugged Cross or Tee Plugged on Run** | **45º Bend** | **22-1/2º Bend** | **11-1/4º Bend** |
| 4 | 1.0 | 1.4 | 1.0 | - | - |
| 6 | 2.1 | 3.0 | 1.6 | 1.0 | - |
| 8 | 3.8 | 5.3 | 2.9 | 1.5 | 1.0 |
| 10 | 5.9 | 8.4 | 4.6 | 2.4 | 1.2 |
| 12 | 8.5 | 12.0 | 6.6 | 3.4 | 1.7 |
| 16 | 15.0 | 21.3 | 11.6 | 6.0 | 3.0 |
| 18 | 19.0 | 27.0 | 14.6 | 7.6 | 3.8 |
| 20 | 23.5 | 33.3 | 18.1 | 9.4 | 4.7 |
| 24 | 34.00 | 48.0 | 26.2 | 13.6 | 6.8 |

Note: Listed areas are based on a test pressure of 150 psi and an allowable soil bearing pressure of 3,000 pounds per square foot. To compute bearing areas for different test pressure, use the following equation:

Bearing area = (Test Pressure ÷ 150) x (Table Value)

The concrete blocking shall not extend beyond the joint. Protect all nuts and bolts from the concrete during pouring so they can be removed without removing or destroying the thrust block.

In situations that the Engineer determines that the cast-in-place concrete will not provide adequate thrust restraint, or that it is not convenient to wait for the concrete to reach the required design strength, the Engineer may require other means of mechanical thrust restraint to be used in addition to concrete thrust blocking. Thrust restraint may be as shown on Standard Detail Drawing 7.02 or it may be provided using manufactured thrust restraint devices such as MEGALUG® or an approved equal. Pipe being anchored to shall be of sufficient length to provide the required restraint to the fitting. If the anchoring pipe is too short, other joints may require thrust restraint to provide the additional anchoring length.

## 703.10 Additional Excavation.

All disinfection materials, procedures and requirements in the City of Madison shall be per AWWA C651 “Standard for Disinfecting Water Mains” latest revision, except as modified herein. Throughout construction constantly keep in mind that these pipe lines are to be used to convey water

for drinking purposes. Special care shall be taken to prevent dirt, mud, muddy water, or other foreign matter from entering the pipe or fittings during installation. The Engineer reserves the right to require that the pipe and fittings be swabbed cleaned prior to lowering into the trench if the proper care has not been taken.

Furnish and install a watertight plug for all open ends of pipe and fittings whenever the work is temporarily stopped. Plug the pipes during work breaks, as well as overnight. Failure to properly plug and protect the pipe during construction may result in additional costs to the Contractor for all work and materials necessary for cleaning pipes and fittings contaminated during construction.

Deposit the following amounts of Calcium Hypochlorite (HTH or equal - 65% available chlorine by weight) in each eighteen (18) foot length of pipe:

| Pipe Diameter (inches) | Amount of HTH or approved equal required (ounces) |
|---|---|
| 4 | 1 |
| 6 | 2 |
| 8 | 3-1/2 |
| 10 | 5-1/2 |
| 12 | 7 |
| 16 | 14 |

## 703.11 Styrofoam Installation.

Unless otherwise provided, backfill all trenches and excavations immediately after the water main and appurtenances have been constructed. In covering the water main and filling around structures, the backfill material shall be brought up evenly on all sides so that no unbalanced pressures are produced on the pipe and masonry.

Backfill all excavations to the original ground elevation unless specified otherwise in the contract or ordered by the Engineer. In the event of a shortage of material to perform this work, including replacement as may be required by rock excavation or removal of boulders, provide the necessary additional fill material at no additional cost to the City.

Walking or working on the completed pipe, except as may be necessary in compacting and backfilling, is prohibited until the trench has been backfilled to an elevation at least two (2) feet above the top of the pipe. Do not take backfill material from trench walls below an elevation of two (2) feet above the top of the pipe. Backfill and compact the remainder of the trench as specified herein.

Dump imported backfill material along the top of the trench beyond the reach of slides. Do not store imported material such that it increases the stresses on the trench section. Place the backfill in lifts with the proper equipment. Backfill material may be dumped directly into the trench from trucks when the amount of material to be dumped is controlled.

Trucks, vehicles, or other equipment are not allowed within the limits of the trench prior to the completion of the backfilling operations. The Engineer may permit the use of heavy equipment in the trench for compaction or other purposes if the pipe is adequately protected. Carefully draw and remove any required sheathing and bracing such that it will not disturb the completed work.

Carefully fill and compact any voids created by the removal of sheathing and bracing with approved backfill material.

Backfilling of structures shall conform to the requirements specified in “Protection of the Concrete” in Subsection 301.8(d) of these Specifications.

Backfill tunnels and shafts for tunneling and jacking operations in accordance with the requirements specified in the Contract. Where not specified in the Contract, such backfilling shall be as authorized by the Engineer.

Where the grade of the water main is such that the top surface of the pipe requires protection, construct an embankment of earth or other approved material over the pipe. The height of the embankment, as specified by the Engineer, shall be adequate to provide proper protection. The width at the top of the embankment shall be a minimum of two (2) feet wider than the external diameter of the pipe. Slope the sides of the embankment from the top of the embankment to the existing ground surface at a ratio of not less than two (2) feet horizontal to one (1) foot vertical. Use surplus excavated material or other material approved by the Engineer for embankment construction. Furnish and place selected material in the embankment over the pipe at no additional cost to the City. If imported material is required to complete the embankment over the pipe, only authorized imported fill quantities will be paid for as provided herein. Compact embankment material as specified in the requirements for “Standard Compaction” Subsection 202.3 (b).

All material used for backfilling trenches and other excavations is subject to the review and approval of the Engineer. Unless specified otherwise in the Contract or directed by the Engineer, backfill the trenches and other excavations with materials excavated during the course of the work. Do not include vegetation, stones, or fragments of broken rock in excess of six (6) inches in any dimension in the backfill.

The excavated materials may be rejected by the Engineer for use as backfill material due to the character of the material, including but not limited to unacceptable moisture content, unacceptable gradation or composition, or the presence of frozen material. Remove all rejected materials from the site.

In the event of inadequate moisture in the backfill materials, add water in quantities deemed necessary to obtain the required compaction.

When the Contract specifies the backfill material shall be imported Select Fill, the Select Fill for backfilling trenches and other excavations shall be as defined in Subsection 202(b), and is paid for as provided in the Contract. If a specific pay item for Select Fill is not provided in the Contract, the specified and required Select Fill is considered to be incidental to the cost of the work and no additional payment will be made. Excess excavated material resulting from the above work is considered surplus material and shall be disposed of at no additional cost to the City.

Unless otherwise specified or authorized by the Engineer, mechanically compact the backfill in all trenches and excavations to thoroughly consolidate the backfill material to the specified density and to not damage or disturb the pipe or other structures. Compaction of the backfill material shall be in accordance with the following requirements:

1. Begin mechanical compaction of the backfill material when the depth of the backfill material is two (2) feet above the top of the pipe. (In the case of structures, begin compaction of the backfill material with the placing of the first layer of backfill material).

2. Deposit, spread and level backfill material in layers not exceeding twelve (12) inches in thickness before compaction.

3. When the material being compacted is of a granular nature and the compacting equipment is adaptable for the purpose, the thickness of the layer may be increased to a maximum of twenty-four (24) inches, provided the required compaction density is obtained.

4. Compact each layer of the material to the specified density before placing the succeeding layer.

5. Compaction Density Requirement:

    a. From two foot over the pipe to within three (3) feet of the bottom of subgrade: a minimum of ninety (90) percent of maximum density.
    b. Within three (3) feet of the bottom of subgrade: a minimum of ninety-five (95) percent of maximum density.

6. Determine maximum density in accordance with the Standard Method of Test for the Moisture-Density Relations of Soils, ASTM Designation: D 1557, Method D, latest revision, with replacement of the fraction of material retained on 3/4-inch sieve with No. 4 to 3/4-inch material.

7. Determine the density of compacted backfill in accordance with one of the following:

    a. Test for Density of Soil-in-Place by the Sand-Cone Method, ASTM Designation: D 1556, latest revision.
    b. Test for Density of Soil and Soil-Aggregate in Place by Nuclear Methods, ASTM Designation: D 2922, latest revision.
    c. Or by other approved methods authorized in writing by the Engineer.

8. In the event the material in the density sample differs in percentage of aggregate retained on a No. 4 sieve from that in the sample upon which maximum density was determined, adjust the maximum density in accordance with approved procedures.

Whenever the work of installing water pipes takes place during freezing weather, the specifications for trench compaction above shall be followed, if practicable. If the specified compaction cannot be achieved, and the Engineer determines that the work may not be suspended until more favorable weather conditions exist, then the following procedures shall apply:

1. Remove all frozen material in the trench at the beginning of the day’s work.

2. Trenches shall be closed at the end of every day.

3. Do not compact frozen materials.

4. Compact material in six (6) inch maximum lifts.

5. Compaction density shall be as specified above.

6. If the top three (3) feet of material does not meet ninety-five (95) percent of maximum density, remove the material and place Select Fill using six (6) inch maximum lifts and compact to ninety-five (95) percent of maximum density.

7. The Engineer will perform compaction testing as necessary to provide uniformity of compaction.

8. As a guideline, no construction will be permitted when the temperatures are too cold to achieve the specified compaction of the backfill. The temperature shall be at least 15ºF and rising with winds less than 10 mph to consider working in freezing conditions.

## 703.12 Installation of Copper Services.

Locate new service connections as noted on the drawings. Where not shown on the drawings, whenever possible locate new service connections at the center of residential lots. Locate the tap on the upper half of the main at a 45º angle from the vertical plane, perpendicular to the water main and on the side of the main to which service is to be extended. Lay service laterals perpendicular to the water main.

Tap the water main and install the corporation stop with a tapping machine specifically designed to tap the water main under pressure. No other method of tapping the water main will be allowed. Repair and replace the polyethylene encasement following the tap to ensure that the water main is fully protected.

Provide and install saddles on all 1-1/2-inch and 2-inch services.

After the tap has been made and the corporation stop and bend have been inserted, loop the copper tubing out and then back toward the main, then back away from the main to form the shape of an "S." This "S" loop shall be of sufficient size so that it uses a minimum of two (2) feet of copper tubing. The highest portion of the loop shall not be any higher than the top of the 45º bend attached to the corporation stop. After the "S" loop is formed, lay the service flat to the property line with a minimum of six (6) feet of cover below the final grade.

Insert a curb stop on the service at a point eight (8) feet from the property line, unless specified otherwise or ordered by the Engineer. Install the curb box vertically over the curb stop so that after the service is backfilled to final grade, a key may be placed on the rod of the curb stop and it may be operated easily. Set curb boxes flush with the finished ground elevation. Do not locate curb boxes in a curb or sidewalk.

Use a standard valve box in lieu of a curb box, with no rod or rings required, for 1-1/2-inch and 2-inch services.

Following installation, open the corporation stop and the curb stop and flush out the service lateral. Once flushed out, hammer shut the end of the service lateral to keep rocks and dirt out of the lateral. Leave the corporation stop open. Plugs or compression fittings at the end of copper services are not allowed.

When backfilling new service lateral trenches, place a 2-IN x 4-IN board next to each curb or valve box in the terraces. This board shall be at least four (4) feet long with at least two (2) feet buried and two (2) feet exposed.

Use a pipe cutter to cut all copper tubing. The use of hacksaws or other such devices to cut copper tubing will not be tolerated.

Prior to backfilling, visually inspect all polyethylene encasement and repair any defects.

## 703.13 Styrofoam Installation.

When specified, shown on the drawings or ordered by the Engineer, place styrofoam insulation over the pipe as follows:

1. After pipe installation, backfill and compact the trench to a point six (6) inches above the top of the pipe.

2. Place two (2) IN thick by four (4) FT wide styrofoam insulation in the trench centered over the pipe.

3. Following installation of the styrofoam, backfill and compact the remainder of the trench.

## 703.14 Tests.

Test all newly installed water mains prior to final acceptance by the Water Utility. The Engineer or the Water Utility Inspector will witness and verify all testing procedures and results. Repair and/or replace any and all defective areas to the satisfaction of the Engineer noted during the testing at no cost to the City.

### 703.14(a) Conductivity Testing.

The Engineer may test the completed water main for electrical conductivity through the joints. If there is no electrical conductivity, check each joint and repair or replace the bonding straps or conductive mechanical joint (no lead) gaskets until there is electrical conductivity through the full length of the main.

### 703.14(b) Water Quality Testing.

After the main has been completely installed and backfilled, assist the Water Utility Inspector to slowly fill the new main from an uncontaminated source by operating the necessary valves. **DO NOT** operate any valves under any circumstances, except as directly instructed to do so, by and in the presence of Water Utility personnel. Loosen one nozzle cap per hydrant to allow air pockets to dissipate along the full length of the pipe being filled.

The chlorinated water shall remain in the newly installed main for a minimum of 48 hours. Following the 48-hour period, schedule flushing and sampling activities with the Water Utility. Water Utility personnel will flush the main and collect samples for bacteriological testing. The newly installed system will not be put into service until the receipt of a safe bacteriological sample result from the certified lab.

Do not discharge highly chlorinated water to any surface water bodies. Provide assistance to the Water Utility as necessary to neutralize the chlorine in the water flushed from the pipe following any disinfection operation. This assistance may include but will not necessarily be limited to help in setting up and operating Water Utility equipment, monitoring the flushing operation, sampling, and assistance in delivering chemicals needed to neutralize the chlorine.

If a sample receives an unsafe result, schedule with the Water Utility to have the main flushed and sampled a second time. If the samples collected the second time do not pass the test, the pipe shall be disinfected again per AWWA C651 latest revision as modified herein and the chlorinated water held in the pipe for a minimum of 48 hours. Following the 48-hour holding period, assist Water Utility personnel with flushing the line again and resampling. This process will be repeated at no additional cost to the City until a safe sample is received from the City's designated testing lab.

### 703.14(c) Hydrostatic Pressure Test.

Unless noted and specified otherwise, hydrostatically pressure test all new water main as specified herein.

After the main has been declared bacteriologically safe by the City's designated testing lab, and following the installation of service laterals on new private development work, or as soon thereafter as convenient for the Engineer, conduct a hydrostatic pressure test. On street reconstruction projects, pressure test mains prior to making any water service lateral connections. Expel all air from the pipe prior to starting the pressure test. If hydrants or blow-offs are not available at high points, make the necessary taps at high points to expel the air and insert plugs after the air is expelled.

The hydrostatic test shall be performed in accordance with the AWWA Standard for Installation of Ductile Iron Water Mains (ANSI/AWWA C600 - Latest Revision). The test pressure shall be a minimum of 150 psi and shall be maintained for a minimum of two hours. Test pressure shall not drop more than 5 psi during the test. Higher pressures and shorter times may be considered by the Engineer on a case-by-case basis. Use only clean, disinfected containers and equipment to add make-up water during pressure testing. Furnish all equipment, labor, and supplies necessary to apply pressure to the pipeline in a manner satisfactory to the Engineer. All pressure tests shall be witnessed and verified by Water Utility personnel.

The testing allowance (allowable makeup water) shall be no greater than as calculated in the formula:

$$L = SD (\sqrt{P}) / 133{,}200$$

Where:

L = Testing allowance (makeup water), in gallons per hour (gph)
S = Length of pipe tested, in feet
D = Nominal diameter of pipe, in inches
P = Test pressure, in pounds per square inch (gauge)
√ = Square Root

When testing against closed metal-seated valves, an additional testing allowance per closed valve of 0.0078 gph per inch of nominal valve size shall be allowed.

If the pipe line fails the pressure test, locate the leak and repair it to like new condition. The type of repair completed shall be approved by the Engineer and shall result in an end product that is equal to or better than new construction. All costs associated with locating the leak, repairing the pipe line to the satisfaction of the Engineer, restoring the area, and any other tasks associated with this repair work is considered to be incidental to the work and will be at no additional cost to the City.

Following location and repair of the leak, repeat the pressure test until a satisfactory result is obtained. All costs associated with retesting the pipe line is considered to be incidental to the work and will be at no additional cost to the City.

## 703.15 Cut Off Existing Water Main.

Where required to cut off existing water mains, cut the pipe to be abandoned upon receipt of approval from the Water Utility Inspector. Work involved in cutting off a water main may include but not be limited to any of the following:

1. Installing a mechanical joint plug in a new or existing fitting,

2. Installing a mechanical joint cap over the end of new or existing pipe, or

3. Cutting out an existing fitting and replacing it with an appropriate length of new pipe and necessary solid sleeves to connect to existing pipe.

Provide and install the necessary thrust blocking behind the ends of the existing pipe and behind any disturbed fittings. Insert a concrete plug in the end of the abandoned pipe to minimize the intrusion of the backfill material into the pipe.

## 703.16 Final Inspection.

Prior to final inspection, repair, replace, and/or adjust any and all valve boxes, curb boxes, and hydrants disturbed or damaged by construction activities. Final inspection will not be scheduled until all final grading, all other utility work, all curb gutter and sidewalk are in, all sodding, pavement, roadway surfacing are complete, and any other work in the right of way is completed. Final inspection will not be scheduled until all water system testing is satisfactorily completed as specified. Prior to notifying the Water Utility, inspect all valve boxes, curb boxes, and hydrants to ensure that they are plumb and centered as specified and that all covers are in place. When satisfied that all work is complete, notify the Madison Water Utility that the project is ready for final inspection.

Water Utility inspectors will complete the final inspection and review all of the project records and paperwork for completeness. Deficiencies will be noted and the Contractor will be notified and requested to make the necessary repairs and/or corrections.

# ARTICLE 704 - MEASUREMENT AND PAYMENT

## 704.1 General.

Visit the site prior to bidding and become familiar with the existing conditions. It will be the responsibility of the Contractor to work with the utilities located in the right of way to resolve conflicts during the construction process.

Contract prices for the various items include but shall not necessarily be limited to; all equipment, tools, materials, labor and incidentals necessary to complete the work as specified. The scope of responsibility for furnishing materials shall be as stated in the specific Contract documents. On select projects, Madison Water Utility may elect to furnish a portion of the required materials as noted and itemized in the specific Contract Documents.

The Water Utility will furnish the tapping valve, tapping sleeve, and one (1) valve box for all pressurized taps four (4) inches or larger. With this one exception, the Water Utility will not furnish any materials to the Contractor unless specifically stated in the Contract documents.

Only work that is completed and accepted in accordance with the terms of the Contract will be measured for payment.

## 704.2 Rock Excavation.

1. Description. Rock Excavation includes all rock that can not be removed by a standard excavator as defined in Article 703.

2. Materials. No materials required.

3. Construction Methods. All work associated with rock excavation shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

4. Method of Measurement. Rock excavation shall be measured in the field and the volume in cubic yards shall be computed from those measurements. Volumes shall be neat line. The vertical measurements shall extend from the surface of the rock to an elevation six (6) inches below the bottom of the pipe or structure; the horizontal measurements shall be limited to the outside diameter of the pipe or outside width of the structure plus two (2) feet. Boulders one-half (1/2) cubic yard or more in volume shall be measured individually, and the volume of each boulder computed from average dimensions taken in three directions.

   Rock excavation required for valve access structures shall be determined by the size of the valve access structure to be installed. The vertical measurement shall extend from the surface of the rock to an elevation of eight (8) inches below the bottom invert of the water main for valve access structures up to ten (10) feet deep and twelve (12) inches below the bottom invert of the water main for valve access structures over ten (10) feet deep. The horizontal measurements shall be limited to the outside dimension of the valve access structure at the valve plus two (2) feet. Excessive rock excavation shall not be paid.

5. Basis of Payment. The Contract price for Rock Excavation includes excavation of the rock; disposal of surplus material from the excavation; replacement with approved material of any

shortage of backfill material resulting from rock excavation; and all other work incidental to rock excavation.

## 704.3 Additional Excavation, Including Undercut.

1. Description. All work involved in forming a satisfactory foundation at depths of six (6) inches or less below the bottom of the pipe will be considered as incidental to the work. Additional excavation, including undercut includes areas noted on the drawings and specifications, areas where unsuitable materials are encountered, and areas where ordered in writing by the Engineer. Over excavation for the Contractor's convenience shall not be considered for additional payment.

2. Materials. No materials required.

3. Construction Methods. All work associated with additional excavation, including undercut shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

4. Method of measurement. Additional excavation authorized in writing by the Engineer, including undercut beyond six (6) inches below the bottom of the pipe, shall be measured in the field and the volume in cubic yards shall be computed from those measurements and paid for as extra work. Volumes shall be neat line. The maximum payment width of the additional excavation or undercut shall be the outside diameter of the pipe or outside dimension of the bottom of the structure plus two (2) feet plus the amount necessary for sheeting and bracing.

5. Basis of Payment. The Contract price for Additional Excavation, Including Undercut includes the required excavation; disposal of surplus material from the excavation; replacement with approved material; compaction; and all other work incidental and required to provide an adequate foundation.

## 704.4 Removal of Excess Amounts of Bidders.

1. Description. Boulders are defined as rocks that have a dimension greater than 12 inches in one or more faces. Boulders are naturally occurring rock in the excavation. The number of boulders on each specific project will vary per the location of the work. Expect to remove any and all boulders encountered regardless of number. When it is deemed, by the Engineer, that the amount of boulders encountered on a water project are excessive, then additional payment under this item may be considered.

2. Materials. No materials required.

3. Construction Methods. All work associated with removal of excess amounts of boulders shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

4. Method of Measurement. When authorized by the Engineer, boulders less than one-half (1/2) cubic yard shall be measured by truck volume. Boulders one-half (1/2) cubic yard or more in volume shall be measured individually, and the volume of each boulder computed from average dimensions taken in three directions. Large boulders will be paid as rock excavation

and not under this item. The Engineer will establish the limits of payment for this item and the Engineers decision shall be considered to be final.

5. Basis of Payment. The Contract price for Removal of Excess Amounts of Boulders includes all means and methods necessary to excavate, load, haul and all other work incidental to the task. When authorized by the Engineer a payment of six dollars ($6.00) per cubic yard of boulders hauled from the project will be added to the Contract.

## 704.5 Cut-In Connection.

1. Description. Cut-In Connection consists of all means and methods, equipment, tools, labor, etc. necessary for making a cut-in connection to the existing water main where designated on the drawings in accordance with Section 703.6 of these Standard Specifications for Public Works Construction.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with cut-in connection shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

4. Method of Measurement. All work under this section shall be measured per each as a completed unit.

5. Basis of Payment. The Contract price per each for Cut-In Connection shall include the excavation required to expose the utility line, imported select fill, backfilling and compacting the excavation; all tools, equipment, labor, and materials required, restoring and maintaining the site and all other work incidental to the work.

## 704.6 Furnish and Install Pipe and Fittings.

1. Description. Furnish and Install Pipe and Fittings consists of all tools, equipment, labor, materials, and any other appurtenances required to furnish and install all water pipe and fittings and testing water main in accordance with the Contract drawings, specifications and these Standard Specifications for Public Works Construction. Where a pressure tap connection is designated on the drawings, provide all necessary excavation, backfill and compaction for the Water Utility to make the tap. All costs associated with making the pressure tap is considered to be incidental to installing the pipe. Concrete and asphalt concrete pavement removal necessary to install the new water pipe and fittings is considered to be incidental to installing the pipe. Items included but not necessarily limited to: all materials necessary to perform the work except as noted specifically in the Contract documents; excavation of the trench; installation and removal of sheeting and bracing; dewatering; bedding the pipe; furnishing and installing pipe, valves, fittings, sleeves, clamps, tie rods, thrust restraint, including thrust blocks, temporary flushing devices, plugs, accessories and polyethylene encasement; temporarily raising or lowering existing water services; adjusting valve boxes and hydrants to finished grade; disposing of surplus material from the trench; disinfecting and testing the new piping system; backfilling the trench; compacting the backfill material; restoring the site and all other work incidental to the installation of water mains. Exposing existing water main to verify location and depth shall be considered incidental and no separate measurement or payment will be made.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with furnish and install pipe and fittings shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

4. Method of Measurement. Measurement for Furnish and Install Pipe and Fittings shall be measured by length in feet, to the nearest half foot for each size (diameter) of pipe installed, measured along the centerline of the pipe at the surface, from center to center of valves and fittings. There shall be no deductions from the measured lengths for fitting installations.

5. Basis of Payment. Furnish and Install Pipe and Fitting shall be paid for at the Contract unit price per linear foot. Payment per foot shall be full compensation for all work in furnishing and installing pipe and fittings.

## 704.7 Install Hydrant.

1. Description. Install Hydrant consists of installing fire hydrants as noted on the drawings or ordered by the Engineer. This item includes but is not necessarily limited to: furnishing all materials, except as noted in the specific Contract documents, excavation, sheeting and bracing, dewatering, backfilling and compaction necessary to connect the hydrant to the water main, installing the necessary rock and plastic to provide a proper drain field for the hydrant, furnishing and installing the concrete thrust blocking behind the hydrant and all other work incidental to the installation of a hydrant.

2. Materials: All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with install hydrant shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

4. Method of Measurement. Hydrants are measured as individual units for each hydrant installed.

5. Basis of Payment. Install Hydrant shall be paid at the per each Contract price for each hydrant installed. Payment per each shall be full compensation for all work in furnishing and installing hydrants.

## 704.8 Select Fill - Sand.

1. Description. Select Fill - Sand consists of furnishing and installing select imported fill in the trenches as specified in the Contract documents, indicated on the drawings, or ordered by the Engineer. No payment will be made for Select Fill - Sand unless specifically specified and authorized in writing by the Engineer. This item includes but is not necessarily limited to; furnishing, hauling, placing and compacting the specified material, and disposal of surplus material from the excavation displaced by the Select Fill.

2. Materials. The Select Fill furnished shall be as specified in Subsection 202.2 (b) and Article 703 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with select fill - sand shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

4. Method of Measurement. Unless otherwise stated in the Contract, Select Fill - Sand is measured by length in trench feet to the nearest foot, measured along the centerline of the pipe at the surface for new installations. When excavating for maintenance or abandonment items, it will be measured along the centerline of the trench. The Engineer may require truck delivery tickets to substantiate payment for Select Fill-Sand.

5. Basis of Payment. Select Fill - Sand is paid for at the Contract unit price per trench foot. Where Select Fill is not listed as an item in the Contract on which to submit unit prices, it shall be understood and agreed that payment shall be five dollars and seventy cents ($5.70) per trench foot of Select Fill - Sand furnished and placed in accordance with these Specifications.

## 704.9 Water Service Laterals.

1. Description. Water Service Laterals consists of installing new copper service laterals as shown on the drawings, specified in the Contract or ordered by the Engineer. This item shall include but not necessarily be limited to; furnishing all materials, including required fittings; excavation of the trench; installing and removing sheeting and bracing; dewatering; backfilling the trench; compacting the backfill material; making the tap; bedding the pipe; laying the pipe; installing fittings and curb box; jointing and sealing of joints in pipe and fittings; installing/repairing polyethylene encasement; restoring the site and other work incidental to the installation of water service laterals.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with water service laterals shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

4. Method of Measurement. Water service laterals shall be measured by length in feet of each of the various types, classes and sizes of pipe installed, measured along the centerline of the pipe at the surface from the center of the water main to the center of the curb stop, or to the end of the lateral pipe, whichever is longer.

5. Basis of Payment. Water Service Laterals are paid for at the Contract unit price per linear foot. Payment per foot shall be full compensation for all work in furnishing and installing water service laterals.

## 704.10 Replace Lead Service Laterals.

1. Description. Replace Lead Service Laterals consists of replacing existing lead service laterals if they exist with copper service laterals. Where the main is not being abandoned, work shall also include cutting off existing lead service, turning off or removing existing corporation stop and plugging the existing corporation stop or main as shown on the drawings, specified

in the Contract, or ordered by the Engineer. The work under this item shall include but not necessarily be limited to; furnishing all materials, including required fittings; excavating the trench; installing and removing sheeting and bracing; dewatering; backfilling the trench; compacting the backfill material; making the tap; bedding the pipe; laying the pipe; installing fittings and curb box; jointing and sealing of joints in pipe and fittings; installing and/or repairing polyethylene encasement; restoring the site and other work incidental to the installation of replacing lead service laterals.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with replace lead service laterals shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

   Coordinate the replacement of lead service laterals with the property owner and the property owner's plumber. Assume that the property owner may have delays in making the connection to the new copper service. Plan for a maximum delay of 14 calendar days where the excavation at the curb stop may have to remain open and the old service remain in use. Protect and maintain all excavations throughout this delay with attention to public safety. No additional compensation will be considered due to the impact of this delay or the failure to coordinate with the impacted property owner or plumber.

   If ordered by the Engineer, to meet project schedule requirements or weather constraints, the new copper service may be temporarily connected to the existing lead service. This work will be paid on a time and materials basis and will only be as authorized in writing by the Engineer. Following the completion of the new copper water lateral, backfill and compact the excavation as specified. No additional compensation will be paid for delays in backfill and compaction due to the temporary connection.

4. Method of Measurement. Replace Lead Service Laterals is measured by length in feet of each of the various types, classes and sizes of pipe installed, measured along the centerline of the pipe at the surface from the center of the water main to the center of the curb stop, or to the end of the lateral pipe, whichever is longer.

5. Basis of Payment. Replace lead service laterals is paid for at the Contract unit price per linear foot. Payment per foot shall be full compensation for all work in furnishing and replacing lead service laterals.

## 704.11 Extend and Reconnect Water Service Lateral.

1. Description. Extend and reconnect water service lateral consists of reconnecting and extending the existing copper water service laterals to the new water main. Furnish all materials for tapping the new main and reconnecting and extending the copper water service laterals. This item includes but is not necessarily limited to; all excavation, including hand digging necessary to expose the existing piping; tapping the new main; reconnecting and extending the existing service; backfilling the excavation; compacting the backfill material; maintaining the ditches and all other work incidental to restoring and maintaining the site.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with extend and reconnect water service laterals shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

4. Method of Measurement. Extend and reconnect water service laterals is measured by length in feet of each of the various types, classes and sizes of pipe installed, measured along the centerline of the pipe at the surface from the center of the water main to the point of the connection.

5. Basis of Payment. Extend and reconnect water service lateral is paid for at the Contract unit price per linear foot. Payment per foot shall be full compensation for all work in furnishing and reconnecting water service laterals.

## 704.12 Reconnect or Disconnect Service Lateral.

1. Description. Reconnect or Disconnect Service Lateral consists of cutting off and reconnecting the existing copper water service laterals to the new water main that results in a shorter water service lateral. Furnish all materials for tapping the new main and reconnecting the copper water service laterals. All work under this section shall include all materials, equipment, labor, and incidentals necessary to complete the work. The task includes but is not necessarily limited to: all excavation, including hand digging necessary to expose the existing piping, reconnecting the existing service, backfilling the excavation, compacting the backfill material, maintaining the ditches and all other work incidental to restoring and maintaining the site.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with reconnect or disconnect service lateral shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

4. Method of Measurement. Reconnect or Disconnect Service Lateral is measured separately per each unit for each complete cutoff and reconnection made in accordance with these Specifications.

5. Basis of Payment. Reconnect or Disconnect Service Lateral is paid for as a completed unit at the Contract unit price. Payment per each shall be full compensation for all work in cutting off and reconnecting water service laterals.

## 704.13 Furnish and Install Styrofoam.

1. Description. Furnish and install styrofoam consists of placing Styrofoam in order to insulate water mains and/or water service laterals. This section includes but is not necessarily limited to; all materials, equipment, labor and incidentals necessary to complete the insulation of the pipe.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with furnish and install styrofoam shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction. After the pipe has been laid, backfill and compact the trench to a point six (6) inches above the top of the pipe. Install two (2) inch thick by four (4) feet wide by eight (8) feet long Styrofoam pieces in the trench centered over the pipe for the full length to be insulated. After styrofoam installation, backfill and compact the remainder of the trench.

4. Method of Measurement. Furnish and install styrofoam is measured by length in feet of pipe insulated measured along the centerline of the pipe at the surface.

5. Basis of Payment. Furnish and install styrofoam is paid for at the Contract unit price per linear foot. Payment per foot shall be full compensation for all work in insulating the pipe as required.

## 704.14 Cut Off Existing Water Main.

1. Description. Cut Off Existing Water Main consists of abandoning the existing water mains in the locations designated by Madison Water Utility. This task includes but is not necessarily limited to; all excavation necessary to expose the existing water main; providing all materials necessary to perform the work, except as noted in the specific Contract document; installing the necessary fittings and restraint on the existing main; thrust blocking and inserting a concrete plug in the abandoned main; backfilling the excavation; compacting the backfill material; restoring and maintaining the site and all other work incidental to cutting off existing water mains.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with cut off existing water main shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

4. Method of Measurement. Cut Off Existing Water Main is measured separately per each unit for each complete individual cutoff made in accordance with these Specifications.

5. Basis of Payment. Cutoff Existing Water Main is paid for as a completed unit at the Contract unit price. Payment per each shall be full compensation for all work in cutting off the water main as specified herein.

## 704.15 Abandon Water Valve Box.

1. Description. Abandon Water Valve Box consists of abandoning all water valve boxes within the project limits that serve valves no longer in service. This item includes but is not necessarily limited to; all materials, equipment, labor, select fill and incidentals necessary to complete the work.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with abandon water valve box shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction. All work shall take place after the existing water main has been abandoned. Remove the top casting to a point three (3) feet below the existing elevation then backfill the opening with select fill and compact.

4. Method of Measurement. Abandon Water Valve Box is measured separately per each unit for each water valve box abandoned in accordance with these Specifications.

5. Basis of Payment. Abandon water valve box is paid for as a completed unit at the Contract unit price. Payment per each shall be full compensation for all work in abandoning the water valve box as specified herein.

## 704.16 Abandon Hydrant.

1. Description. Abandon Hydrant consists of abandoning all fire hydrants identified on the drawings to be abandoned. This item includes but is not necessarily limited to; all materials, equipment, labor, select fill and incidentals necessary to complete the work.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with abandon hydrant shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction. All work shall take place after the existing water main has been abandoned. If the hydrant is a screw type hydrant, unscrew the hydrant with chain tongs (or like) and remove high stock and salvage for the Madison Water Utility. The frost case shall be removed and salvaged for the Madison Water Utility. If the hydrant is not a screw type hydrant, excavate to the bottom of the hydrant and disassemble from the hydrant lead. Remove the hydrant and salvage for the Madison Water Utility. Backfill the opening with existing material and compact. Use select fill as additional backfill material if there is not enough existing material.

4. Method of Measurement. Abandon Hydrant is measured separately per each unit for each hydrant abandoned in accordance with these Specifications.

5. Basis of Payment. Abandon water valve box is paid for as a completed unit at the Contract unit price. Payment per each shall be full compensation for all work in abandoning the hydrant as specified herein.

## 704.17 Abandon Water Valve Access Structure.

1. Description. Abandon Water Valve Access Structure consists of abandoning all water valve access structures or manholes as indicated on the drawings or ordered by the Engineer. This item includes but is not necessarily limited to; all materials, including valve box, if required, equipment, labor, select fill and incidentals necessary to complete the work.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with abandon water valve access structure shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction. Remove the casting and structure walls. If concrete is in contact with a main and/or valve that is to remain in service, and removal of the structure may damage the existing piping system, the Engineer may instead require that the structure walls be removed to a depth of three (3) feet below finished grade. If the valve is to remain in use, replace the water valve access structure with a valve box. Backfill the opening with select fill and compact.

4. Method of Measurement. Abandon water valve access structure is measured separately per each unit for each water valve access structure abandoned in accordance with these Specifications.

5. Basis of Payment. Abandon water valve access structure is paid for as a completed unit at the Contract unit price. Payment per each shall be full compensation for all work in abandoning the water valve access structure as specified herein.

## 704.18 Adjust Water Valve Box.

1. Description. Adjust Water Valve Box consists of adjusting all existing water valve boxes within the project limits to final grade. Adjustment of new valve boxes is incidental to water main construction and will not be paid under this item. This item includes all materials, equipment, labor and incidentals necessary to complete the work.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with adjust water valve box shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction. Excavate and expose the existing water valve boxes to the depth needed to adjust the valve boxes to finished grade. Extensions may be required. Backfill and compaction shall be in accordance with these Standard Specifications for Public Works Construction. Leave all valve boxes centered over the valve operating nut and free of dirt and debris.

4. Method of Measurement. Adjust water valve box is measured separately per each unit for each water valve box adjusted in accordance with these Specifications.

5. Basis of Payment. Adjust Water Valve Box is paid for as a completed unit at the Contract unit price. Payment per each shall be full compensation for all work in adjusting the water valve box as specified herein.

## 704.19 Relocate Hydrant.

1. Description. Relocate hydrant consists of removing and relocating existing fire hydrants identified on the drawings or ordered by the Engineer. All work under this section includes but is not necessarily limited to; all materials, equipment, labor and incidentals necessary to complete the work. This item includes excavating the trench; removing the hydrant;

extending or shortening the hydrant lead; installing fittings; reinstalling fire hydrant; installing and removing temporary sheathing, shoring and bracing; installing the necessary rock and plastic to provide a proper drain field for the hydrant; furnishing and installing the concrete thrust blocking behind the hydrant; furnishing and installing a 6-IN hydrant valve if required, disinfecting and testing the installation; cleaning up and restoring the site and all other work incidental to hydrant relocation.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with relocate hydrant shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction. Relocate hydrants per the following:

   a. Hydrant valve is adequately restrained to the water main tee:

      i. Shut off the hydrant valve.
      ii. Excavate along the hydrant lead
      iii. Add or remove fittings, extending or shortening the hydrant lead as shown on the drawings or as ordered by the Engineer to properly place the hydrant.

   b. Hydrant does not have a valve or if the hydrant valve is not adequately restrained to the water main:

      i. Shut off the water main. Do not operate any valves under any circumstances, except as directly instructed to do so, by and in the presence of Water Utility personnel.
      ii. Excavate along the hydrant lead and cut the lead.
      iii. Add a six-inch hydrant valve securely restrained back to the water main.
      iv. Return the water main to service as soon as practical and safe.
      v. Add or remove fittings, extending or shortening the hydrant lead as shown on the drawings or as ordered by the Engineer to properly place the hydrant.

   c. Backfill the excavation with existing material to an elevation of six (6) inches below the street terrace finished grade.

4. Method of Measurement. Relocate Hydrant is measured separately per each unit for each hydrant relocated in accordance with these Specifications.

5. Basis of Payment. Relocate Hydrant is paid for as a completed unit at the Contract unit price. Payment per each shall be full compensation for all work in relocating hydrants as specified herein.

## 704.20 Water Valve Access Structure.

1. Description. Water Valve Access Structure consists of furnishing and installing a six (6) foot I.D. City of Madison standard valve access structure with steps and casting as identified on the drawings and according to these Standard Specifications for Public Works Construction. This work also includes installing a one (1) inch tap on each side of the valve. All work under this section includes but is not necessarily limited to; all materials, including castings and

taps; excavation; installation and removal of sheeting and bracing; dewatering; disposal of surplus material from the excavation; backfilling; compacting backfill material; preparing the foundation; constructing the structure, including connections; making the taps; cleaning out the structure; restoring the site and all other equipment, labor, and incidentals necessary to complete the work.

2. Materials. All materials including the water valve access structure, adjustment rings, casting, and 1-inch taps used for this work shall conform to the requirements of Articles 503, 507, 702 and 703 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with water valve access structure shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction. Install access structure per the following:

   a. The water valve access structure has a flat top with an offset opening and a standard access structure frame and non-rocking cover.
   b. Center the water valve access structure over the valve.
   c. Place clear gravel and stones up to three (3) inches in size as a base for the structure.
   d. Do not pour a concrete floor with this structure
   e. Pour a one (1) foot wide concrete support ring around the base of the structure to prevent the structure from settling.
   f. Provide appropriate openings in the structure and the support ring so that the structure is not resting on the water main.

4. Method of Measurement. Water Valve Access Structure is measured separately per each unit for each water valve access structure installed in accordance with these Specifications.

5. Basis of Payment. Water valve access structure is paid for as a completed unit at the Contract unit price. Payment per each shall be full compensation for all work in installing a valve access structure as specified herein.

## 704.21 Install Boltless Restrained Joint Pipe and Fittings.

1. Description. This work shall consist of installing boltless restrained joint pipe and fittings as shown on the drawings or ordered by the Engineer. All work under this section, including all equipment, labor, excavation, washed stone bedding and all incidentals necessary to complete the work as described herein is considered to be incidental to the work.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with install boltless restrained joint pipe and fittings shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction. Wrap the pipe and fittings in a double layer of polyethylene encasement prior to installation. Excavate to a point 6-IN below the bottom of the pipe, and bed the pipe with 3/4-IN washed stone. Backfill the trench to a height of 3-FT above the pipe with 3/4-IN washed stone.

4. Method of Measurement. Measurement for Install Boltless Restrained Joint Pipe and Fittings shall be measured by length in feet, to the nearest half foot for each size (diameter) of pipe

installed, measured along the centerline of the pipe at the surface, from center to center of valves and fittings. There shall be no deductions from the measured lengths for fitting installations.

5. Basis of Payment. Install Boltless Restrained Joint Pipe and Fitting shall be paid for at the Contract unit price per linear foot. Payment per foot shall be full compensation for all work in furnishing and installing pipe and fittings.

## 704.22 Tunneling and Jacking Water Pipe.

The description, measurement and payment for tunneling and jacking operations shall be in accordance with the Special Provisions covering such work in the contract.

## 704.23 Furnish and Install Pipe Casing.

1. Description. Pipe Casing consists of installing either steel or reinforced concrete casing pipes as detailed on the drawings, and in accordance with the Special Provisions in the Contract.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with furnish and install pipe casing shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

4. Method of Measurement. Measurement for Pipe Casing shall be measured by length in feet, to the nearest half foot for each size (diameter) of casing installed, measured along the centerline of the pipe at the surface, from end to end of the casing.

5. Basis of Payment. Pipe casing is paid for at the Contract unit price per linear foot. Payment per foot shall be full compensation for all work in furnishing and installing pipe casing as specified.

## 704.24 Trench Restoration for Water Main.

1. Description. Trench Restoration for Water Main includes restoration of those areas disturbed for water main installation. This item includes but is not necessarily limited to; furnishing all work, labor, tools, equipment and materials necessary to restore the trench to grade, including furnishing, placing, consolidating, and compacting the crushed stone aggregate as described herein. Any select fill material used for backfilling of the trench for restoration purposes shall not be paid for under this item.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods: All work associated with trench restoration for water main shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction. Place a six (6) inch layer of 1-1/2-IN crushed stone base course in the trench, full width, after installing the water main and backfilling and compacting the trench. Thoroughly compact the crushed stone keeping it flush with the existing pavement grade and

terrace area. All saw-cutting necessary to provide a clean edge along the existing pavement is incidental to this bid item.

When ordered by the Engineer, dust-proof the patch by sprinkling it with a water and calcium chloride mixture in accordance with Section 107.6 of these Standard Specifications for Public Works Construction. Compensation will be at the rate stated in Section 107.6 for providing any dust proofing.

4. Method of Measurement. Measurement for Trench Restoration for Water Main is measured by length in feet, to the nearest half foot for each size (diameter) of water main installed, measured along the centerline of the pipe at the surface.

5. Basis of Payment. Trench Restoration for Water Main is paid for at the Contract unit price per linear foot. Payment per foot shall be full compensation for all work in restoring the water main trench as specified.

## 704.25 Cut Out Existing Water Main Fittings.

1. Description. Cut Out Existing Water Main Fittings consists of removing the existing water fitting in the locations designated by the Madison Water Utility. This task includes but is not necessarily limited to; all excavation necessary to expose the existing water main fitting; providing all materials necessary to perform the work, except as noted in the specific Contract document; removing the necessary fittings and pipe; installing the necessary fittings and or pipe to replace the removed fittings and pipe on the existing main; thrust blocking; backfill; backfilling the excavation; compacting the backfill material restoring and maintaining the site and all other work incidental to cutting out the fitting.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with cut out existing water main fittings shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

4. Method of Measurement. Cut Out Existing Water Fittings is measured as a complete unit per each complete cut out made in accordance with these Specifications.

5. Basis of Payment. Cut Out Existing Water Main Fitting is paid for as a complete unit at the Contract price, Payment per each shall be full compensation for all the work in cutting out the existing water main fitting as specified herein.

## 704.26 Cut Out & Replace Existing Water Main Valve.

1. Description. Cut Out & replace Existing Water Main Valves consists of removing the existing water valve in the locations designated by the Madison Water Utility. This task includes but is not necessarily limited to; all excavation necessary to expose the existing water main valve; providing all materials necessary to perform the work, except as noted in the specific Contract document; removing the necessary valve and pipe; installing the replacement valve and pipe on the existing main; thrust blocking; backfill; backfilling the

excavation; compacting the backfill material; restoring and maintaining the site and all other work incidental to cutting out the fitting.

2. Materials. All materials used for this work shall conform to the requirements of Article 702 of these Standard Specifications for Public Works Construction.

3. Construction Methods. All work associated with cut out & replace existing water main valve shall conform to the requirements of Article 703 of these Standard Specifications for Public Works Construction.

4. Method of Measurement. Cut Out & Replace Existing Water Valves is measured as a complete unit per each complete cut out made in accordance with these Specifications.

5. Basis of Payment. Cut Out Existing Water Main Valves is paid for as a complete unit at the Contract price, Payment per each shall be full compensation for all the work in cutting out the existing water main fitting as specified herein.