SECTION 02660

WATER SYSTEMS (GENERAL)

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the material standards for valves, gate wells, hydrants, tapping sleeves, service connections and other appurtenances used in potable water supply systems. This Section also includes the requirements related to the installation of these items, as well as general items related to water main construction.

B. This Section does not include standards for water main pipe materials. Refer to the related Sections as included in the Contract Documents.

C. Related Requirements
1. Section 02315 – Utility Trenching, Backfill and Compaction
2. Section 02661 – Ductile Iron Water Main Pipe
3. Section 02662 – High Density Polyethylene Water Main Pipe
4. Section 02663 – Pre-Stressed Concrete Cylinder Water Main Pipe
5. Section 02668 – Polyethylene Encasement for Ductile-Iron Pipe Systems

1.2 MEASUREMENT AND PAYMENT

A. **Water Main, _____, ___ inch, OC (Open Cut).....Foot**:
The Owner shall pay for **Water Main** of the material and nominal diameter specified at the contract unit price per linear foot, measured in place along the centerline of pipe, which price shall be payment in full for furnishing the materials including thrust blocks, special fittings, all necessary excavation, sheeting or bracing, draining, laying, jointing, bedding, testing, disinfecting, backfilling and compacting, disposal of surplus excavated materials, restoration and final cleanup, and all other Work required for the construction of the water main. All labor, tools and material necessary to excavate for, lay, join, backfill, test, disinfect, and finish the water mains complete, shall be considered as part of the water main construction. Measurement of **Water Main** will be taken from end to end with no reductions for fittings and valves.

B. **Gate Valve and Well, ___ inch.....Each**:
The Owner shall pay for **Gate Valve and Well** of the nominal valve size specified at the contract unit price for each and shall include all excavation, backfill and compaction, stone leveling course, and the manhole structure including flexible boot connections, frame and cover, and waterproofing, the gate valve, manhole steps, corporations stops, service saddles (where necessary), blocking and all connections. Measurement of **Gate Valve and Well** will be taken when the construction of the valve and structure is complete. All labor, tools and material necessary to excavate for, lay, join, backfill, test, disinfect, and finish the Work complete, shall be considered as part of the **Gate Valve and Well** construction.

C. **Tapping Sleeve Valve and Well, ___ inch by ____ inch……Each**:
The Owner shall pay for **Tapping Sleeve Valve and Well** of the nominal valve size specified at the contract unit price for each. and shall include all excavation, backfill and compaction, stone leveling course, and the manhole structure including the tapping sleeve and gate valve, brick masonry infill, frame and cover, and waterproofing, manhole steps, corporations stops, service saddles (where necessary), blocking, thrust blocking and all connections. Measurement of **Tapping Sleeve Valve and Well** will be taken when the construction of the valve and structure is complete. All labor, tools and material necessary to excavate for, lay, join, backfill and compact, test, disinfect, and finish the Work complete, shall be considered as part of the **Tapping Sleeve Valve and Well** construction. The cost for the physical connection to the existing water main shall be included in this pay item and shall not be paid for separately.

D. **Gate Valve and Box, ___ inch……Each**:
The Owner shall pay for **Gate Valve and Box** of the nominal valve size specified at the contract unit price for each and shall include all excavation, backfill and compaction and the valve box including bonnet cover, riser stem, extension stems and cover, and all connections. Measurement of **Gate Valve and Box** will be taken when the construction of the valve is complete, and the box is backfilled and secured in place. Gate valve and boxes located outside of paved surfaces will include a concrete pad to secure the extension stem in accordance with plan details, unless otherwise specified. All labor, tools and material necessary to excavate for, lay, join, backfill, test, disinfect, and finish the Work complete, shall be considered as part of the **Gate Valve and Box** construction.

E. **Fire Hydrant Assembly, Complete……Each**:
The Owner shall pay for **Fire Hydrant Assembly, Complete** at the contract unit price for each, and shall include all Work between the main and hydrant and including the connection to the water supply main, up to 20 feet of 6 inch diameter ductile iron water main pipe between the main and the hydrant, special fittings, thrust blocks, bumper/guard posts where required, companion valve and valve box, excavation, backfill and compaction and field painting of the hydrant. Measurement of **Fire Hydrant Assembly, Complete** will be taken when the construction of the Work is complete. All labor, tools and material necessary to excavate for, lay, join, backfill, test, disinfect, and finish the Work complete, shall be considered as part of the **Fire Hydrant Assembly, Complete** construction.

F. **Blow-off Valve and Well, ___ inch……Each**:
The Owner shall pay for **Blow-off Valve and Well** of the nominal valve size specified at the contract unit price for each and shall include all excavation, backfill and compaction, the connection to the water supply main, all fittings and water main piping to extend to the manhole structure and the manhole structure including flexible boot connection, frame and cover, and waterproofing, the gate valve, flared outlet, corporations stop, sump and all connections. Measurement of **Blow-off Valve and Well** will be taken when the construction of the valve, flared outlet and structure is complete. All labor, tools and material necessary to excavate for, lay, join, backfill, test, disinfect, and finish the Work complete, shall be considered as part of the **Blow-off Valve and Well** construction.

G. **Air Release Valve and Well, ___ inch……Each**:
The Owner shall pay for **Air Release Valve and Well** of the nominal valve size specified at the contract unit price for each and shall include all excavation, backfill

and compaction, the air release valve and all discharge piping and ancillary drainage appurtenances and the manhole structure including flexible boot connections, brick masonry infill, frame and cover, and waterproofing, all internal appurtenances, corporations stops, saddles (where necessary) and all connections. Measurement of **Air Release Valve and Well** will be taken when the construction of the internal appurtenances and structure is complete. All labor, tools and material necessary to excavate for, lay, join, backfill, test, disinfect, and finish the Work complete, shall be considered as part of the **Air Release Valve and Well** construction.

H. **Water Service Connection, ____ inch……Each**:
The Owner shall pay for **Water Service Connection, ____ inch** of the material and diameter specified at the contract unit price for each and shall include all Work to complete the tap of the size specified at the main, corporation stops, saddles (where necessary), up to ten (10) feet of new water service piping, connection to any existing service line and any other special connectors or fittings required by the local water authority. Documentation of **Water Service Connection, ____ inch** will be taken when the service line connections are complete and installed piping shall be measured along the centerline of the pipe from the tap at the main. All labor, tools and material necessary to excavate for, lay, join, backfill, compact, disinfect, flush and finish the Work complete, shall be considered as part of the **Water Service Connection, ____ inch** construction.

I. **Water Service, __(material)__, ___ inch……Foot**:
The Owner shall pay for **Water Service, ____ inch** of the material and diameter of the piping specified at the contract unit price per linear foot and shall include all Work to install the pipe and any other special connectors or fittings required by the local water authority. Documentation of **Water Service, __(material)__, __ inch** will be taken when the construction of the Work is complete and shall be measured in-place along the centerline of the piping, exclusive of the amount (ten (10) feet) included in the Water Service Connection item. All labor, tools and material necessary to excavate for, lay, join, backfill, compact, disinfect, test, flush and finish the Work complete, shall be considered as part of the **Water Service, __(material)__, __ inch** construction.

J. **Water Service Curb Stop and Stop Box, ___ inch……Each**:
The Owner shall pay for **Water Service Curb Stop and Stop Box, ____ inch** of the curb stop diameter specified and the appropriate size stop box for the curb stop at the contract unit price for each, and shall include all Work to install the curb stop and stop box and any other special connectors or fittings required by the local water authority. Measurement of **Water Service Stop Box, ____ inch** will be taken when the construction of the Work is complete. All labor, tools and material necessary to excavate for, lay, join, backfill, compact, flush, and finish the Work complete, shall be considered as part of the **Water Service Curb Stop and Stop Box, ____ inch** construction.

K. **Water Main Connection, ___ inch to Existing ___ inch……Each**:
The Owner shall pay for **Water Main Connection, ____ inch to Existing ____ inch** of the sizes specified at the contract unit price for **each** connection to an existing water main and all Work to make the physical connection to the existing water system after successfully completing all pressure and bacteriological testing of the new main, and any special connectors or fittings required by the local water authority. Measurement of **Water Main Connection, ____ inch to Existing ____**

inch will be taken when the construction of the Work is complete. All labor, tools and material necessary to excavate for, lay, join, backfill and compact, test, disinfect, and finish the Work complete, shall be considered as part of the **Water Main Connection, ____ inch to Existing ____ inch** construction.

L. **Abandon Water Main, ___ inch……Foot**:
The Owner shall pay for **Abandon Water Main** of the diameter specified at the contract unit price per linear foot, measured in place along the centerline of pipe, which price shall be payment in full for furnishing the materials including non-structural flowable fill, bulkheads, and grout ports/stands, all necessary excavation, sheeting or bracing, draining, backfilling, compaction, disposal of surplus excavated materials, restoration and final cleanup, water main to be removed and all other Work required for the abandonment of the water main. All labor, tools and material necessary to excavate, set up, and cleanup for the filling of all cavities of a water main with non-structural flowable fill shall be considered as part of the abandonment of the water main. Measurement of **Abandon Water Main** will be taken from end to end with no reductions for fittings and valves. Unless otherwise noted, restoration of paved areas and turf restoration necessary to restore areas damaged by operations to abandon the existing water main as detailed shall be paid for under separate items within the Contract Proposal.

M. **Temporary Water Stop, ___ inch……Each**:
The Owner shall pay for **Temporary Water Stop, ____ inch** of the diameter specified at the contract unit price for each, and shall include all Work to expose the main to confirm size and material, install the tapping sleeve and body, make the tap the live water main, install devices as necessary to plug the main and maintain pressure on the plug for the duration of its use. Measurement of **Temporary Water Stop, ____ inch** will be taken when the water stop device is removed, the blind flange is installed and the excavation is backfilled and compacted. All labor, tools and material necessary to excavate for, lay, join, backfill, test, disinfect, and finish the Work complete, shall be considered as part of the **Temporary Water Stop, inch** construction

N. The costs for providing, removing or abandoning materials and completing Work that is incidental to the Pay Items established in the Proposal shall be included in the unit prices bid. Incidental Work includes: excavating earth and other materials, trench or excavation shoring, sheeting and bracing, trench or excavation dewatering, pipe bedding and backfill, installing thrust blocks, installing temporary thrust restraint devices due to staging of construction, properly disconnecting, removing and disposing and/or abandoning existing water services, curb stops and stop boxes and properly disposing of surplus materials.

O. The costs for all testing and disinfection required by State and public health officials prior to connection to the existing water supply system will not be paid separately and are to be included unit price bid for Water Main.

1.3 REFERENCES

A. Abbreviations and Acronyms
1. ANSI – American National Standards Institute (www.ansi.org)
2. AWWA - American Water Works Association (www.awwa.org)
3. NSF – National Sanitation Foundation

4. ASTM – American Society for Testing and Materials
5. DIPRA – Ductile Iron Pipe Research Association

B. Definitions
1. Working Pressure – the maximum expected, sustained operating pressure applied to the pipe exclusive of transient and surge pressures, also referred to as Maximum Expected Operating Pressure.
2. Surge Pressure – the transient internal hydrostatic pressure that the pipeline is subjected to because of pressure waves created by the conveying fluid's velocity change.
3. Test Pressure – the internal hydrostatic pressure specified in the contract documents to which the pipeline will be subjected to during the hydrostatic pressure test and testing allowance test.
4. Restrained Joint –a type of joint designed to resist forces that act to separate a joint, such as thrust caused by internal pressure, external pulling forces, etc. Standard push-on and mechanical joints by themselves do not provide significant restraint against axial thrust forces.

C. Reference Standards
1. ANSI/AWWA (www.awwa.org)
   a. ANSI/AWWA C111 Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
   b. ANSI/AWWA C223 – Fabricated Steel and Stainless Steel Tapping Sleeves
   c. ANSI/AWWA C502 – Dry Barrel Fire Hydrants
   d. ANSI/AWWA C515 - Resilient-Seated Gate Valves for Water Supply Service
   e. ANSI/AWWA C600 - Installation of Ductile-Iron Mains and their Appurtenances
   f. ANSI/AWWA C651 - Disinfecting Water Mains
   g. ANSI/AWWA C800 – Underground Service Line Valves and Fittings
2. ASTM
   a. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes, using Rubber Gaskets
   b. ASTM C478 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
3. Unless otherwise specified, references to documents shall mean the latest published edition of the referenced document in effect at the bid date of the project.

1.4 SUBMITTALS

A. Manufacturer's specific technical data with the physical properties of valves, hydrants, tapping sleeves, fittings and other appurtenances to be used on the project.

B. Pipe fittings, specials, and valves shall be tested by an approved independent testing laboratory for compliance with the specifications. Certified copies of such tests shall be furnished if requested by the Owner, all at the Contractor's expense.

C. Shop drawings for well structures including dimensions and reinforcement of all structure components.

1. Include details (materials, configuration and dimensions) of temporary thrust blocking to be installed where indicated.

D. Water Main Abandonment Work Plan, including but not limited to;
1. Flowable fill materials for abandonment of piping and structures.
2. Planned pipe segments to be abandoned with sequence, length and volume calculations.
3. Proposed preparation, process and procedure for flowable fill installation
4. Air release locations
5. Pumping locations
6. Normal operating pressure and maximum pressure for flowable fill pumping.
7. Risk mitigation plan to limit spikes in pressure and over-pumping of flowable fill.

E. Pressure readings taken during abandonment procedure shall be submitted to Engineer for record upon completion.

F. Detail (configuration and dimensions) of temporary thrust blocking to be used within gate wells.

G. Certificates of Compliance with Specifications shall be furnished for all materials to be supplied.

H. Provide chlorination and bacteriological testing plan and schedule to the Owner and OCWRC prior to initiating chlorination.
1. Indicate method of chlorination.
2. Indicate the number and location of sampling points.
3. Indicate the schedule of sampling.

1.5 QUALITY ASSURANCE

A. Provide a list of all suppliers of pipe, fittings, valves and all other applicable water system materials.

B. Provide the Owner with a Certificate of Intent of Compliance prior to material delivery.
1. Certificate shall certify that all materials supplied for the Work will be manufactured, tested and inspected in accordance with the contract documents.

C. Following the delivery of the materials the supplier shall provide the Owner with a Certificate of Compliance.
1. The Certificate shall certify that all materials supplied have been manufactured, tested and inspected in accordance with the contract documents.

D. Each of the above Certificates shall include the following:
1. Suppliers name
2. Mailing address;
3. Project title,
4. Description of each material supplied,

5. Statement that all materials will be (or have been) manufactured, tested and inspected in accordance with the contract documents for the project and shall be signed and notarized.

E. All of the above shall be provided at the Contractor's expense.

F. Visually inspect all valves, hydrants, fittings and other materials delivered to the project site for compliance with the specifications and physical condition. Any non-compliant or defective valve, hydrant, fitting or other materials shall be immediately removed from the project site.

PART 2 PRODUCTS

2.1 WATER MAIN PIPE

A. Material requirements for water main pipe of the material specified on the plans is included in the related Section for that type of pipe.

2.2 DRINKING WATER SYSTEM COMPONENTS

A. All materials, products, appurtenances, etc. listed herein that come into contact with drinking water and/or drinking water chemicals shall be certified to meet ANSI/NSF Standard 61.

2.3 GATE VALVES

A. Provide gate valves of the type specified on the plans as required by the local water authority.

B. Provide resilient seated wedge gate valves for sizes 3-inch to 24-inch in accordance with ANSI/AWWA C515.

C. Gate valves shall have a ductile iron body with a fusion-bonded epoxy coating, fully rubber encapsulated resilient wedge-with a non-rising 2-inch stem and mechanical joint bell ends.

D. Stem nuts shall open to the local municipalities' requirements as indicated in the Owner's standard details and show the direction of operation.

E. Gate valves with operating nuts at a distance greater than five (5) feet below ground surface shall be provided with a type 304 stainless steel extension stem.
1. Length of the extension stem shall reach within five (5) feet from the ground surface.
2. When an extension stem is used, it shall be held in place by a type 304 stainless steel extension stem guide suitably fastened to the wall of the gate well.
3. Mechanically attach extension stem to the operating nut.
4. Details of the extension stem and the method of installation shall be approved by the Engineer prior to installation.

F. All castings shall be coated with coal tar pitch varnish, with sufficient oil added to produce a smooth coating, tough, and tenacious when cold, and not brittle nor with any tendency to scale off.

G. Manufacturers
   1. EJ
   2. Mueller
   3. U.S. Pipe
   4. American Flow Control
   5. Approved Equal

H. Bolts and nuts for mechanical joints shall be manufactured of low alloy steel conforming with the material characteristics listed in ANSI/AWWA C111.
   1. Coated with a minimum two (2) coats of fluoropolymer epoxy coating and heat cured.
   2. Manufacturers
      a. Cor-Blue by Birmingham Fasteners
      b. R-Blue by Romac Industries
      c. Owner approved equal

2.4 GATE WELLS:

A. Gate wells shall be precast concrete construction in accordance with the details shown on the Drawings.

B. Gate well diameter based on size of gate valve: 5 foot diameter for 10 inch or smaller gate valves; 6 foot diameter for 12 inch to 24 inch valves.

C. Precast concrete structures shall be reinforced in accordance with ASTM C478 at a minimum.
   1. Structures shall have modified groove tongue joints with gaskets manufactured to conform with ASTM C443.

D. Provide wall thickness for precast concrete structures in accordance with OCWRC Standard Details.

E. Gate well steps shall be plastic coated steel meeting the requirements of ASTM D4101 and ASTM A615, with foot recess, suitable secured to provide a non-slip surface.
   1. Manufacturers
      a. MA Industries PS2-PF
      b. Owner approved equal
   2. Install steps on 16-inch centers
      a. Maximum of 21-inches below the casting elevation
      b. Maximum of 45-inches above the centerline of the water main
   3. Install steps at the time of manufacture
   4. Replacement steps to meet above requirements but shall be colored to indicate the step was installed post-manufacture

F. Gate well frame and cover to be EJ 1040A with a bolted frame.
   1. Match lettering on the cover with the municipal water system
   2. Format lettering in accordance with OCWRC Standard Details.

2.5 VALVE BOX (3” to 16”)

A. Valve boxes shall be a three-piece adjustable heavy-duty ductile iron box with 5-1/4 inch screw shaft in accordance with OCWRC Standard Details unless otherwise shown in special details in the Drawings.

B. Valve box diameter based on the size of the gate valve

C. Include valve box base with centering ring, unless otherwise noted.

D. Include stainless steel extension stem within valve box shaft unless otherwise noted.

E. Manufacturers
   1. Tyler Pipe Series 6860
   2. EJ 8560
   3. Approved Equal

2.6 TAPPING SLEEVE

A. Full circumferential, all 18-8 type 304 stainless steel tapping sleeve with heavy gauge stainless steel flanged branch outlet.

B. Manufacturers
   1. JCM 432 SSTS
   2. Romac Industries, Inc. SST
   3. Smith-Blair 663/665
   4. Approved Equal

C. Tapping sleeves for plastic pipe shall comply with the above requirements however, it shall be specifically designed for use with plastic pipe and include compression washers to accommodate pipe movement.

D. Manufacturers
   1. JCM 429
   2. Romac Industries, Inc. SST-H
   3. Approved Equal

2.7 BLOW-OFF VALVE & WELL

A. Provide 6-inch gate valve in accordance with Article 2.3.

B. Provide 5 foot diameter gate well in accordance with Article 2.4

C. Provide 90 degree flared outlet in accordance with Section 02661, Article 2.2

2.8 COMBINATION AIR VALVE & WELL

A. Provide gate well of appropriate diameter in accordance with project details and Article 2.3

B. Combination Air Valve

1. Automatic function to release large amounts of air to atmosphere as the pipeline is being filled and small amounts of air from the pipeline while it is under pressure.
2. Automatic function to admit air into the pipeline when it is being drained or under vacuum condition.
3. Non-slam device
4. Corrosion resistant valve body, cover and float.
5. Working pressure up to 250 psi
6. Manufacturers
    a. Valmatic Series 200C
    b. DeZurick/APCO. Series 140C
    c. A.R.I. D-040
    d. Approved Equal

C. Isolation Valve
1. Epoxy-coated cast iron body designed for submerged conditions.
2. Size to match combination air valve inlet.
3. Manufacturers
    a. Valmatic
    b. DeZurick/APCO
    c. EJ
    d. Approved Equal

2.9 FIRE HYDRANT ASSEMBLY

A. Fire hydrant assembly includes the fire hydrant and the companion valve and valve box

B. Provide fire hydrants that conform to AWWA C-502 for Dry Barrel Hydrants.

C. Hydrants shall be manufactured with the following features;
1. 5-1/4 inch valve openings
2. Breakable safety flange and o-ring assembly
3. 6-inch mechanical joint inlet connection
4. Left open operating nut (counter-clockwise)
5. Pumper nozzle and hose nozzle sizes and threads and operating nut size per local municipalities' requirements. Refer to Owner's Standard Details.
6. Ground drain plugged
7. Painted red above ground (yellow for City of Pontiac) and black below ground
    a. Hydrant cap shall be painted the same color as the hydrant
    b. Red: Glamortex 501 Enamel, Color 314 Vermillion or approved equal
    c. Yellow: Rust-oleum #7543 Safety Yellow

D. Self-draining hydrants are prohibited.

E. Hydrant extensions limited to 18 inches.

F. Provide 6-inch gate valve in accordance with Article 2.3.

G. Provide valve box in accordance with Article 2.5.

H. Manufacturers

1. EJ 5BR 250 Traffic Model
2. Approved Equal

2.10 CORPORATION STOPS

A. Bronze cast bodies, keys, stem washers and nuts and inlet threads conforming to AWWA C800

B. Corporation stops to be AWWA/CC taper thread inlet by flare copper outlet or quick/pack joint connection unless otherwise indicated

C. Provide the following size corporation stops where indicated on the Drawings and standard details sheets:
1. Less than 16-inch diameter water main; 1-inch diameter corporation stop
2. 16-inch diameter water main and larger; 2-inch diameter corporation stop

D. Type of corporation stop as follows:
1. 1-inch and less: Key/Plug valve
2. Greater than 1-inch Ball valve

E. Manufacturers
1. Mueller Type H-15000
2. Ford Meter Box F1000-4-Q-NL (1-inch)
3. Ford Meter Box FB1000-X-Q-NL (Greater than 1-inch)
4. Approved Equal

F. Installation of corporation stops 2-inch diameter and larger on ductile iron pipe requires installation with a heavy-duty double strap brass service saddle. Refer to Section 02661 for service saddle Product requirements.

G. Installation of corporation stops on plastic pipe requires the use of coated ductile iron service saddle with double stainless steel straps. Refer to the related Section for water main pipe of the material specified on the plans for service saddle Product requirements.

2.11 CURB STOP VALVES

A. Bronze cast bodies, ball, keys, stems, and outlet and inlet threads conform to AWWA C800

B. Valves to be quick/pack joint connection for copper or CTS O.D. tubing inlet and outlet unless otherwise indicated.
1. Valves to be non-directional and watertight with flow in either direction
2. Insulated valves are required when connecting dissimilar metal piping unless otherwise indicated.

C. Match the curb stop valve to the service line size from the municipal water supply

D. Manufacturers
1. Ford Meter Box B44-XXX-Q-NL
2. Mueller Type P-25209
3. Approved Equal

2.12 STOP BOX (LESS THAN 3")

A. Two-piece cast iron valve box with an arch pattern base furnished with a one inch upper section and a two-hole pattern cast iron lid.
   1. Provide telescoping upper with a spring friction ring to allow for adjustment to final grade.
   2. Provide stainless steel stationary rod

B. Manufacturers
   1. Ford Meter Box EA1-XX-40-XXR-SS
   2. Mueller H-10385
   3. Approved Equal

C. Provide curb box base for curb stop valves greater than 1 inch diameter

2.13 WATER SERVICE LINES

A. Type 'K' Copper
   1. Unless otherwise indicated on the Drawings, Type 'K" copper tubing is to be used for new water service line installations.
   2. CTS type 'K' tubing in conformance with ASTM B88.

B. High-density polyethylene (HDPE)
   1. Conforms with ASTM D3035 and AWWA C901 (3/4 inch through 3 inch) standards.
   2. Produced from resins that meet or exceed the requirement of ASTM D3350, designation PE4710, that meets or exceeds a cell classification of PE445574C/E per ASTM D3350.
   3. NSF/ANSI 61 listed by the manufacturer and bear the NSF logo or mark.
   4. CTS DR9 for the nominal diameter, at a minimum
   5. Tracer wire is required for all HDPE water services. Refer to Owner's Standard Details for acceptable products.

C. The use of plastic water service lines, if authorized, must be accompanied by verification that the premises in which the service is connected has an electrical service that is not grounded to the existing premise plumbing.

D. All water service lines shall be a minimum of one (1) inch in diameter or shall match existing diameter whichever is larger.
   1. Water service lines less than one (1) inch in diameter shall only be used upon written authorization by the Owner.

E. Transitions, fittings unions or couplings needed for service line installations shall be compatible and specifically made for the service line material being installed.

2.14 TEMPORARY WATER STOP

A. Full circumferential, type 304 stainless steel body, mount, flange and hardware with an epoxy coated carbon steel blind flange and NBR Rubber body sealing gasket.

B. Designed to withstand a 250 psi working pressure and a 375 psi maximum test pressure.

C. Manufacturers

1. Hydra-Stop HSF 250 Patriot
2. Approved Equal

PART 3 EXECUTION

3.1 DELIVERY, HANDLING, AND STORAGE

A. Deliver and unload materials in a manner such that damage to those materials or coatings is prevented. Materials found to be damaged at the point of installation will be rejected and must be removed from the project site.

B. Handle and store pipe in accordance with the related Section for the pipe material that is being installed.

C. Store rubber gaskets in a cool location, out of direct sunlight and out of contact with petroleum products.

D. Materials shall only be stored in areas designated by the Owner. Security for stored materials is the responsibility of the Contractor.

3.2 EXCAVATION

A. Complete trenching and excavation in accordance with Section 02315.

3.3 LAYING PIPE

A. Install pipe in accordance with the related Section for the pipe material that is being installed.

B. Install pipe at depths to provide a minimum cover of five and one half (5-1/2) feet over the top of pipe unless otherwise noted on the plans.

3.4 JOINING PIPE

A. Join pipe in accordance with the related Section for the pipe material that is being installed.

3.5 PIPE BEDDING AND INITIAL BACKFILL

A. Install pipe bedding and initial backfill in accordance with the related Section for the pipe material that is being installed.

3.6 BACKFILLING

A. Backfill water main trench in accordance with Section 02315.

3.7 GATE VALVE

A. Install gate valves 3-inches and larger in a gate well unless otherwise indicated or authorized by the Owner.

B. Inspect valves prior to installation for, but not limited to, the following;
1. Direction of opening
2. Number of turns to open

3. Freedom of operation
4. Tightness of pressure-containing bolting and test plugs
5. Cleanliness of valve ports and seating surfaces
6. Handling damage and cracks

C. Support valves on approved blocking in accordance with the Owner's standard detail sheets.

D. Install valve plumb with the operating nut pointed towards the surface, unless otherwise indicated on the Drawings.

E. Install valve in the closed position.

F. Installation of valves to correct the misalignment of piping is strictly prohibited.

G. Operate each valve through one complete opening and closing cycle in the position in which it is installed, prior to verification testing.

3.8 GATE WELLS

A. Prepare the excavation in accordance with Section 02315

B. Construct gate well in accordance with standard details.
1. Level each gate well section prior to placement of subsequent section.
2. Lubricate the gasket between each gate well section
3. Fill all lift holes prior to backfilling
4. Backfill structure in accordance with Section 02315

C. Locate the gate well opening so that the operating nut for the gate valve is accessible by a valve key from the surface.

D. Frame and cover to be bolted to gate well structure

E. Clean interior of structure as part of final completion

3.9 VALVE BOX (3" to 16")

A. Install valve box plumb and centered over the operating nut of the valve.

B. Install valve box so that it does transmit loads or stress to the valve, valve stem or piping system
1. Place a support box around the valve bonnet in which to support the valve box base.
2. Encase the valve, support box and valve box base in suitable open-graded material

C. Provide a base to support the bottom of the valve.
1. Support valve base on poured concrete base or block as shown in the project details.

D. Support valve box stem and cover with a 6-inch thick non-reinforced concrete pad to the dimensions as shown in the project details.
1. Provide a bond breaker between the valve box and the concrete

E. Adjust valve box cover height to match finished grade.
   1. Review plumbness of valve box and accessibility of operating nut after backfilling and correct any deficiencies prior to final restoration.
   2. Clean valve box as part of final completion.

3.10 TAPPING SLEEVE

A. Field verify outside diameter of pipe to be tapped prior to ordering materials.

B. Size on size taps are prohibited unless otherwise authorized by the Owner.

C. Clean and lubricate pipe, install tapping sleeve in accordance with manufacturer's recommended instructions.

D. Test assembly seals with water per AWWA C223.

E. Commence tapping operation upon successful testing of assembly seals.
   1. Tapping operation must not force the pipe away from the gasket seal.

3.11 BLOW-OFF VALVE & WELL

A. Rotate tee on main line water main so that the branch is angled downward and the crown of the blow-off valve is equal to or below the invert of the main line water main.

B. Install well in accordance with Article 3.8, except that the base shall be cast-in-place with an integral 12-inch diameter sump.

C. Install valve in accordance with Article 3.7

D. Install flared outlet pointing away from the sump and perpendicular to the floor of the well.

E. Clean interior of structure as part of final completion

3.12 AIR RELEASE VALVE

A. Construct gate well in accordance with the project details and Article 3.8.

B. Install fitting or service saddle of the size and type required to accommodate the specified air release valve.
   1. Install fittings with water main construction.
      a. Provide restrained cap or blind flange for use during acceptance testing
   2. Install corporation stop and service saddle after successful acceptance testing.

C. Install isolation valve and air release valve.

D. Install discharge piping through gate well wall.
   1. Core drill penetration through gate well wall.
   2. Pack penetration through wall with non-shrink grout.
   3. Waterproof the exterior of the gate well at the penetration.

E. Route discharge piping to absorption pit or to ground surface.
   1. Discharge piping must have an open air discharge with a screen and downward facing elbow.
   2. The routing of discharge piping directly to a storm drain or sewer is prohibited.

F. Clean interior of structure as part of final completion

3.13 HYDRANT ASSEMBLY

A. Provide a minimum of 5.5 feet of pipe cover from finish grade for all piping in the hydrant assembly.

B. Inspect hydrants prior to installation for, but not limited to, the following;
   1. Direction of opening
   2. Nozzle threading
   3. Operating nut dimensions
   4. Nozzle dimensions and configuration
   5. Tightness of pressure-containing bolting and test plugs
   6. Cleanliness of inlet elbow
   7. Handling damage and cracks

C. Install hydrants plumb
   1. Brace and backfill hydrants in such a manner that that they will remain plumb.
   2. Hydrant joints to be fully restrained.
   3. Concrete thrust block is required at the hydrant riser per standard detail sheets

D. Place companion valve as close to hydrant as possible, but in no case less than 18 inches from hydrant.

E. Make all grade facing and vertical alignment adjustments prior to pressure testing.
   1. Place nozzles parallel with or at right angles to the curb/edge of pavement, with the pumper nozzle facing the curb/edge of pavement.
   2. Set hydrants having two-nozzles 90 degrees apart with each nozzle facing the curb/edge of pavement at an angle of 45 degrees
   3. Set hydrant with the lowest nozzle at least 18-inches above finished grade
   4. Install hydrant such that the breakaway flange is between 2-inches and 6-inches above finished grade.

F. Clean and touch up paint all hydrants after all verification tests are completed and prior to final acceptance.

G. Keep all fire hydrants pumped down to protect from freezing until the system is accepted.
   1. Failure to comply with this requirement will result in the hydrants being pumped down at the Contractor's expense.

3.14 CORPORATION STOP

A. Install corporation stop in accordance with the related Section for the pipe material that is being tapped.

3.15 CURB STOPS & STOP BOX

A. Install curb stop plumb with the valve stem pointing towards the surface.

B. Provide a base to support the bottom of the curb stop.
   1. Support curb stop base on poured concrete base or block as shown in the project details.

C. Install stop box base so that it does transmit loads or stress to the curb stop or water service
   1. Install the foot piece beneath the curb stop and the stop box base over the curb stop onto the foot piece
   2. Encase the stop box base in suitable open-graded material

D. Install stop box plumb and centered over the curb stop.

E. Adjust stop box cover height to match finished grade.
   1. Review plumbness of stop box and accessibility of curb stop after backfilling and correct any deficiencies prior to final restoration.

3.16 TEMPORARY WATER STOP

A. Expose the existing water main scheduled for the water stop and confirm the outside diameter and pipeline material.

B. Schedule the Work to minimize the duration that the temporary water stop is necessary.

C. Install the mount, body, flange and line stopper and tap the existing water main.

D. Install the stopping head and gradually increase pressure to create a plug in the existing water main.

E. Maintain pressure in the stopping head to sufficiently plug the line to accommodate work downstream of the stop and without disrupting pressure or service upstream of the stop.

F. Remove the line stopper and install the blind flange once the Work downstream is complete and the system is sufficiently restrained to receive working pressure.

G. Install Bedding and Backfill in accordance with Section 02315.

3.17 THRUST BLOCKS

A. Furnish and place thrust blocks at all plugs, caps, tees, fittings, bends and elbows, unless otherwise indicated.
   1. Size and dimension of the thrust blocking is detailed in the Drawings or Owner’s standard details.
   2. Construct thrust blocks with minimum 3,000 psi compressive strength concrete.
   3. The cost of thrust blocks shall be included in the cost of the Work.

B. In unstable soil conditions, the thrust blocks are to be supported by piling driven to solid foundations or by removal of the unstable soils and replacement with ballast of sufficient stability to resist the thrust.

C. Thrust blocks shall be approved by the Owner or Engineer before backfilling.

3.18 WATER MAIN ABANDONMENT

A. Fill water main to be abandoned with a flowable fill in accordance with Section 02200.

B. Placement of flowable is not permitted if the anticipated air temperature will be 35 degrees Fahrenheit or less in the 24 hour period following proposed placement.

C. Deliver flowable fill mixture at a temperature no less than 50 degrees Fahrenheit.

D. Completely fill all cavities.
   1. Utilize appropriately sized vent and pump pipes to minimize the potential of clogging of the lines.
   2. Maintain water content such that compressive strengths are achieved and a flowable mixture of uniform consistency is developed that is self-leveling when placed.
      a. Water may be added to the flowable fill mixture only upon authorization of the Owner or Engineer and in accordance with the Work Plan.
   3. Provide volume calculations and planned abandonment lengths to the Owner's Field Representative and Engineer prior to commencing grouting operations.
      a. Volume calculations shall consider actual inside diameter measurements and condition of pipeline.
   4. Monitor the volume of flowable fill delivered into each length of existing water main to avoid spreading flowable fill into the surrounding soils.
   5. Monitor the pressure of the flowable fill delivered.
      a. Monitor and record pressures at 15 minute intervals to mitigate the potential fracking of material into the surrounding soils.
   6. Review maximum pumping pressures with Owner's Field Representative prior to and during grouting operations to determine a normal operating pressure and a maximum operating pressure that once exceeded will postpone operation.
   7. Review Work Plan and Risk Mitigation Plan with Owner's Field Representative prior to grouting operations.

E. If frack-out of flowable fill becomes evident;
   1. Complete CCTV of nearby sanitary sewers, sewer leads and storm drains to identify and document locations and estimated volumes of frack-out.
   2. Remove all flowable fill identified during CCTV investigation.
   3. Work to identify and remove flowable fill frack outs during water main abandonment operations shall be completed at no cost to the Owner.

F. Bulkhead ends of water main with 3,500 psi concrete bulkheads once grouting is complete.
   1. Bulkheads shall be a minimum of 12-inches thick and completely fill the interior cavity of the main to be abandoned.

3.19 TESTING

A. Testing of newly installed water main systems, or any valved section thereof, is required before connection to the municipal system is allowed. Testing includes hydrostatic testing and bacteriological testing.
   1. Successfully complete hydrostatic testing prior to bacteriological testing unless other approved by the Owner.

B. Testing shall be completed after installation and backfill is complete, temporary blow-offs, caps or plugs are provided at the ends of the new main and after water main system is sufficiently blocked or restrained against thrust forces that will occur during testing.

C. Notify Owner in writing 72 hours prior to testing.
   1. Owner's representative must be on-site to witness testing or testing shall be repeated.

D. Contractor to furnish all water needed for testing.
   1. Water may be purchased from the water supply for the full-metered amount at the current water rate for the system used.
   2. Obtain permit from the Owner for hydrant use which will include the installation of certified backflow preventer and meter.
   3. If a meter is not available to measure the volume of water used, the Contractor shall pay for a minimum of three times the volume of the pipe installed or as otherwise determined by the Engineer.
   4. If more than one Contractor is involved in the installation of the water system the Engineer shall prorate the amount of water used between the various Contractors based upon the volume of the pipe in each section.

3.20 HYDROSTATIC TESTING

A. Thoroughly flush the portion of the system to be tested prior to conducting the hydrostatic test.

B. Expel all entrapped air from the water main to be tested prior to applying test pressure.
   1. Install taps at points of highest elevation in the pipe if necessary to purge all the air from the watermain.
   2. Close such openings, prior to test, with tight threaded brass plugs.

C. OCWRC Water System Operations will supply the test gauge for the hydrostatic test unless the Contractor can provide a gauge with certification of calibration within the last 6 months.
   1. OCWRC requires 72 hours' notice prior to hydrostatic test for supply of gauge.
   2. Contractor's gauge must be approved by the Owner prior to use.

D. Pressure testing against valves in an existing distribution system is strictly prohibited.

E. Conduct the hydrostatic pressure test in accordance with the applicable article in the separate water main pipe material specification for the type of pipe being installed.

F. Should the pipeline fail the hydrostatic test, Contractor shall determine the reason for failure, make all necessary repairs, including the repair of all visible leaks and cracks, and repeat the test until a passing result is achieved.
   1. All Work necessary and the associated costs thereof to determine the reason for failure and to make repairs including complete excavation of the completed Work as required are the responsibility of the Contractor.

3.21 BACTERIOLOGICAL TESTING

A. Bacteriological analysis and testing shall be completed by a laboratory approved by the State of Michigan for such testing.

B. Disinfect water main in accordance with ANSI/AWWA C651 and conduct bacteriological testing of water samples taken from the pipeline.
   1. Provide chlorination and bacteriological testing plan to the Owner and OCWRC prior to initiating chlorination.
      a. Indicate method of chlorination.
      b. Indicate the number and location of sampling points
      c. Indicate the schedule of sampling
   2. Following chlorination, all treated water shall be thoroughly flushed from the main.
      a. The treated water will be considered flushed when the residual chlorine content is less than 0.7 ppm
      b. Spent treated water shall not be allowed to enter any watershed, sanitary sewer, storm drain or any other area where environmental damage may occur without neutralizing the discharge in an industry acceptable manner.
      c. Chlorine levels in discharge water shall be neutralized below 4.0 ppm.
   3. Bacteriological testing to be performed by the OCWRC unless otherwise noted.
      a. The first water sample shall be taken 24 hours after disinfection and flushing, and the second 24 hours after the first sample.
      b. OCWRC will prepare a chain-of-custody for all samples taken, signed by all persons who handle the sample from the field, throughout transport to the laboratory, and at the laboratory.
      c. Analysis of other contaminants may be required if the Engineer has reason to believe that these contaminants are present.
   4. Test results shall be directly reported to the Owner and OCWRC.

C. Should the initial treatment of all or any section of the main, in the opinion of the Engineer, prove ineffective, the chlorination procedure shall be repeated until confirmed tests show that water sampled from the new main conforms to the foregoing requirements.

D. Repeat bacteriological testing if the system is not activated within 30 days after initial testing.

3.22 SHUTTING OFF WATER

A. Familiarize locations of existing gate valves and have them made easily accessible for emergency shutoffs.

B. Notify the OCWRC to have valves opened and closed for purposes of shutting down the water supply.

C. Keep on the job at all times, all of the necessary equipment to shut the water off and to make immediate emergency repairs without undue delay.

D. In case of an emergency break in a water line due to the Contractor's construction operations, the Contractor shall supply water to those deprived of water service.

E. Twenty-four hour advance notice shall be given to persons whose water is to be shut off.

3.23 WATER SERVICE CONNECTIONS

A. After water main has passed all testing, all applicable tap permits have been obtained and the water main has been accepted by the OCWRC, reconnect existing services or install new service lines and connections as specified in the Contract Documents.

B. During construction of replacement water main or where called for on construction of new water main, and unless separate pay items have been included in the Contract, the Contractor shall include in the project, all costs incurred in providing a service saddle, corporation stop, a sufficient length of service line to extend from the water supply main to the right-of-way line, curb stop, stop box and connections to the water supply main and existing private side water service line.

C. The best available information for the location of stop boxes and service lines have been shown on the construction drawings. Properly maintain and protect any service connection encountered that is not shown within this available information at no additional cost to the Owner.

D. OCWRC Water System Operations will install all water service connections 2-inches and smaller, unless otherwise indicated in the Contract Documents and separate bid items are provided in the Proposal.

E. Water services greater than 2-inches in diameter shall pass hydrostatic testing and bacteriological testing.in accordance with Article 3.19 through Article 3.21 prior to connection to the municipal system.

F. Connection to a water service line that contains lead or galvanized piping is strictly prohibited.
   1. Immediately report the discovery of a lead or galvanized water service to the OCWRC and Owner.
      a. The OCWRC or Owner will provide direction on how to proceed.

G. Saddles are required for service line connections to the following water main pipe materials;
   1. HDPE
      a. Refer to Section 02662 for further detail
   2. Asbestos Cement
      a. Consult the OCWRC prior to making connection for further detail.
   3. Prestressed Concrete Cylinder Pipe
      a. Consult the OCWRC prior to making connection for further detail.

4. Ductile Iron (16-inch and larger)
    a. Refer to Section 02661 for further details.
5. Screw-in type corporation stop connections are permitted for all other material types and should follow manufacturers guidelines for installation.

H. Install water services of the material approved for use at a minimum of 5.5 feet of cover.

I. Long side water services (i.e. beneath roadways, water courses, etc.) shall be installed using trenchless methods (i.e. horizontal directional drilling or pipe pulling) unless otherwise authorized by the Owner.

J. Conduct initial water service line flush;
1. Complete initial flush prior to connecting to the private service line.
2. Connect new water service to water main.
3. Connect a hose to the end of the new water service within the excavation at the curb stop and flush at full velocity for a minimum of 10 minutes or until water runs clear, whichever is less,
4. Drain the flush water to the nearest drainage structure as agreed to with the Owner's representative.

END OF SECTION