

**UNIFORM DESIGN AND CONSTRUCTION
STANDARDS FOR EXTENDING WATER
DISTRIBUTION SYSTEMS**

SECTION 4

**MATERIALS AND PERFORMANCE
SPECIFICATIONS**

MATERIALS AND PERFORMANCE SPECIFICATIONS

SECTION 4

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SECTION 02225

TRENCHING

PART 1 General

1.01 Section Includes

- A. Trenches for pipelines and appurtenances
- B. Maintaining trenches.
- C. Encountering underground facilities.
- D. Existing structures and pavements within the trench limits.
- E. Trees, bushes and plantings.
- F. Surplus materials.
- G. Dust control.
- H. Voids under adjacent structures.

1.02 Related Sections

- A. Section 02227 – Backfilling
- B. Section 02229 – Rock Removal
- C. Section 02230 – Select Fill
- D. Section 02670 – Bores
- E. Section 02671 – Horizontal Directional Drilling

1.03 Definitions

- A. Trenching or Excavation
 - 1. Grubbing, stripping, removing, storing and re-handling of all materials of every name and nature necessary to be removed for all purposes incidental to the construction and completion of all the Work under construction;
 - 2. All dikes, ditches, flumes, cofferdams, pumping, bailing, draining, well points, or otherwise disposing of water;

3. The removing and disposing of all surplus materials from the excavations in the manner specified;
 4. The maintenance, accommodation and protection of travel;
 5. The supporting and protecting of all tracks, rails, buildings, curbs, sidewalks, pavements, overhead wires, poles, trees, vines, shrubbery, pipes, sewers, conduits or other structures or property in the vicinity of the Work, whether over or underground or which appear within or adjacent to the excavations and the restoration of the same in case of settlement or other injury;
 6. All temporary bridging and fencing and the removing of same.
- B. Earth
1. All materials such as sand, gravel, clay, loam, ashes, cinders, pavement, muck, roots, pieces of timber, soft or disintegrated rock, not requiring blasting, barring, or wedging from their original beds, and specifically excluding all ledge or bedrock and individual boulders or masonry larger than one-half cubic yard in volume.
- C. Backfilling
1. The refilling of excavation and trenches to the line of filling indicated on the Approved Plans or as directed using materials suitable for refilling of excavations and trenches; and the compacting of all materials used in filling or refilling by rolling, ramming, watering, puddling, etc., as may be required.
- D. Native Materials
1. Excavated materials such as sand, gravel, and clay, suitable for backfilling and capable of being satisfactorily compacted within the trench. Rock with no dimension greater than 6 inches may also be included.
- E. Select Native Materials
1. Excavated materials, such as sand, gravel, and clay, suitable for backfilling and capable of being satisfactorily compacted within the trench. Rock with no dimension greater than 2 inches may also be included.
- F. Spoils
1. Surplus excavated materials not required or not suitable for backfill or embankments.

G. Embankments

1. Fills constructed above the original surface of the ground or such other elevation as specified or directed.

H. Limiting Subgrade

1. The underside of the pipe barrel for pipelines.

I. Excavation Below Subgrade

1. Excavation below the limiting subgrade of pipelines.
2. Excavate to such new lines and grades as required when material encountered at the limiting subgrade is not suitable for proper support of pipelines.

PART 2 Products

2.01 Fill Materials

- A. Type 1 Select Fill
- B. Type 2 Select Fill
- C. Type 5 Select Fill

PART 3 Execution

3.01 Preparation

- A. Identify required lines, levels, contours, and datum. Locate all utilities and underground obstructions prior to starting excavations, including cutting pavement.
- B. Cut pavement and pavement base over the proposed trench before excavating for pipeline installation. Utilize a jackhammer, wheel cutter ("Pizza Cutter") or power driven saw. Cut pavement to the required trench width.
- C. Relocate, remove and later restore, or replace existing structures in the proposed trench limits and those structures which would be damaged or impede progress.
- D. Remove, protect and restore existing street signs within the limits of disturbance.

- E. Protect the trunks of trees adjacent to the Work that are not to be cut. Tie back overhanging branches and limbs not to be cut to prevent injury from excavating machinery or any other operations related to the Work.
- F. Do not cut or remove branches, limbs and roots except for those plantings included in clearing and grubbing areas. In the case of unavoidable damage to plantings, neatly trim the injured portions without splitting or crushing.
- G. Remove and temporarily store in soil, any plants and flowers which would be injured by the Work. Replant in their original position after the Work has been substantially completed. Maintain until re-established. Replace with plantings of the same kind, quality and size that existed prior to construction when the original plantings die or their growth, beauty or usefulness is diminished as a result of the Work.
- H. Maintain support of existing power, lighting, telephone, traffic control and utility poles adjacent to excavations as required by the owners of the poles.
- I. Do not operate on paved surfaces equipment which has treads or wheels that would cut or damage the pavement.
- J. Avoid damage to existing pavement other than pavement within the limits of the trench. Provide the pads of outriggers with protective covers, or place planks or timbers under the pads to prevent damage to pavement.

3.02 Excavation

- A. Excavate trenches to the lines and grades specified and as required. Backfill with special granular materials, concrete or other materials as directed by the Engineer, any excavated space carried beyond or below the lines and grades shown on the Approved Plans, or as directed by the Engineer. Backfill unauthorized excavations at the Contractor's expense.
- B. Excavate the trench sides vertically between the centerline of the pipe and an elevation 1 foot above the top of the pipe unless this conflicts with the requirements of OSHA. In the case of rock excavation, excavate to 6 inches below invert elevation of pipe and 12 inches wider than the nominal pipe diameter. Maintain a minimum clearance of 6 inches around the pipe.
- C. Provide and maintain proper and satisfactory means and devices for the removal of all water entering the excavations, and remove all such water as fast as it may collect in such a manner as shall not interfere with the progression of the Work or the proper placing of pipes or other work.
- D. Prevent damage to surrounding pavement, gutters, and structures while excavating.
- E. Furnish, place and maintain such sheeting, bracing and shoring as may be required to support the sides and ends of excavations in such manner as to prevent any movement which could, in any way, damage the pipe, structures, or other work; diminish the width necessary for

construction; otherwise damage or delay the work of the Contract; endanger existing structures, pipes or pavements; or cause the excavation limits to exceed the right-of-way limits.

In no case will bracing be permitted against pipes or structures in trenches or other excavations.

Drive sheeting vertically with the edges tight together as the excavation progresses, and in such manner as to maintain pressure against the original ground at all times. Design all bracing to maintain sheeting in its proper position.

The adequacy of all sheeting and bracing is the sole responsibility of the Contractor. Remove and dispose of all materials which slide, fall, or cave into the established limits of excavations due to any cause whatsoever, at the Contractor's expense.

- F. Discontinue machine excavation in the vicinity of pipes, conduits and other underground structures and facilities and complete the excavation with hand tools as required by Industrial Code Rule 753.
- G. When determination of the exact location of a pipe or other underground structure is necessary for completing the work properly, excavate test holes to determine such locations.
- H. When the bottom of any excavation is taken out beyond the limits indicated or prescribed, backfill and compact the resulting void with Type 1 or 2 Select Fill, compacted to 95% maximum modified Proctor density.
- I. Remove materials which, in the opinion of the Engineer, are found to be unsuitable for foundation of the pipeline and appurtenances during excavation.
- J. Use suitable surplus excavated materials for backfill of excavations in rock or to replace other materials unacceptable for use as backfill except in areas which require select backfill. Surplus excavated materials may be stockpiled at appropriate locations as needed for future use.
- K. Remove from the Site all spoils not needed.
- L. Replace existing structures (including concrete gutters, concrete sidewalks and curbs that are crossed by the proposed water main) and stone shoulders or other stone areas which are damaged or removed during the Work.
- M. When existing driveway culverts are encountered, replace with adequate size (minimum 12-inch diameter). Methods, materials and alignment to be determined by the applicable highway department.
- N. Minimize the creation and dispersion of dust. Sweep and sprinkle with water as required by conditions.

- O. Completely fill all voids which occur under existing sidewalks, curbs, gutters or other structures during the excavation with Type 5 Select Fill.

- P. Remove and replace landscape boulders, bushes, trees, railroad ties and posts as indicated on Approved Plans.

~ END OF SECTION ~

SECTION 02227

BACKFILLING

PART 1 General

1.01 Section Includes

- A. Backfilling around and above pipe and appurtenances.
- B. Consolidation and compaction.
- C. Backfill in paved areas, lawn areas and field areas.
- D. Surplus materials.
- E. Fine grading.

1.02 Related Sections

- A. Section 02225 – Trenching
- B. Section 02230 – Select Fill
- C. Section 02600 – Pipe Installation

1.03 References

- A. ANSI/ASTM D1556 – Test Method for Density of Soil in Place by the Sand-Cone Method.
- B. ASTM D2167 – Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- C. ASTM D2922 – Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- D. ASTM D3017 – Test Method for Water Content of Soil and Rock in Place by Nuclear Methods.

PART 2 Products

2.01 Select Fill Materials

- A. As specified or as directed by the Engineer.

PART 3 Execution

3.01 Examination

- A. Verify installation has been inspected by the Engineer.

3.02 Preparation

- A. Submit modified Proctor tests / moisture – density curves from certified laboratory for select fill used for backfill in pavement areas.
- B. Perform nuclear gauge daily standardization counts per ASTM D6938-17a at the beginning of each work day or at intervals as directed by the Engineer. Furnish copies of calibration curves for nuclear gauge and results of standardization counts to the Authority.
- C. Cut out soft areas of subgrade not capable of in-situ compaction. Backfill with select fill and compact to 95% maximum modified Proctor density.
- D. When required to obtain the optimum moisture content, add, at no additional cost to the Authority, sufficient water during compaction to assure the specified maximum density of the backfill. If, due to rain or other causes, the material exceeds the optimum moisture content, it shall be allowed to dry, assisted if necessary, before resuming compaction or filling efforts.

3.03 Bedding and Backfilling Pipe Zone

- A. Bed pipe with 6 inches of Select Native Material. When trench bottom is in rock, bed with 6 inches of Select Native Material or Type 4 Select Fill.
- B. Backfill the remaining pipe zone with Select Native Material in non-pavement areas or Type 2 Select Fill in pavement areas.
- C. Place materials in by shovel in such a manner as not to damage pipe or appurtenances and in layers not to exceed 6 inches in depth. Compact to 85% maximum standard Proctor density in non-pavement areas, and compact to 95% maximum modified Proctor density in pavement areas.

3.04 Backfilling Above Pipe Zone

- A. Backfill all excavations to the original surface of the ground or to such other grades as may be shown, specified or directed.
- B. Backfill non-pavement areas with Native Material, which can be satisfactorily compacted during refilling of the excavation, or as directed by the Engineer. Use Native Material which was removed in the course of construction excavations, including surplus Native Material. In the event Native Material is not suitable, use select fill as ordered by the Engineer. Place and

- compact material in layers not to exceed 12 inches in depth. Compact to 85% maximum standard Proctor density.
- C. Backfill trenches under streets, roads, driveways, walks, gutters and curbs or other areas requiring structural support with select fill, or as directed by the Engineer. Place material in layers not to exceed 6 inches in depth. Compact to 95% maximum modified Proctor density.
 - D. Use compaction equipment suitable for materials excavated, and pipe or appurtenances installed.
 - E. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces. Employ a placement method that does not disturb or damage other work. Do not backfill against unsupported foundation walls.
 - F. Remove surplus backfill materials from site.
 - G. Refill and compact settlements and repair finished work damaged by settlement at no additional cost to the Authority.
 - H. Each day complete fine grading operations of the Work completed the previous day in areas other than pavement. In pavement areas, complete fine grading and install temporary asphalt the same day.
 - I. Fine grade by leveling disturbed areas as close to final finish grade as possible, leaving the fill mounded slightly over the trench. Remove all debris. In pavement areas place temporary asphalt as specified or as directed by the Engineer.

3.05 Field Quality Control

- A. The Contractor shall be responsible for all damage or injury done to pipes, structures, property or persons due to improper placing or compacting of backfill.
- B. Compaction testing shall be performed in accordance with ANSI/ASTM D1556.

~ END OF SECTION ~

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SECTION 02229

ROCK REMOVAL

PART 1 General

1.01 Section Includes

- A. Removal of rock by mechanical methods.
- B. Rock excavation and disposal.

1.02 Related Sections

- A. Section 02225 – Trenching
- B. Section 02227 – Backfilling

1.03 Definitions

- A. Rock: Solid mineral material with a volume in excess of 1/2 cubic yard or solid mineral material that cannot be removed with a 3/4 cubic yard capacity power shovel and which requires drilling, wedging, barring or hammering.

1.04 Submittals

- A. Shop Drawings: Indicate proposed method of rock removal.

PART 2 Products

2.01 Materials

- A. Expansive Disintegration Compounds: Grout-type mix of materials that expand upon curing. Select correct product type for the specific temperature range.
 - 1. Manufacturers:
 - a. ECOBUST
 - b. Crackamite

PART 3 Execution

3.01 Examination

- A. Note subsurface irregularities affecting Work of this section.

3.02 Preparation

- A. Identify required lines, levels, contours and datum.

3.03 Rock Removal – Mechanical Method

- A. Excavate and remove rock by the mechanical method. Hammer or drill holes and utilize tools, wedges or expansive disintegration compounds to fracture rock.

3.04 Excavation, Backfill, and Disposal

- A. Remove rock from the excavation to the required lines and grades.
- B. Excavate to 6 inches below invert elevation of pipe, conduit or structure, and 12 inches wider than the nominal pipe or conduit diameter or structure width. Maintain a minimum clearance of 6 inches around pipe.
- C. Correct over-excavation of rock in accordance with requirements of Specification 02225.
- D. Install bedding and backfill in accordance with Specification 02227.
- E. Remove surplus excavated materials from site.

~ END OF SECTION ~

SECTION 02230

SELECT FILL

PART 1 General

1.01 Section Includes

- A. Types of select fill.
- B. Placement and installation.
- C. Disposal of displaced material.

1.02 Related Sections

- A. Section 02227 – Backfilling

1.03 References

- A. ASTM D422, Standard Method for Particle-Size Analysis of Soils.

1.04 Submittals

- A. Submit name of supplier and source for each type of select fill material.
- B. Provide sample and test report for each type of select fill material.

PART 2 Products

2.01 Select Fill Materials

- A. Type 1 is No. 1 Crusher Run Stone – NYSDOT Standard Specification Item No. 304.11: Hard durable limestone with the following gradation:

Sieve Size Designation	Percent Passing by Weight
3 Inch	100
2 Inch	90 – 100
1/4 Inch	30 – 65
No. 40	5 – 40
No. 200	0 – 10

- B. Type 2 is No. 2 Crusher Run Stone – NYSDOT Standard Specification Item No. 304.12: Hard durable limestone with the following gradation:

Sieve Size Designation	Percent Passing by Weight
2 Inch	100
1/4 Inch	25 – 60
No. 40	5 – 40
No. 200	0 – 10

- C. Type 3 is Run-of-Bank Gravel: Run-of-bank gravel free from organic matter with the following gradation:

Sieve Size Designation	Percent Passing by Weight
1-1/2 Inch	100
1/4 Inch	30 – 65
No. 200	0 – 10

- D. Type 4 is Sand: Coarse sand with the following gradation:

Sieve Size Designation	Percent Passing by Weight
3/8 Inch	100
No. 4	90 – 100
No. 8	80 – 100
No. 16	50 – 85
No. 30	25 – 60
No. 50	10 – 30
No. 100	2 – 10

- E. Type 5 is Controlled Density Fill (CDF): “K-Krete®” with a compressive strength of 50 to 100 psi. Fly ash or other pozzolan-containing materials are not acceptable in the mix design. The consistency shall be suitable for pumping or flowing into the annular space between a casing pipe and the carrier pipe.

- F. Type 6 is stone fill (fine) conforming to NYSDOT 620.02 standards with the following gradation:

Stone Size	Percent of Total Weight
Smaller Than 7.9 Inches	90 – 100
Larger Than 3 Inches	50 – 10
Smaller Than 0.08 Inch	0 – 10

- G. Type 7 is No. 1 Washed Stone meeting the requirements of NYSDOT Standard Specification Section 703-02 for Coarse Aggregates. Hard durable limestone shall be used with the following gradation:

Sieve Size Designation	Percent Passing by Weight
1 Inch	100
1/2 Inch	90 – 100
1/4 Inch	0 – 15

PART 3 Execution

3.01 Storage and Protection

- A. Store loose granular materials on solid flat surfaces in well-drained area.
- B. Protect materials and prevent mixing with foreign matter.

3.02 Installation

- A. Place select fill in accordance with Specification 02227, or as otherwise specified or directed.
- B. Employ a placement method that does not disturb or damage other work.

3.03 Disposal of Displaced Materials

- A. Remove and properly dispose of surplus or displaced materials.

~ END OF SECTION ~

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SECTION 02600

PIPE INSTALLATION

PART 1 General

1.01 Section Includes

- A. Installation of pipe, fittings and appurtenances by open cut for water distribution and transmission lines.
- B. Installation of pipe by horizontal directional drilling (general requirements).

1.02 Related Sections

- A. Section 02225 – Trenching
- B. Section 02227 – Backfilling
- C. Section 02230 – Select Fill
- D. Section 02610 – Ductile Iron Pipe
- E. Section 02630 – Service Connections
- F. Section 02650 – Water Main Connections
- G. Section 02655 – Water System Appurtenances
- H. Section 02660 – Water Valves
- I. Section 02670 – Bores
- J. Section 02671 – Horizontal Directional Drilling
- K. Section 02675 – Pressure Testing, Flushing, Disinfecting, and Health Sampling of Water Mains
- L. Section 02700 – Concrete Thrust Blocks

1.03 References

- A. ANSI/AWWA C600 – Installation of Ductile Iron Mains and their Appurtenances.

PART 2 Products

2.01 Pipe

A. Pipe

1. Materials for piping, joints and fittings shall be specified in the section for the type of pipe to be installed as shown on Approved Plans.
2. All pipe and appurtenances to comply with the applicable standards for their type of material.

B. Joints

1. Type of joints as specified as shown on Approved Plans.

C. Inspection

1. Inspect pipe and appurtenances upon delivery and prior to installation for conformance with standards and Specifications.

2.02 Bedding Materials

- #### **A. Bedding: Fill type as specified in Specification 02227.**

2.03 Accessories

- #### **A. Concrete for thrust blocks: Concrete type specified in Specification 02700.**

PART 3 Execution

3.01 Preparation

- A. Place pipe and related appurtenances on supports above flood level within right-of-way or easements or other approved locations. Use slings or other approved methods to unload and place pipe. Do not dump pipe from trucks. Cover both ends of each pipe segment when in outdoor storage or staging areas.
- B. Field cut pipes in accordance with manufacturer's instructions. Bevel all cuts. Remove all burrs.
- C. Remove scale and dirt on inside and outside of pipe before assembly.
- D. Identify any areas on the pipe where the zinc coating has been removed or scratched. Wipe area clean and completely coat all bare and scratched areas with zinc-rich primer. Coating

shall be applied in accordance with the coating manufacturer's instructions with a minimum of 3 mils dry film thickness. Bitumastic coating shall then be applied over cured zinc-rich primer.

- E. When material unsuitable for foundation has been removed, as outlined in Specification 02225, replace with select fill compacted to 95% maximum standard Proctor density.
- F. Excavate bell holes at each joint to permit the joint to be made properly and provide uniform and continuous bearing for the pipe.

3.02 Installation – General

- A. Maintain a minimum vertical separation of 18 inches when water main crosses above storm or sanitary sewers.

In Monroe County, maintain a minimum vertical separation of 6 inches when water main crosses above storm or sanitary sewers.

- B. Maintain a minimum vertical separation of 18 inches with one full length of water main centered around crossing when water main crosses under storm or sanitary sewers.
- C. Maintain a minimum horizontal separation of 10 feet edge to edge when the water main is installed parallel to a storm or sanitary sewer. In Monroe County, maintain a minimum horizontal separation of 3 feet when the water main is installed 6 inches above and parallel to a storm or sanitary sewer and, maintain a minimum vertical separation of 18 inches when the water main is installed below and parallel to a storm or sanitary sewer with less than 10 feet of horizontal separation.
- D. Examine all pipe and appurtenances prior to installation for defects and damage. Immediately remove from site all pipe or appurtenances which are known to be defective or damaged.
- E. Maintain water-tight temporary plugs in all open ends of pipe when laying pipe is not actively in progress.
- F. Maintain trench free of standing water when laying pipe. Prevent foreign material from entering pipe during installation. When such material enters pipe, the Authority may require additional flushing procedures. When pipe is flooded during construction, drain water and flush with potable water. Chlorinate flooded section of pipe with water having a minimum free chlorine residual of 25 parts per million (PPM) after 24 hours of contact time.
- G. In all areas where the surface elevation of the proposed trench is above that of the adjacent road or highway, install the water main to a depth that will result in a 5 foot minimum elevation difference between the top of the proposed pipe line and center line of adjacent road or highway.

- Install pipe with a minimum cover, as measured from final grade, of 5 feet over the top of the pipe. Install pipe that runs longitudinally under street and highway pavement and adjacent shoulders with a minimum cover of 6 feet over the top of the pipe.
- H. Prevent floatation of the pipe in the event of water entering trench.
 - I. Route pipe as shown on Approved Plans and as required by actual location of utilities and structures. Verify utility depths in advance of crossings and deflect pipe accordingly to maintain required cover and vertical clearances as required by each utility.
 - J. Install pipe in accordance with the manufacturer's instructions.
 - K. Orient vertical bends with one leg horizontal
 - L. Install temporary facilities as required by Approved Plans or as necessary to permit flushing, pressure testing, chlorine injection for disinfecting, dechlorinating and sampling. Backfill and restore all excavations made to install these fittings in accordance with Section 02227.
 - M. Install additional fittings as directed by Engineer.
 - N. Install temporary air releases as specified or shown on Approved Plans.
 - O. Install temporary health sampling points as indicated on Approved Plans and as specified in Section 02675, Article 3.03G.
 - P. Install a sand cushion when clearance between water main and any other existing facility or service is less than 1 foot.
 - Q. Install thrust blocks at all tees, bends and reducers.
 - R. Swab disinfect all pipe, fitting and appurtenances installed for tie-in connections as specified in Section 02675, Article 3.03J.
 - S. Complete all tie-in connections to existing water mains within 4 hours of depressurizing existing water main.

~ END OF SECTION~

SECTION 02610

DUCTILE IRON PIPE

PART 1 General

1.01 Section Includes

- A. Ductile iron pipe and fittings for water distribution and transmission lines.

1.02 Related Sections

- A. Section 02600 – Pipe Installation
- B. Section 02650 – Water Main Connections
- C. Section 02655 – Water System Appurtenances
- D. Section 02670 – Bores
- E. Section 02671 – Horizontal Directional Drilling
- F. Section 02675 – Pressure Testing, Flushing, Disinfecting & Health Sampling of Water Mains

1.03 References

- A. ANSI/AWWA C104 – Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water.
- B. ANSI/AWWA C105 – Polyethylene Encasement for Ductile Iron Pipe Systems.
- C. ANSI/AWWA C110 – Ductile Iron and Gray Iron Fittings, 3 Inch through 48 Inch, for Water and Other Liquids.
- D. ANSI/AWWA C111 – Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
- E. ANSI/AWWA C116 – Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings.
- F. ANSI/AWWA C151 – Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water or Other Liquids.
- G. ANSI/AWWA C153 – Ductile Iron Compact Fittings for Water Service.
- H. ANSI/AWWA C550 – Protective Interior Coatings for Valves and Hydrants.

- I. ANSI ISO 8197-1 – Ductile Iron Pipes – External Zinc Based Coating – Part 1: Metallic Zinc with Finishing Layer.

1.04 Submittals

- A. Product Data: Provide data on pipe materials, pipe fittings, accessories and polyethylene encasement.
- B. Manufacturer’s Certificate: Certify that products meet or exceed specified requirements.

PART 2 Products

2.01 General Material Requirements

- A. All pipe and fittings, including glands and bolts, shall be produced in the United States, its territories or possessions.
- B. All pipe and fittings shall be NSF-61 Certified for contact with drinking water.

2.02 Ductile Iron Pipe

- A. ANSI/AWWA C151.
- B. Wall Thickness: Class 52 minimum, unless otherwise shown on Approved Plans.
- C. Lining: ANSI/AWWA C104, cement.
- D. Exterior Coating: Arc-sprayed zinc at a mass of 200 g/m² of pipe area, in accordance with ISO-8179-1 base coat, with a shop-applied bituminous finish (top) coat.
- E. Marks: Factory marked to indicate zinc-coated.
- F. Joints: ANSI/AWWA C111, rubber gasket.
- G. Manufacturers:
 - 1. American Pipe: Fastite Joint.
 - 2. U.S. Pipe and Griffin Pipe: Tyton Joint.
 - 3. McWane Group (Tyler, Union and Clow): Fastite or Tyton Joint.

2.03 Fittings for Push-On Joint Pipe

- A. ANSI/AWWA C110 (full body) or ANSI/AWWA C153 (compact).
- B. Lining: ANSI/AWWA C110 or C153 (ANSI/AWWA C104), cement.
- C. Exterior Coating: ANSI/AWWA C110 or C153, asphaltic.
- D. Joints: ANSI/AWWA C110 or C153 (ANSI/AWWA C111), rubber gasket, mechanical joint, unless otherwise specified.
- E. Body & Glands: ANSI/AWWA C110 or C153 (ANSI/AWWA C111), ductile iron.
- F. Bolts: High-strength, low-alloy steel T-bolts; blue fluoropolymer-coated or polytetrafluoroethylene-coated.
- G. Manufacturers:
 - 1. U.S. Pipe.
 - 2. American Pipe.
 - 3. McWane Group (Tyler, Union and Clow).
 - 4. Star Pipe Products.

2.04 Restrained Joint Pipe

- A. Restraint Mechanism: Boltless, ductile iron wedges or segments in bell in conjunction with a spigot ring.
- B. Retainer bead/ring: Factory-applied.
- C. Manufacturers:
 - 1. American Pipe: Flex-Ring.
 - 2. U.S. Pipe and Griffin Pipe: TR FLEX, up to 36" or HP-Lok, 30" – 54".
 - 3. McWane Group (Tyler, Union and Clow): TR FLEX, up to 36".
- D. Fittings shall be restrained joint.

2.05 Anchor Pipe

- A. Cast Ring Anchor Pipe

1. ANSI/AWWA C110 or C153.
 2. Minimum Wall Thickness:
 1. 4" – 0.52"
 2. 6" – 0.37"
 3. 8" – 0.39"
 4. 12" – 0.75"
 3. Lining: ANSI/AWWA C104, cement.
 4. Exterior Coating: ANSI/AWWA C110 or C153, asphaltic.
 5. Joints: ANSI/AWWA C110 or C153 (ANSI/AWWA C111), rubber gasket, mechanical joint, solid gland cast integrally with pipe by swivel gland.
 6. Glands: ANSI/AWWA C110 or C153 (ANSI/AWWA C111), ductile iron.
 7. Ring: Solid anchor ring cast integrally with pipe.
 8. Bolts: High-strength, low-alloy steel T-bolts; blue fluoropolymer-coated or polytetrafluoroethylene-coated.
 9. Sizes 4" x 13"; 6" x 12", 13", 18", 24", and 36"; 8" x 12"; and 12" x 13".
 10. Manufacturers:
 1. McWane Group (Tyler, Union and Clow): swivel x solid adapter and swivel x swivel adapter.
- B. Welded Ring Anchor Pipe
1. ANSI/AWWA C151
 2. Wall Thickness: Class 54 minimum.
 3. Lining: ANSI/AWWA C104, cement.
 4. Exterior Coating: ANSI/AWWA C110 or C153, asphaltic.
 5. Joints: ANSI/AWWA C110 or C153 (ANSI/AWWA C111), rubber gasket mechanical joint, swivel gland by swivel gland.
 6. Glands: ANSI/AWWA C110 or C153 (ANSI/AWWA C111), ductile iron.

7. Ring: 1/2" x 1/2" solid anchor ring welded onto pipe on joint side of ring.
 1. Material: Steel, A36
 2. Weld:
 1. Fusion welded.
 2. AWS 5.15 ENiFeMN-CI (NI ROD 44) Electrode.
8. Bolts: High-strength, low-alloy steel T-bolts; blue fluoropolymer-coated or polytetrafluoroethylene-coated.
9. Sizes: 4" x lengths over 13", 6" x lengths over 36", 8" x lengths over 13" and 12" x lengths over 13".
10. Manufacturers:
 - a. C & B Piping, Inc. (must specifically request Class 54 pipe): Anchor coupling, swivel gland by swivel gland.

2.06 Mechanical Joint Adaptors

- A. Mechanical joint bell to mechanical joint bell (with restraint).
- B. Dimensions: ANSI/AWWA C110 or C153.
- C. Working Pressure: 3" – 24": 350 psi rating, 30" – 36": 250 psi rating.
- D. Lining: ANSI/AWWA C116, epoxy.
- E. Exterior Coating: ANSI/AWWA C116, epoxy.
- F. Ends: Male x male with bolt-through center ring on body.
- G. Bolts and Nuts: High-strength, low-alloy T-bolts and nuts; blue fluoropolymer-coated or polytetrafluoroethylene-coated.
- H. Gaskets: ANSI/AWWA C111, SBR.
- I. Sizes: 4" – 36"
- J. Manufacturer
 1. Infact Corporation: Foster Adaptor®.

2.07 Push-On Joint Restraint Gaskets

- A. Working Pressure: 250 psi.
- B. Restraint Mechanism: Stainless steel locking segments, vulcanized into gasket, capable of being disassembled.
- C. Gasket: ANSI/AWWA C111.
- D. For use on ductile iron pipe, 4-inch through 12-inch diameter, inclusive.
- E. Manufacturers:
 - 1. U.S. Pipe: Field-Lok 350® Gasket.
 - 2. American: Fast Grip Gasket.

2.08 Mechanical Joint Restraint Gland (for temporary restraint on 4" – 12" DI and CI Pipe)

- A. Restraint Mechanism:
 - 1. Multiple wedges incorporated into gland that grip pipe wall.
 - 2. Bolt heads (on wedges) twist off at a pre-set torque to ensure proper engagement against pipe.
- B. Wedges:
 - 1. Ductile iron.
 - 2. Heat-treated to a minimum BHN of 370.
- C. Gasket: MJ rubber gasket per ANSI/AWWA C111.
- D. Glands: ANSI/AWWA C111, ductile iron per ASTM A536
- E. Coating: epoxy, or electrostatically-applied, heat-cured polyester.
- F. 350 psi working pressure
- G. Bolts (for MJ assembly): high-strength, low-alloy steel T-bolts; blue fluoropolymer- or polytetrafluoroethylene-coated.
- H. Capable of being disassembled.
- I. Not acceptable for permanent restraint (i.e. thrust blocks must still be used).

J. Manufacturers:

1. EBAA Iron, Inc.: MEGALUG®, Series 1100.
2. Ford Meter Box Company, Inc.: Uni-Flange®, Series 1400.
3. McWane Group (Tyler, Union, Clow): MJ TUFgrip® TLD, Series 1000.
4. Star Pipe Products: Stargrip®, Series 3000.

2.09 Zinc-Rich Primer for Zinc-Coating Repairs

- A. Color: Gray.
- B. Zinc Content: More than 85% in the dried film.
- C. Manufacturers:
 1. Sherwin Williams Company: Corothane® Galvacpac 1k Zinc Primer.
 2. Tnemec Company: Tneme-Zinc Series 90 – 98.
 3. Rust-oleum: Cold Galvanizing Compound Spray

2.10 Polyethylene Encasement

- A. Film: ANSI/AWWA C105, Virgin material.
- B. Tube: Extruded linear low-density polyethylene (LLDPE) film.
- C. Thickness: 8 mils.
- D. Color: Weather-resistant black containing not less than 2% carbon black.
- E. Marks: ANSI/AWWA C105.
- F. Closure Tape: Polyken #900, 3M™Scotchrap™ #50, Trumbull Polywrap Tape or AA Thread Seal Tape, Inc. Polywrap Tape, 2" wide, plastic-backed, adhesive tape.
- G. Flat Tube Widths:

Nominal Pipe Size	Push-On Joint Flat Tube Minimum Width	Mechanical Joint Flat Tube Minimum Width
6"	16"	20"
8"	20"	24"
10"	24"	27"

12"	27"	30"
14"	30"	34"
16"	34"	37"
18"	37"	41"
20"	41"	45"
24"	54"	53"

H. Manufacturers:

1. Trumbull Industries, Inc.
2. Repor, Inc.
3. AA Thread Seal Tape, Inc.

2.11 V-Bio® Enhanced Polyethylene Encasement

- A. Film: ANSI/AWWA C105, virgin material.
- B. Tube: Three layers of co-extruded linear low-density polyethylene (LLDPE) film.
- C. Thickness: 8 mils.
- D. Color: White.
- E. Marks: ANSI/AWWA C105.
- F. V-Bio® Enhancement: One inside surface (surface to be against the pipe) infused with an anti-microbial additive and a volatile galvanic corrosion inhibitor.
- G. Closure Tape: Polyken #900, 3M™Scotchrap™ #50, Trumbull Polywrap Tape or AA Thread Seal Tape, Inc. Polywrap Tape, 2" wide, plastic-backed, adhesive tape.
- H. Flat Tube Widths: as specified under 2.10 for Mechanical Joint Flat Tube Minimum Widths.
- I. Manufacturers:
 1. American Pipe Company.
 2. U.S. Pipe.
 3. McWane Group.
 4. AA Thread Seal Tape, Inc.: VB3® Enhanced Polywrap Pipe Sleeves.

PART 3 Execution

3.01 Installation

- A. Assemble push-on joints using lubricant furnished by manufacturer. Guide plain end of pipe into bell until contact is made with gasket and exert sufficient force to drive pipe home until penetration is made to a depth recommended by manufacturer.
- B. Assemble mechanical joints in accordance with the Notes on Method of Installation AWWA C111, Appendix A. Tighten all bolts by means of torque wrenches such that follower is brought up evenly. When effective sealing is not obtained at the specified torques, disassemble joint, clean and reassemble.
- C. Assemble restrained joints in accordance with manufacturer’s instructions. After each joint has been assembled and restrained, retract pipe until slack is removed from joint. When deflection is required at joint, it shall be taken after retraction.
- D. The maximum allowable deflection per length of pipe is ½ the manufacture’s standard maximum deflection. Limit maximum deflection over 18’ pipe length as follows:

Pipe Size	Push-On Joint	Restrained Joint
4”	9”	9”
6”	9”	9”
8”	9”	9”
10”	9”	9”
12”	9”	9”
14”	9”	6”
16”	9”	6”
18”	9”	5.5”
20”	9”	4.5”
24”	9”	4”

- E. Assemble anchor pipe joints in accordance with manufacturer’s instructions.
- F. Assemble restrained push-on and mechanical joints in accordance with manufacturer’s instructions.
- G. Cut polyethylene tubing in lengths which are 2 feet longer than pipe section and place around pipe. After pipe joint has been made, overlap joint one foot in each direction with polyethylene tube and secure in place with circumferential wraps of tape. Fold tube over at top and secure at two foot intervals along pipe section. Remove and replace all damaged tube.

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SECTION 02630

SERVICE CONNECTIONS

PART 1 General

1.01 Section Includes

- A. Installation of consumer services 3/4-inch through 2-inch.

1.02 Related Sections

- A. Section 02225 – Trenching
- B. Section 02227 – Backfilling

1.03 References

- A. ANSI/AWWA C105, Polyethylene Encasement for Ductile Iron Pipe Systems.
- B. ANSI/AWWA C800, Underground Service Line Valves and Fittings.
- C. ANSI/AWWA C901, Polyethylene (PE) Pressure Pipe and Tubing, 1/2-Inch through 3-Inch, for Water Service.
- D. ASTM B88 – Standard Specification for Seamless Copper Water Tube.

1.04 Definitions

- A. Short Side Services: Services connected to new main on same side of street as building being served.
- B. Long Side Services: Services connected to new main on opposite side of street from building being served.
- C. Corporation Stop: Valve connecting service line to water main and used to stop flow of water during installation or maintenance of service line.
- D. Curb Stop: Valve installed in water service line which connects Authority's service to customer's service and is operable from the ground surface. Used for stopping the flow of water through the customer service line and installed at the right-of-way or easement line unless directed otherwise by the Engineer.
- E. Tapping Saddle: Fitting that attaches circumferentially to water main to provide attachment for a corporation. Used for all 1½-inch and 2-inch taps on 4-inch through 12-inch ductile and cast iron mains and all size service taps on all sizes of PVC and asbestos cement water mains.

- F. Compression Joint: Joint compresses a combined gasket and stainless steel gripper ring/band to provide a seal and prevent pullout. Joint nut has a stop to ensure proper tightening.
- G. Directional Drilling: Installation by drilling method, using equipment manufactured by Vermeer or equivalent, where drill head course is directed using a steering mechanism capable of changing direction at any time. Directional drilling operation includes a drilling head capable of auguring, a tracking system to monitor alignment during installation, and the injection of a slurry to fill annular void.
- H. Pavement: Streets, roads, gutters, curbs, sidewalks, asphalt and concrete driveways and asphalt and concrete surfaces.

1.05 Coordination

- A. Verify that a notice from Health Department has been received by the Authority stating that health sample for distribution main is satisfactory.

1.06 Storage and Handling

- A. Ensure that polyethylene tubing is not dragged over rough ground or installed by pulling through bore holes containing sharp-edged material.
- B. Uncoil tubing and handle without kinking or creasing. Remove all portions of pipe that are damaged or cut to a depth greater than 10 percent of the wall thickness.

1.07 Submittals

- A. Product Data: Provide data on service materials and polyethylene encasement.

PART 2 Products

2.01 General Material Requirement

- A. All material specified in this section, except brass service couplings, brass bushings and meter tiles, shall be produced in the United States, its territories or possessions.
- B. All material in contact with potable water shall be NSF-61 certified.

2.02 Service Material

- A. Copper Tubing Specifications (3/4", 1", 1-1/2" and 2"):
 - 1. ASTM B88, Type K seamless, virgin copper.

2. Dimensions: ANSI/AWWA C800, Appendix A.2.
3. Copper Tubing Manufacturers:
 - a. Cambridge-Lee Industries LLC.
 - b. Wieland Copper Products, LLC.
- B. Polyethylene Tubing (1", 1-1/2" and 2"):
 1. Virgin PE meeting AWWA C901, PE4710, SDR-9, Oxidative Resistance Categorization CC2 or CC3, and color and UV stabilizer code C or code E in accordance with ASTM D3350 and AWWA C901.
 2. Dimensions: ANSI/AWWA C901, Table 5 outside diameter (CTS PE tubing OD-controlled diameter).
 3. Working Pressure: 250 psi.
 4. Color: Blue or black with blue stripe.
 5. Marks: ANSI/AWWA C901. Include the following markings applied at intervals not more than 5 feet:
 - a. Nominal size, diameter base (CTS) and SDR.
 - b. Manufacturer's name or trademark and production record code.
 - c. Material designation code (PE 4710).
 - d. AWWA pressure class.
 - e. AWWA standard designation number (AWWA C901).
 - f. Seal or mark of testing agency that certified suitability of pipe or tubing material for potable water products.
 - g. Standard PE compound oxidative resistance classification per D3350 (CC2 or CC3).
 6. Polyethylene Service Tubing Manufacturers:
 - a. Endot Industries: Endopure.
 - b. JM Eagle.
 - c. Charter Plastics.

d. WL Plastics.

C. Tracing wire for plastic services:

1. 12 AWG, copper-clad steel wire.
2. Core Material: AISI 1055 steel.
3. Conductivity: 21% minimum.
4. Break Load: 1,150 pounds minimum.
5. Exterior Coating: 45 mil high-density, high molecular weight polyethylene (HMWPE).
6. Color: Blue
7. Tracing Wire Manufacturers:
 - a. Kris-tech Wire: Copper-clad steel tracer wire, EHS (extra high strength) for 600V with high-density, high molecular weight polyethylene (HMWPE) coating.
 - b. Pro-Line Safety Products: PROTRACE HDD-CCS PE45.
 - c. Copperhead Industries: Soloshot Part #1245 EHS.

2.03 Corporation Stops: 3/4-Inch and 1-Inch

- A. Fabricated from no-lead brass (CDA / UNS Copper Alloy C89520, C89833 or C89836) in accordance with ANSI/AWWA C800 and chemical and mechanical requirements of ASTM B584.
- B. Valve: Ball valve with full-port opening, ¼ turn (90°) to full close or open.
- C. Working pressure: 300 psi.
- D. Inlet: AWWA CC threads.
- E. Outlet: Compression, MIP or FIP (as required by use or by Engineer).
- F. Manufacturers, Compression Outlet, Non-insulated: for plastic water tubing, air releases and blow-offs (and disinfection / blow-offs / sampling taps if not used for a service).
 1. A.Y. McDonald: 74701BQ.
 2. Ford: FB1000-3-Q-NL, FB1000-4-Q-NL.

3. Mueller: B-25008N.
- G. Manufacturers, MIP or FIP Outlet, Non-insulated: for plastic water tubing, air releases and blow-offs (and disinfection / blow-offs / sampling taps if not used for a service).
1. A.Y. McDonald: 73128B or 73148B.
 2. Ford: FB400-3-NL, FB400-4-NL, FB1600-3-NL or FB1600-4-NL.
 3. Mueller: B-2996N or B-20045N.
- H. Manufacturers, Compression Outlet, Insulated: for copper tubing services on ductile iron, cast iron or steel pipe (and disinfection / blow-offs / sampling taps if used for a service).
1. A.Y. McDonald: 74701BDBQ.
 2. Mueller: N-35008N.

2.04 Corporation Stops: 1½-Inch, 1½-Inch x 2-Inch, and 2-Inch

- A. Fabricated from no-lead brass (CDA / UNS Copper Alloy C89520, C89833 or C89836) in accordance with ANSI/AWWA C800 and chemical and mechanical requirements of ASTM B584.
- B. Valve: Ball valve with full-port opening, ¼ turn (90°) to full close or open.
- C. Working Pressure: 300 psi.
- D. Inlet: AWWA CC threads.
- E. Outlet: Compression, MIP or FIP (as required by use or by Engineer).
- F. Manufacturers, Compression Outlet, Non-insulated: for plastic water tubing, air releases and blow-offs (and disinfection / blow-offs / sampling taps if not used for a service).
1. A.Y. McDonald: 74701BQ.
 2. Ford: FB1000-6-Q-NL or FB1000-7-Q-NL.
 3. Mueller: B-25008N.
- G. Manufacturers, MIP or FIP Outlet, Non-insulated: for plastic water tubing, air releases and blow-offs (and disinfection / blow-offs / sampling taps if not used for a service).
1. A.Y. McDonald: 73128B, 73148B, or 73121B.

2. Ford: FB400-6-NL, FB400-7-NL, FB400 -67-NL, FB1600-6-NL, FB1600-67-NL, or FB1600-7-NL.
 3. Mueller: B-2996N or B-20045N.
- H. Manufacturers, MIP or FIP Outlet, Insulated: for copper tubing services on ductile iron, cast iron or steel pipe (and disinfection / blow-offs / sampling taps if not used for a service).
1. Mueller: N-30045N

2.05 Curb Stop: 3/4-Inch and 1-Inch

- A. Fabricated from no-lead brass (CDA / UNS Copper Alloy C89520, C89836 or C89833) in accordance with ANSI/AWWA C800 and chemical and mechanical requirements of ASTM B584.
- B. Valve: Ball valve with full port-opening, ¼ turn (90°) to full close or open.
- C. Working Pressure: 300 psi.
- D. Inlet: Compression, MIP or FIP.
- E. Outlet: Compression, MIP or FIP (as required by use or by Engineer).
- F. Manufacturers: Compression by Compression
 1. A.Y. McDonald: 76100Q.
 2. Ford: B44-333-Q-NL or B44-444-Q-NL.
 3. Mueller: B-25209N.
- G. Manufacturers: Compression by Compression (Self draining for blow-offs and air releases):
 1. A.Y. McDonald: 76000Q.
 2. Ford: BC44-444SW-Q-NL.
- H. Manufacturers: Compression by FIP or MIP
 1. A.Y. McDonald: 76102Q.
 2. Ford: B41-333-Q-NL, B41-444-Q-NL, B84-333-Q-NL, or B84-444-Q-NL.
 3. Mueller: B-25172N, or B-25122N.

- I. Manufacturers: FIP or MIP by FIP or MIP
 - 1. A.Y. McDonald: 76101, 76107, or 76107P
 - 2. Ford: B11-333-NL, B11-444-NL, B81-333-NL, B81-444-NL, B88-333-NL, or B88-444-NL.
 - 3. Mueller: B-20283N, B-20285N, or B-20276N.

2.06 Curb Stops: 1½-Inch and 2-Inch

- A. Fabricated from no-lead brass (CDA / UNS Copper Alloy C89520, C89833 or C89836) in accordance with ANSI/AWWA C800 and chemical and mechanical requirements of ASTM B584.
- B. Valve: Ball valve with full-port opening, ¼ turn (90°) to full close or open.
- C. Working Pressure: 300 psi.
- D. Inlet: Compression (grip), FIP or MIP.
- E. Outlet: Compression, FIP or MIP.
- F. Manufacturers: Compression by Compression
 - 1. A.Y. McDonald: 76100Q.
 - 2. Ford: B44-666-Q-NL, or B44-777-Q-NL.
 - 3. Mueller: B-25209N.
- G. Manufacturers: Compression by Compression (Self draining for blow-offs and air releases):
 - 1. A.Y. McDonald: 76000Q.
 - 2. Ford: B44-666SW-Q-NL or B44-777SW-Q-NL.
- H. Manufacturers: Compression by FIP or MIP
 - 1. A.Y. McDonald: 76102Q.
 - 2. Ford: B41-666-Q-NL, B41-777-Q-NL, B84-666-Q-NL, or B84-777-Q-NL,
 - 3. Mueller: B-25172N, or B-25122N.

- I. Manufacturers: FIP or MIP by FIP or MIP
 - 1. A.Y. McDonald: 76101, 76107, or 76107P.
 - 2. Ford: B11-666-NL, B11-777-NL, B81-666-NL, B81-777-NL, B88-666-NL, or B88-777-NL.
 - 3. Mueller: B-20283N, B-20285N, or B-20276N.

2.07 Curb Boxes and Curb Rods: 1¼-Inch

- A. Curb Box: Arch pattern extension type with a 5½-foot bury, 66-inch maximum extended length and compressed minimum length of 54-inch.
- B. Curb Box Rod: Stainless steel, minimum ½" outside diameter by 42" length. "S" type, bottom clamp/yoke of stainless steel, welded on rod and drilled for cotter pin. Brass or stainless steel cotter pin.
- C. Curb Box Lid: Cast iron, tapped 1¼-inch with brass pentagon nut plug. "WATER" cast in raised letters on the lid.
- D. Curb Box Bottom: Arch must fit ¾-inch and 1-inch ball valve curb stop with a 1¼-inch upper section.
- E. Curb Box Manufacturers:
 - 1. Ford: EA2-55-50-with type PL lid and stationary rod.
 - 2. A.Y. McDonald: 5604, with 5614L lid and 5660SS rod.
 - 3. Mueller: H-10306-66 with 89369 Lid.
- F. Curb Rod Manufacturers:
 - 1. A.Y. McDonald.
 - 2. Ford.
 - 3. Mueller.

2.08 Curb Boxes – Enlarged Base

- A. Adaptable with lower section of 1¼-inch arch pattern curb boxes and sized to fit over 1½-inch and 2 inch ball curb stops.

B. Manufacturers:

1. Bibby-Ste. Croix: V313 (non-USA-produced).
2. Ford: CB-7.
3. A.Y. McDonald: 5700E.
4. Mueller: H-10310
5. Bingham & Taylor: 4980, No. 14-E

2.09 Tapping Saddles for Services on Ductile Iron, Cast Iron, and Asbestos Cement Mains

- A. Body: Copper alloy CDA / UNS C83600 (85-5-5-5) in accordance with ANSI/AWWA C800 and chemical and mechanical requirements of B584.
- B. Strap: Double straps of flattened silicon bronze.
- C. Nuts: 85-5-5 brass alloy as per ASTM B62 and B584 and ANSI/AWWA C800. With integral washers.
- D. Outlet: AWWA Standard CC female thread.
- E. Gasket: ASTM-D2000, Nitrile (Buna-N / NBR) rubber or EPDM o-ring.
- F. Manufacturers:
 1. Ford: 202B.
 2. Mueller: BR2B series.
 3. A.Y. McDonald: 3825 for 2" – 12", 3825A or 3825B for 14" – 24".

2.10 Tapping Saddles for Services on 6-inch to 12-inch PVC pipe

- A. Body: Copper alloy CDA / UNS C83600 (85-5-5-5) in accordance with ANSI/AWWA C800 and chemical and mechanical requirements of B584.
- B. Strap: Single strap, cast bronze (CDA / UNS C83600) or cast brass (CDA / UNS C84400).
- C. Studs, Nuts and Washers: Silicon bronze, bronze (CDA / UNS C65100) or brass (CDA / UNS C84400).
- D. Outlet: AWWA CC threads for 1-inch and smaller, Female Iron Pipe Thread for 1-1/2-inch and greater.

E. Gasket: ASTM-D2000, Nitrile (Buna-N / NBR) rubber or EPDM o-ring.

F. Manufacturers:

1. Ford: S90 Design A (bolted or hinged).
2. Cambridge Brass Inc: Series 800.
3. Mueller: S-13000 or H-13000 (bolted or hinged)
4. AY McDonald: 3805 (bolted) or 3895 (hinged)

2.11 Tapping Saddles for Services on 14-inch to 24-inch PVC pipe

A. Body: Copper alloy CDA / UNS C83600 (85-5-5-5) in accordance with ANSI/AWWA C800 and chemical and mechanical requirements of ASTM B584.

B. Strap: Double strap, Type 304 stainless steel.

C. Studs, Nuts and Washers: Type 304 stainless steel.

D. Outlet: AWWA CC threads for 1-inch and smaller, Female Iron Pipe Thread for 1-1/2-inch and greater.

E. Gasket: ASTM-D2000, Nitrile (Buna-N / NBR) rubber or EPDM o-ring.

F. Manufacturers:

1. Ford: 202BSD.
2. Cambridge Brass Inc: Series 812.
3. Mueller: BR 2 S.
4. AY McDonald: 3855 (AWWA CC) or 3856(FIPT).

2.12 Brass Service Couplings

A. Fabricated from no-lead brass (copper alloy CDA/UNS C89833, C89836 or C89520) in accordance with ANSI/AWWA C800 and chemical and mechanical requirements of ASTM B584.

B. Compression inlet and outlet.

C. Manufacturers, Compression by Compression: for copper to copper, plastic tubing to plastic tubing, or plastic tubing to copper:

1. A.Y. McDonald: 74758Q,
 2. Ford: C44-33-Q-NL, C44-34-Q-NL, C44-44-Q-NL, C44-46-Q-NL, C44-66-Q-NL, or C44-77-Q-NL.
 3. Mueller: H-15403N.
- D. Manufacturers, Compression by MIP or FIP: for copper or plastic tubing to iron pipe thread.
1. A.Y. McDonald: 74754Q, or 74753Q.
 2. Ford: C14-33-Q-NL, C14-43-Q-NL, C14-44-Q-NL, C14-66-Q-NL, C14-77-Q-NL, C84-33-Q-NL, C84-43-Q-NL, C84-44-Q-NL, C84-66-Q-NL, or C84-77-Q-NL.
 3. Mueller: H-15451N.
 4. Lee Brass: Lee Free®
- E. Manufacturers, Compression by FIP with MIP Plug: for air releases and blow-offs.
1. A.Y. McDonald: 74754Q with MIP plug.
 2. Ford: C14-44-Q-NL with CSP-4-I-NL, or C14-77-Q-NL with CSP-7-I-NL.
 3. Mueller: H-15451N with H-10035N brass plug.

2.13 Brass Bushings

- A. Fabricated from no-lead brass (copper alloy CDA/UNS C89833, C89836 or C89520) in accordance with ANSI/AWWA C800 and chemical and mechanical requirements of ASTM B584.
- B. Inlet / outlet: Iron pipe threads.
- C. Manufacturers:
1. Mueller: 47162N, 47163N, 47164N, 47165N, 47168N, 47169N and 47172N.
 2. Ford: C18-34-NL, C18-36-NL, C18-37-NL, C18-43-NL, C18-46-NL, C18-47-NL, C18-67-NL or C18-76-NL.
 3. Lee Brass: Lee Free®

2.14 Repair Clamps with CC Outlet for Defective Tap

- A. Band Material: Type 304 (18-8) Stainless Steel.

- B. Lug Material: Type 304 (18-8) Stainless Steel.
- C. Spanner / Bridge Plate: Type 304 (18-8) Stainless Steel.
- D. Bolts: Type 304 (18-8) Stainless Steel.
- E. Gaskets: Virgin SBR material or Nitrile (Buna-N / NBR) formulated for water use.
- F. Manufacturers:
 - 1. JCM: 133 or 134 Extended Range.
 - 2. Ford: FS1 or FS2 (Two Sections).
 - 3. Smith Blair: 265.
 - 4. Cascade: CR1 or CR2 (Two Sections).
 - 5. PowerSeal: 3132AS.
 - 6. Romac: SS1 or SS2.

2.15 Polyethylene Encasement

- A. In accordance with Specification 02610.

2.16 Meter Tiles

- A. Tile
 - 1. 18" nominal diameter.
 - 2. SDR 35 PVC pipe, or smooth-interior, corrugated N-12 HDPE.
 - 3. Manufacturers:
 - a. JM Eagle.
 - b. IPEX.
 - c. Vinyltech.
 - d. North American Pipe Corporation.
 - e. ADS.

B. Meter Tile Box Cover

1. 18" diameter.
2. Drilled hole in lid for electronic meter reading.
3. Pentagon bolt.
4. Locking.
5. Manufacturers:
 - a. Ford: W32-t Wabash double lid, C-32T Type C single lid.
 - b. Mueller: H-10817-09 single lid, H-10814-09 double lid.
 - c. A.Y. McDonald: 74M32WT.

C. Angle Meter Valve

1. Ball valve.
2. Inlet / Outlet: Meter swivel nut by copper compression.
3. Manufacturers:
 - a. Mueller: H-14269N (Angle meter dual check valve) or B-24258N (300™ Ball angle meter valve).
 - b. Ford: BA43-342W-Q or BA43-444W-Q.
 - c. A.Y. McDonald: 74602BG (1 x 3/4 x 5/8) or 74602BG (1).

PART 3 Execution

3.01 Installation

- A. Use direct tapped connections for all 3/4-inch and 1-inch taps on ductile iron pipe. Use service saddles for all 1½-inch and 2-inch connections on 12-inch, or less, ductile iron pipe.
- B. Install all service materials, including corporation and curb stop, at a minimum depth of cover of 5.0 feet.
- C. Install directional drilled services using equipment capable of being steered or tracked. Before boring, drilling, missiling, tunneling, or directional drilling for services, verify in accordance

- with New York State Industrial Code Rule 753 or as directed by each utility that existing utilities will not be pierced or damaged. Check inverts of all existing utilities including sewers, electric, gas and communication utilities before boring, drilling, missiling, tunneling or directional drilling.
- D. Install 3/4-inch and 1-inch corporations in upper half of main at a 22½ degree angle with horizontal axis of main and on same side of main as consumer. Install corporation a minimum of 2 feet from any joint or fitting with operating key positioned on side.
 - E. Connect 3/4-inch and 1-inch service material to corporation and gooseneck material downward in such a manner that service material rests firmly on undisturbed soil. Rotate gooseneck slightly to the right (clockwise) of corporation's centerline. Install gooseneck of sufficient length to preclude any possibility of failure due to settlement. Maintain minimum of 5.0 feet of cover over service gooseneck.
 - F. Install 1½-inch and 2-inch corporations in line with horizontal axis of water main and on same side of main as consumer. Install corporations a minimum of 2 feet from any joint or fitting with operating key positioned on side. Install two 90 degree brass street ells (I.P. threads) such as that ell attached to corporation will remain stationary while second ell will tighten in the event of settlement. Install a brass female iron pipe thread by compression (copper or plastic) adapter on the second ell.
 - G. Install polyethylene tubing around corporation stop and 3-1/2 feet of copper service pipe. Tape polyethylene at both ends and circumferentially along copper.
 - H. Repair all defective service taps with stainless steel split sleeve repair clamps. Do not re-tap main within 12 inches of repair clamp.
 - I. Install all plastic services with 12 AWG, copper-clad steel, tracing wire wrapped around service. Strip and firmly attach tracing wire to corporation and continue installation above service to curb stop. Attach a second wire to the first near curb stop and extend it to the top of the curb box as shown on the Approved Plans. Ensure electrical continuity between the wires.
 - J. When installing services on a polyethylene encased main, tightly wrap the main with 2 layers of 8 mil polyethylene adhesive tape for 12 inches each side of the proposed tap location. After the corporation has been installed, repair any cuts or scrapes to the polyethylene encasement or tape to prevent exposure of water main to the soil. Tape shall conform to section entitled "Ductile Iron Pipe".
 - K. Locate new curb boxes on right-of-way or easement line. Avoid locating new curb boxes in sidewalks, pavement, lawn areas between street curb and sidewalk ("tree lawns") or driveways unless approved in writing by Engineer.

Avoid locating couplings under pavement or sidewalks unless approved in writing by the Engineer.

- L. Install one continuous length of service material from connection to curb box or existing service to main.

- M. Install all services perpendicular to the main, and in a straight line. No horizontal offsets greater than 24 inches in either direction will be allowed unless approved in writing by the Engineer.

If the horizontal offset must be greater than 24 inches, place the new curb box directly opposite the new corporation and offset the service back to the existing customer service.

~ END OF SECTION ~

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SECTION 02650

WATER MAIN CONNECTIONS

PART 1 General

1.01 Section Includes

- A. Installing Tapping Sleeves and Valves
- B. Installing Ductile Iron Pipe, Anchor Tees, and Valves

1.02 Related Specifications

- A. Section 02610 – Ductile Iron Pipe
- B. Section 02655 – Water System Appurtenances
- C. Section 02660 – Water Valves

1.03 References

- A. ANSI/AWWA C110 – Ductile Iron and Gray Iron Fittings, 3 Inch through 48 Inch, for Water and Other Liquids.
- B. ANSI/AWWA C111 – Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
- C. ANSI/AWWA C153 – Ductile Iron Compact Fittings, 3 Inch through 24 Inch.
- D. ANSI/AWWA C500 – Gate Valves, 3 Inch through 48 Inch NPS, for Water and Sewage Systems.

1.04 Submittals

- A. Product Data: Provide data on tapping sleeves, valves, pipe, couplings and anchor tees.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

PART 2 Products

2.01 General Material Requirement

- A. All tapping sleeves, including glands and bolts, shall be produced in the United States, its territories or possessions.

- B. All tapping sleeves shall be NSF-61 Certified for contact with drinking water.

2.02 DI and CI Tapping Sleeves for 4" – 24" Ductile or Cast Iron Pipe

- A. Tapping Sleeve: ANSI/AWWA C110, DI or CI.
- B. Working Pressure: 200 psi minimum.
- C. Tapping Flange: ASME B16.1, Class 125 / Class B, with groove for tapping valve flange.
- D. Joints: ANSI/AWWA C111, mechanical joint by tapping flange.
- E. Bolts: High-strength, low-alloy steel T-bolts; blue fluoropolymer-coated or polytetrafluoroethylene-coated.
- F. Gaskets: SBR, EPDM or Nitrile (Buna-N/NBR).
- G. Exterior Coating: ANSI/AWWA C153, asphaltic.
- H. Manufacturers for Ductile or Cast Iron Tapping Sleeves
 - 1. US Pipe/Mueller: H-615, H-619.
 - 2. American: 2800-C Series.
 - 3. McWane Group (Tyler, Union and Clow): 25-U-Compact.

2.03 Stainless Steel Tapping Sleeves for 4" – 24" Ductile Iron, Cast Iron or Asbestos Cement Pipe

- A. Tapping Sleeve: ANSI/AWWA C223, 18-8 Type 304 or Type 316 stainless steel.
- B. Working Pressure: 200 psi minimum.
- C. Tapping Flange: CF8 cast stainless steel, or, 304 or 316 stainless steel; ANSI B16.1 Class 125/Class B, with groove for tapping valve flange.
- D. Bolts: Type 304 stainless steel.
- E. Gasket: SBR or Nitrile (Buna-N / NBR), Full circumferential gasket.
- F. Manufacturers for Stainless Tapping Sleeves.
 - 1. Power Seal: 3490-AS.
 - 2. Ford: FTSS.

3. Cascade: CST-EX (Not approved for use on mains to be pressure tested over 150 psi).
4. U.S. Pipe / Mueller: H-304SS.
5. Total Piping Solutions: Triple-Tap®.
6. JCM: 432SS (not approved for use on AC mains and mains to be pressure tested over 150 psi).

2.04 Valves and Tapping Valves

- A. Conform to Specification 02660.

2.05 Ductile Iron Pipe

- A. Conform to Specification 02610.

2.06 Tees, Anchor Tees, and Couplings

- A. Conform to Specification 02655.

2.07 Stainless Steel Tapping Sleeves for 6" – 48" Steel Pipe

- A. Weld-on.
- B. ANSI/AWWA C200, Steel per ASTM A36 or ASTM A283 Grade C.
- C. Working Pressure: 150 psi.
- D. Tapping Flange: ANSI/AWWA C207, Class D or ANSI B16.5 Class 125/Class B, with groove for tapping valve flange.
- E. Exterior Coating: Shop coat primer or epoxy coated.
- F. Manufacturers for Steel Weld-on Tapping Sleeves:
 1. Romac: FTS445.
 2. Smith Blair: 626.
 3. JCM: 417.

2.08 Stainless Steel Tapping Sleeves for 20" – 42" Pre-Stressed Concrete Cylinder Pipe (PCCP)

- A. ANSI/AWWA C223, Steel, ASTM A36, ASTM A283 Grade C or ASTM C253 Grade C.

- B. Working Pressure: 150 psi.
- C. Tapping Flange: ANSI/AWWA C207, Class D or ANSI B16.5 Class 125 / Class B, with groove for tapping valve flange.
- D. Straps: ASTM A36 Steel, Type 304 Stainless Steel.
- E. Bolts/Studs/Nuts: ANSI/AWWA C111, high-strength, low-alloy steel.
- F. Gaskets: SBR or Nitrile (Buna-N / NBR) per ASTM D2000.
- G. Exterior Coating: Fusion-bonded epoxy.
- H. Interior Coating: Fusion-bonded epoxy to a minimum thickness of 15 mils in accordance with AWWA C213.
- I. Design
 - 1. The sleeve shall have a separate gland, which allows the sleeve to be installed, and the annular space between the pipe and the sleeve to be grouted, prior to cutting the pre-stressed wires.
 - 2. Foam or rubber grout gaskets and hard rubber spacers shall be used to provide an annular space between the pipe and the sleeve. Grout horns shall be furnished to facilitate grouting of the annular space.
 - 3. The annular space shall be grouted with a suitable Portland Cement grout. The grout shall be allowed to set prior to cutting any pre-stressing wires. Any accelerant used in the grout shall not be deleterious to pre-stressing wires.
 - 4. The pressure plate shall be adequately braced to eliminate vibration and flexing of the plate while the tapping machine is operating.
 - 5. The machined gasket groove on the pressure plate must be consistently positioned about throat of tapping gland waterway. However, ID of the gasket groove must be set back a minimum of 1" from the waterway to allow dispersal of forces generated by gasket compression. Gasket grooves machined in a circle and then rolled to an elliptical shape will not be allowed.
 - 6. All waterway welds shall be dye-penetrant inspected or hydrostatically shop tested for water tightness.
 - 7. The gland shall be equipped with load bearing set screws to transfer thrust loads from the branch piping to the sleeve.

8. A three ring flange configuration shall be used on all outlets above 12 inch to allow for valve bypass.
 9. Welding the gland to the steel cylinder of the pipe to provide a watertight seal shall not be permitted.
 10. The sleeve shall be encased in a minimum of 1 inch of Portland cement mortar or concrete for corrosion protection after the tap.
- J. Manufacturers:
1. Romac: FTS435
 2. Smith Blair: 625
 3. JCM: 415

PART 3 Execution

3.01 Preparation

- A. Excavate existing main at tie-in location in accordance with Specification 02225.
- B. Verify actual pipe size, material and tap location.
- C. Remove dirt and scale on exterior of existing main.

3.02 Installation – Tapping Sleeve and Valve

- A. Schedule tap with the Authority 2 working days in advance.
- B. Install tapping sleeve and valve in accordance with the manufacturer's instructions. Maintain a 3 foot separation from ends of sleeve to adjacent joints or fittings.
- C. Verify with the Authority in advance of tap that excavation provided is of sufficient size for tapping operations. If a larger excavation is required, excavate as directed by Engineer. Excavate and provide sheeting and shoring and access to excavation in accordance with OSHA regulations.
- D. Provide backhoe and Operator to assist Tapping Crew during tapping work. Provide flagmen and barricades when necessary. Operator of backhoe shall assist Tapping Crew with installation and removal of tapping machine.
- E. Tapping Crew shall perform an air pressure test on the installed tapping sleeve and valve. Sleeve and valve shall maintain 150 psi for 5 minutes with no leakage.

- F. When tapping sleeve or tapping valve leaks, it is the sole responsibility of the Contractor to remove, reinstall and replace, if necessary, tapping sleeve or tapping valve. Reinstalled or replaced sleeves and valves shall be retested until they achieve satisfactory test results.
- G. Backfill excavation in accordance with Specification 02225.
- H. Install valve box in accordance with Specification 02660.

3.03 Installation – Cut-In Tee and Valve

- A. Schedule water main shutdown with the Authority.
- B. Excavate existing water main at the tie-in location. Prevent undermining of existing main outside of replacement limits.
- C. Confirm water main has been turned off.
- D. Cut and remove existing water main at tie-in location. The minimum length of pipe removed shall be the laying length of the tee plus 3 feet on either side of tee. When existing pipe joints fall within 3 feet of the cut points (located as specified above), joints shall also be removed and additional ductile iron pipe installed.
- E. Swab disinfect pipe and fittings to be installed.
- F. Install couplings, ductile iron pipe, anchor tee and valve.
- G. Assist the Authority in returning main to service.
- H. Verify that installed pipe and fittings do not leak.
- I. Backfill excavation in accordance with Section 02225.
- J. Install valve box in accordance with Section 02660.

~ END OF SECTION ~

SECTION 02655

WATER SYSTEM APPURTENANCES

PART 1 General

1.01 Section Includes

- A. Hydrants
- B. Hydrant Extensions
- C. Couplings and Flanged Coupling Adapters
- D. Permanent Manual Air Releases & Blow-Offs
- E. Automatic Air Releases

1.02 Related Sections

- A. Section 02600 – Pipe Installation
- B. Section 02610 – Ductile Iron Pipe
- C. Section 02630 – Service Connections
- D. Section 02660 – Water Valves

1.03 References

- A. ANSI/AWWA C110 – Ductile Iron and Gray Iron Fittings, 3” through 48”, for Water and Other Liquids.
- B. ANSI/AWWA C111 – Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
- C. ANSI/AWWA C219 – Bolted, Sleeve-type Couplings for Plain End Pipe.
- D. ANSI/AWWA C502 – Dry Barrel Fire Hydrants.
- E. ANSI/AWWA C512 – Air Release, Air Vacuum, and Combination Air Valves for Waterworks Service.
- F. ASTM A36 – Standard Specification for Carbon Structural Steel.

- G. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless.
- H. ASTM A242 – Standard Specification for High-Strength, Low-Alloy Structural Steel.
- I. ASTM A304 – Standard Specification for Carbon and Alloy Steel Bars, Subject to End-Quenched Hardenability Requirements.
- J. ASTM A307 Standard Specification for Carbon Steel Bolts and Studs.
- K. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat-Treated, 120/105 KSI Minimum Tensile Strength.
- L. ASTM A513 – Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
- M. ASTM A536 – Standard Specification for Ductile Iron Castings.
- N. ASTM A563 – Standard Specification for Carbon and Alloy Steel Nuts.
- O. ASTM A635 – Standard Specification for Steel, Sheet and Strip Heavy-Thickness Coils, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, General Requirements.

1.04 Definitions

- A. Limited Range: A coupling that will fit only Class A, B, C, or D cast iron pipe, Class 51-56 ductile iron pipe, or Class 100 or 150 rough barrel asbestos cement pipe.

1.05 Submittals

- A. Provide product data as required.

PART 2 Products

2.01 General Material Requirement

- A. All material specified in this section, except cement blocks, select fill and blow-off brass shall be produced in the United States, its territories or possessions.
- B. All materials in contact with potable water shall be NSF-61 Certified.

2.02 Hydrants and Hydrant Branches

A. Hydrants

1. ANSI/AWWA C502, Dry barrel, 5-1/2 foot bury for a standard hydrant and 6-1/2 foot bury for a blow-off hydrant.
2. Opens: Counterclockwise direction.
3. Valve Opening: 5-1/4 inch
4. Operating Nut: Pentagon-shaped, 1-1/2 inch point to flat with weather cap or shield.
5. Packing: "O" Ring.
6. Seat Rings: Bronze to bronze.
7. Inlet: 6" MJ with gasket and connecting gland.
8. Nozzles
 - a. 1 – 4-1/2 inch inside diameter, male, 4 threads per inch.
 - b. 2 – 2-1/2 inch inside diameter, male, 7-1/2 threads per inch.
 - c. Mechanically attached nozzles.
 - d. National Standard Threads.
 - e. Threaded female caps without chains.
 - f. Orientation: Two smaller nozzles 180° apart with large nozzle located equidistant between them.
9. Bolts: High-strength, low-alloy steel T-bolts; blue fluoropolymer-coated or polytetrafluoroethylene-coated.
10. Paint: OSHA safety yellow, polyurethane modified alkyd (conforming to Federal Lead Standards).
11. Paint Coats: 1 primer coat, 2 finish coats.
12. Manufacturers
 - a. Mueller: Super Centurion 250®.
 - b. Clow Eddy: F-2640.

- c. Kennedy Guardian: K-81-D.
 - d. U.S. Pipe: M-94.
 - B. Anchor Pipe & Mechanical Joint Fittings
 - 1. In accordance with Specification 02610.
 - C. Anchor Tees and Anchor Elbows, Mechanical Joint
 - 1. ANSI/AWWA C110, or ANSI/AWWA C153
 - 2. Lining: ANSI/AWWA C110 or C153 (ANSI/AWWA C104), cement.
 - 3. Exterior Coating: ANSI/AWWA C110 or C153, asphaltic.
 - 4. Joints: ANSI/AWWA C110 or C153 (ANSI/AWWA C111), rubber gasket, mechanical joint (MJ x MJ x swivel tee, MJ x swivel elbow).
 - 5. Body and Glands: ANSI/AWWA C110 or C153 (ANSI/AWWA C111), Ductile Iron.
 - 6. Bolts: High-strength, low-alloy steel T-bolts; blue fluoropolymer-coated or polytetrafluoroethylene-coated.
 - 7. Manufacturers
 - a. McWane Group (Tyler, Union and Clow).
 - 1. MJ x MJ x swivel tee,
 - 2. MJ x swivel tee, MJ x swivel elbow,
 - 3. Swivel x swivel hydrant ell,
 - 4. 90° Swivel x swivel bends.
 - D. Guard Valve
 - 1. 6 inch gate valve in accordance with Specification 02660.
 - E. Cement Block
 - 1. Hydrants: Solid 8"x8"x16".
 - 2. Guard Valve: See Section 02660.

F. Select Fill for Drain

1. Type 7

2.03 Straight, Transition and Multi-Range Couplings

A. Straight Couplings for Ductile and Cast Iron Pipe

1. ANSI/AWWA C219.
2. Working Pressure: 150 psi.
3. Sleeves: Ductile iron per ASTM A536, steel per ASTM A36 or carbon steel per ASTM A283C
4. Follower flange: Ductile iron per ASTM A536, steel per ASTM A36 or carbon steel C1020 per ASTM A576.
5. Center sleeves for 16" – 30" diameter shall have a 10" minimum length and 36" – 48" diameter shall have a 16" minimum length.
6. Bolts / Nuts: ANSI/AWWA C111, high-strength, low-alloy steel bolts; blue fluoropolymer – coated or polytetrafluoroethylene-coated.
7. Gasket: ANSI/AWWA C111, SBR or Nitrile (Buna-N / NBR).
8. Coating: Fusion-bonded epoxy.
9. Manufacturers – Straight Couplings
 - a. Smith Blair: #441, 4 inch through 12 inch, Limited Range only.
 - b. Smith Blair: #411, 14 inch through 60 inch.
 - c. JCM: #210, 2 inch through 12 inch.
 - d. JCM: #201, 14 inch and greater.
 - e. Ford: #FC1, 2 inch through 12 inch.

B. Transition Couplings for Ductile or Cast Iron Pipe

1. ANSI/AWWA C219.
2. Working Pressure: 150 psi.
3. Sleeves: ASTM A536, ductile iron or ASTM A36, ASTM A53 or ASTM A513, steel.

4. Sleeve length: Center sleeves for 16" – 30" diameter shall have a 10" minimum length and 36" – 48" diameter shall have a 16" minimum length.
 5. Follower Flange: ASTM A536, ductile iron or ASTM A36 or AISI 1020, steel.
 6. Bolts / Nuts: ANSI/AWWA C111, high-strength, low-alloy steel bolts; blue fluoropolymer – coated or polytetrafluoroethylene-coated.
 7. Gasket: ANSI/AWWA C111, SBR or Nitrile (Buna-N / NBR).
 8. Coating: Fusion-bonded epoxy.
 9. Manufacturers – Transition Couplings
 - a. Smith Blair: #441, Omni, 4 inch through 12 inch.
 - b. Smith Blair: #415, 16 inch through 30 inch.
 - c. Smith Blair: #413, 14" and above.
 - d. JCM: #212, 4 inch through 12 inch.
 - e. JCM: #203, 14 inch and above.
 - f. Ford: #FC2A, 4 inch through 12 inch.
 - g. Ford: #FC5, 14" and above.
 - h. PowerSeal: #3562R, 14 inch and above.
- C. Multi-Range, Two-Bolt Couplings for Ductile or Cast Iron Pipe
1. ANSI/AWWA C219.
 2. Working Pressure: 260 psi.
 3. Sleeves and follower flange: ASTM A536, ductile iron or ASTM A36, ASTM A285A or ASTM A283C, carbon steel.
 4. Bolts / Nuts: Type 304 Stainless Steel.
 5. Gaskets: EPDM or Nitrile (Buna-N / NBR).
 6. Coating: Fusion-bonded epoxy.

7. Manufacturers – Multi-Range, Two Bolt Couplings
 - a. Hymax®: Hymax® 2 Coupling (non-USA-produced).
 - b. Smith-Blair: #421 Top Bolt® Wide Range Coupling.
- D. Polyethylene Encasement
 1. In accordance with Specification 02610.

2.04 Flanged Coupling Adapters

- A. Body and End Ring: ASTM A536, ductile iron or ANSI/AWWA C219, steel.
- B. Coating: Fusion-bonded epoxy.
- C. Flange: ANSI/AWWA C207, Class B, ASME B16.1 Class 125, or ASME B16.5 Class 150.
- D. Flange O-ring: Nitrile (Buna-N / NBR).
- E. Restraint Mechanism: No anchor studs or pins.
- F. Bolts: High-strength, low-alloy steel bolts; blue fluoropolymer-coated or polytetrafluoroethylene-coated.
- G. Gasket: SBR or Nitrile (Buna-N / NBR).
- H. Manufacturers:
 1. Ford: FCA
 2. Smith-Blair: 912 or 913.
 3. JCM: 301 (4 inch to 12 inch only).
 4. Romac: FC400 (14 inch and larger).

2.05 Permanent Manual Air Releases & Blow Offs (1 Inch and 2 Inch)

- A. Corporations (1 Inch & 2 Inch)
 1. In accordance with Specification 02630.

- B. Copper Tubing – Permanent Manual Air Releases (1 Inch)
 - 1. In accordance with Specification 02630.
- C. Pipe & Fittings – Blow-Offs (2 Inch)
 - 1. Brass (bronze)
 - a. 125 pounds, IPS threads.
 - b. Standards
 - 1. Red Brass Pipe: ASTM B43.
 - 2. Fittings: ASTM B62.
 - 3. I.P.S. Threads.
- D. Curb Stops
 - a. In accordance with Specification 02630.
- E. Curb Rods & Boxes (1-1/4 Inch & 2 Inch)
 - 1. In accordance with Specification 02630.
- F. Couplings
 - 1. Manufacturers – Permanent Manual Air Releases (1 Inch) and Blow-Offs (2 inch)
 - a. In accordance with Specification 02630.
- G. Caps
 - 1. Manufacturers – Permanent Manual Air Releases (1 Inch)
 - a. A.Y. McDonald: 74754Q with MIP plug.
 - b. Ford: C14-44-Q-NL with CSP-4-I-NL or C14-77-Q-NL with CSP-7-I-NL.
 - c. Mueller: H-15451N with H-10035N brass plug.
 - 2. For Blow Offs (2 Inch) use a brass cap with female I.P.S. threads.

H. M.J. Plugs and Tapped Tees

1. In accordance with Section 02610.

I. Tapped Tees – Blow-Offs (2 Inch)

1. Manufacturers

- a. McWane Group (Tyler, Union and Clow): Tapped Tee.

2.06 Automatic Air Releases

A. Automatic Air Release Valve (Small Orifice)

1. Standard: AWWA C512 – Air Release, Air Vacuum and Combination Air Valves for Waterworks Service.
2. Working Pressure: 150 psi, unless noted.
3. Body/Cover material: ASTM A126, Class B, gray/cast iron or ASTM A536, Grade 65-45-12, ductile iron.
4. Float, Trim & Lever: Stainless steel.
5. Valve seats: Elastomeric materials.
6. Body Inlet/Cover Outlet: Threaded.
7. Valve (Inlet) & Orifice Size: As indicated on the Approved Plans.
8. Test Pressure:
 - a. Shell – Minimum of 1.5 times the working pressure.
 - b. Seat- Zero leakage at 1.5 times the working pressure.
 - c. Float – Minimum of 1,000 psi.
9. Interior / Exterior Coating: Epoxy.
10. Manufacturers:
 - a. Val-Matic Corporation.
 - b. GA Industries: DUOJET®.

B. Corporations

1. In accordance with Specification 02630 and as shown on the Approved Plans.

C. Brass (Bronze) Pipe and Fittings

1. In accordance with Specification 02630 and as shown on the Approved Plans.

D. Vault & Other Materials

1. As specified in the pertinent sections of the Approved Plans and Specifications.

PART 3 Execution

3.01 Hydrants

- A. Request final field location of the proposed hydrant from Engineer just before installation.
- B. Install only anchor pipe and mechanical joint fittings from hydrant tee to hydrant in order to provide a mechanically restrained hydrant branch.
- C. For blow-off hydrants, rotate hydrant anchor tee outlet 45 degrees below the horizontal axis of the water main. Install a 45 degree mechanical joint bend on the hydrant tee.
- D. Maintain 24 inches minimum separation between guard valve and hydrant.
- E. Install hydrant vertical and plumb with the casting ring or mark (located just below the breakaway flange on the hydrant barrel) at grade. When there is no casting ring or mark, install hydrant with breakaway flange 2-1/2 inches above grade.
- F. Install an 8" x 16" x 8" solid concrete building block and, as necessary, smaller solid concrete blocks between hydrant base and undisturbed soil at trench bottom.
- G. Install No. 1 washed stone (Type 7 Select Fill) at bottom of the excavation along the entire width and length of trench and to the base of the guard valve box as shown on the Approved Plans. Install polyethylene encasement on top of Select Fill.
- H. Install hydrant extensions on hydrants when the distance between the centerline of the 4-1/2 inch nozzle and finished grade (the "nozzle height") is less than 18 inches. Install appropriate hydrant extension to ensure that the "nozzle height" is not greater than 24 inches.
- I. Remove all nozzle cap chains.
- J. When installation and clean up are complete, remove all loose scale and foreign matter on the hydrant and paint with one coat of paint.

- K. Plug hydrant weep holes when ground water is encountered within 7 feet of finished grade.

3.02 Couplings

- A. Install in accordance with the manufacturer's instructions.
- B. Wrap coupling with polyethylene tubing and secure in accordance with Specification 02610.

3.03 Permanent Manual Air Releases.

- A. Install corporation on top of water main.
- B. Install as shown on Approved Plans.

3.04 Blow-Offs

- A. Install taps for blow-offs in the lower half of water main at a 45 degree angle with the horizontal axis of the main. On dead end mains, install tap 1.5' from end of pipe.
- B. Install as shown on Approved Plans.

3.05 Automatic Air Releases

- A. Install corporation on top of water main.
- B. Install as shown on Approved Plans.

3.06 Final Adjustments

- A. Adjust all hydrants, valve boxes, curb boxes, manhole covers, and other facilities to finished grade.

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SECTION 02660

WATER VALVES

PART 1 General

1.01 Section Includes

- A. Specifications for and installation of buried service main line and tapping valves

1.02 Related Sections

- A. Section 02600 – Pipe Installation
- B. Section 02610 – Ductile Iron Pipe
- C. Section 02650 – Water Main Connections
- D. Section 02655 – Water System Appurtenances

1.03 References

- A. ANSI/AWWA C110 – Ductile Iron and Gray Iron Fittings, 3 Inch through 48 Inch for Water and Other Liquids.
- B. ANSI/AWWA C111 – Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
- C. ANSI/AWWA C500 – Metal Seated Gate Valves for Water Supply Service.
- D. ANSI/AWWA C504 – Rubber Seated Butterfly Valves.
- E. ANSI/AWWA C509 – Resilient Seated Gate Valves, 3 Inch through 48 Inch NPS, for Water and Sewage Systems.
- F. ANSI/AWWA C515 – Reduced Wall, Resilient Seated Gate Valves for Water Supply Service.
- G. ANSI/AWWA C550 – Standard for Protective Epoxy Interior Coatings for Valves and Hydrants.

1.04 Submittals

- A. Product Data: Provide data on valves and accessories.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 Delivery, Storage and Handling

- A. Deliver and store valves, 16 inch and larger, in shipping containers with labeling in place.

PART 2 Products

2.01 General Material Requirements

- A. All valves shall be produced in the United States, its territories or possessions.
- B. All valves shall be NSF 61 certified for contact with drinking water.

2.02 Resilient-Seated Gate Valves, 3 Inch through 30 Inch Diameter (Including Tapping Valves)

- A. Valves 4" – 12": ANSI/AWWA C509 – Including factory production testing, except for rated working pressure.
- B. Valves 14" – 30": ANSI/AWWA C515 – Including factory production testing, except for rated working pressure.
- C. 250 psi rated working pressure
- D. Valves 16" and larger must be horizontal with bevel gearing unless otherwise noted.
- E. Opens: Counterclockwise direction (left), except all valves in the Town of Henrietta shall be clockwise direction of opening and valves 12 inch and smaller installed in the Town of Webster shall be clockwise direction of opening.
- F. Operator/Stem: Buried service, non-rising stem, 2" square operating nut, double o-ring stem seal.
- G. ANSI/AWWA C111, Mechanical joint ends except for tapping valves which shall be mechanical joint by tapping flange. Tapping flange shall have a raised ring to seat properly on tapping sleeve.
- H. Body/Bonnet Bolts: 304 stainless steel.
- I. MJ Bolts: High-strength, low-alloy steel T-bolts; blue fluoropolymer-coated or polytetrafluoroethylene-coated.
- J. Tapping Flange Bolts: 304 stainless steel.
- K. Interior / Exterior Coating: Fusion-bonded epoxy.
- L. Manufacturers

1. Clow
 - a. MJ x MJ, 4" – 12": Model 2639.
 - b. MJ x MJ, 14" – 30": Model 2638.
 - c. MJ x Tapping Flange, 4" – 12": Model 2639.
 - d. MJ x Tapping Flange, 14" – 30": Model 2638.
2. Mueller
 - a. MJ x MJ, 4" – 12": Model A-2362-20.
 - b. MJ x MJ, 14" – 30": Model A-2361-20.
 - c. MJ x Tapping Flange, 4" – 12": Model T-2362-16.
 - d. MJ x Tapping Flange, 14" – 30": Model T-2361-16.
3. U.S. Pipe
 - a. MJ x MJ, 4" – 12": Model A-USP2-20.
 - b. MJ x MJ, 14" – 30": Model A-USP1 – 20.
 - c. MJ x Tapping Flange, 4" – 12": Model T-USP2-16.
 - d. MJ x Tapping Flange, 14" – 30": Model T-USP1-16.
4. Kennedy
 - a. MJ x MJ, 4" – 12": Model 8571SS.
 - b. MJ x MJ, 14" – 20": Model 7571SS.
 - c. MJ x Tapping Flange, 4" – 12": Model 8950SS.
 - d. MJ x Tapping Flange, 14" – 20": Model 7950SS.
5. American
 - a. MJ x MJ, 14" – 24": Series 2500.

2.03 Rubber Seated Butterfly Valves for Buried Service

- A. ANSI/AWWA C504, Class 150A, 150B, 250A, or 250B as specified, including factory testing.
- B. 150 psi or 250 psi rated working pressure, as specified.
- C. Opens: Counterclockwise direction (left), except all valves in the Town of Henrietta shall be clockwise direction of opening and valves 12 inch and smaller installed in the Town of Webster shall be clockwise direction of opening.
- D. Operator: Buried service, non-rising stem, and 2" square operating nut.
- E. Shaft: ASTM A276 Type 304 or ASTM A564 Type 630 stainless steel.
- F. Joints: ANSI/AWWA C111 for MJ x MJ, ANSI/AWWA C207, ANSI B16.1 Class 125 or Class 250 for flanged x flanged, as specified.
- G. MJ Bolts: High-strength, low-alloy steel T-bolts; blue fluoropolymer-coated or polytetrafluoroethylene-coated.
- H. Flange Bolts: 304 stainless steel.
- I. Interior/Exterior Coating: Fusion-bonded epoxy.
- J. Manufacturers
 - 1. Henry Pratt Company: HP250™.
 - 2. Val-Matic: VM-2000.
 - 3. Mueller: Lineseal XP, Lineseal XP II.

2.04 Extension Stems

- A. As provided by MCWA.

2.05 Valve Boxes

- A. 5-1/4 inch diameter, screw-type; locks into base section.
- B. Coating: Petroleum asphaltic material.
- C. "WATER" cast into top.
- D. Sections shall be interchangeable with old Buffalo Foundry boxes, Style #5001.

- E. No base used on butterfly valves.
- F. Manufacturers – Gate and Tapping Valve Boxes
 - 1. Bibby-Ste-Croix (Complete) (non-USA-produced):
 - a. V616 #A, V617 #B, V618 #C or V619 #CC.
 - 2. Bibby-Ste-Croix (Parts) (non-USA- produced):
 - a. Base: #6 7341.
 - b. Mid Section: 7345 #59 or V817 #61.
 - c. Top Section: V733, V734 or V735.
 - d. Risers: V829, V831, V832 or V833.
 - e. Covers: V878.
 - 3. Bingham & Taylor (Complete):
 - a. Series Figure 4906 (AA-E)
 - 4. Bingham & Taylor (Parts):
 - a. Base: #6 Round Base.
 - b. Mid-Section: Figure 4905-X (18, 20, 21 or 22).
 - c. Top Section: Series Figure 4906.
 - d. Risers: Series Figure 6016-B.
 - e. Covers: Figure 4905-L1.5.
 - 4. Bingham & Taylor (Replacement Parts):
 - a. Top Section: #54, #55, #56 screw type.
 - b. Middle: #62 screw type, #64 - #61 Screw Ex.
 - 5. EJ, USA (Complete):
 - a. Valve Box Complete: 85605061, 85603343, 85603950, 85604555.

6. EJ, USA (Parts):
 - a. Base: #6 Base, 85605006
 - b. Mid-Section: 36B, 85606036
 - c. Top Section: 16T, 85507016
 - d. Cover: 06800001 (Water)
7. Tyler Union (Complete):
 - a. Valve Box Complete: Cast Iron 3 piece, 6860 Screw Type (AA-G)
8. Tyler Union (Parts):
 - a. Base: #6 base, 145660
 - b. Mid-Section: #58 screw-type, 145141 or #59 screw-type, 1451158
 - c. Top Section: 6860 AA-G
 - d. Risers: 5-1/4 Slip-In: 533641, 533689, 533696, 533702
 - e. Cover: 145325, WATER

2.06 Cement Block

- A. Solid, 4" x 8" x 16"

PART 3 Execution

3.01 Installation

- A. Install valve on cement block support so that valve is supported independently of pipeline.
- B. Install valve in accordance with manufacturer's recommendations.
- C. Place and compact Type 7 Select Fill around valve up to base of valve box. Install polyethylene encasement on top of Select Fill.
- D. Center and plumb valve box over operating nut. Set box cover flush with finished grade.
- E. Install valve stem extensions when required.

1. Install extension stems on valves when the distance between the valve operating nut and finished grade is greater than 5-1/2 feet.
2. Maintain a distance between 5-1/2 feet and 3 feet from top of extension stem and finished grade.
3. Field cut fiberglass tubing to required length.
4. Apply silicone to inner groove of end units and install end units on tubing.
5. Apply silicone to lower end unit and install on valve nut.

~ END OF SECTION~

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SECTION 02670

BORES

PART 1 General

1.01 Section Includes

- A. Casing Pipe Installation by Bore Method
- B. Casing Pipe Installation by Open-Cut Method
- C. Bore Without Casing Pipe
- D. Tunneling

1.02 Related Sections

- A. Section 02225 – Trenching
- B. Section 02227 – Backfilling
- C. Section 02229 – Rock Removal

1.03 References

A.

Nominal Casing Diameters	ASTM Standard Specifications
4" through 92"	A-139 "Electric-Fusion (Arc) Welded Steel Pipe" (Factory hydrostatic tests are not required.)
4" through 26"	A-53 "Type-E Electric Resistance Welded" (Factory hydrostatic tests are not required.)

1.04 Qualifications

- A. Boring Firm: Company specializing in performing the work of this section with minimum 3 completed installations and 2 years documented experience.

PART 2 Products

2.01 Materials

- A. Welded steel casing pipe with 3/8" thick walls.

- B. Install only new pipe that has smooth surfaces which are uniform and free of bulges, dents or warping throughout entire length. Furnish finished lengths of pipe with beveled-cut ends to facilitate proper welding of transverse joints.
- C. Furnish casing pipe that has been joined together circumferentially, either in shop or in the field, by the continuous butt welding method, performed in accordance with procedures, required materials and equipment specified by the American Welding Society. Utilize only experienced welders, qualified in accordance with the requirements of the latest edition of "Standard Qualification Procedure" issued by the American Welding Society.
- D. Shop coat all surfaces (exterior and interior) of the pipe (except for a 1" wide circumferential band at ends of pipe lengths which are to be jointed by field welding) with one coat of Carboline Bitumastic 300M or Tnemec Series 46-465 H.B. Tnemecol. Remove all scale and rust with a wire brush. Wipe clean and dry all surfaces prior to painting. Clean greasy or oily surfaces with benzene or mineral spirits. Paint field weld areas with one coat of bitumastic.
- E. Casing spacers constructed of 14 gauge carbon steel (with thermoplastic powder coating) or stainless steel with PVC or EPDM liners, or high-density polyethylene. Liners are not required for high-density polyethylene casing spacers. Runners constructed of UHMW polymer, glass reinforced plastic, or high-density polyethylene spaced equally around the circumference to maintain bell clearance on all sides. Runners to be equal length to assure water main is centered in casing pipe.
 - 1. Manufacturers:
 - a. Cascade: CCS
 - b. PSI: A86-2
 - c. Advance Products and Systems, LLC: SIM
- F. Type 5 Select Fill.
- G. A larger size casing may be utilized for convenience or ease of construction, if approved by the Engineer and permitted by owner of highway, including any additional requirements which may be imposed by said owner. Use of a larger size casing will not result in additional costs to the Authority.

PART 3 Execution

3.01 Preparation

- A. Identify required lines, levels, contours, and datum.

- B. Lay out necessary excavations and tunnel or bore locations to determine clearances or conflicts with existing structures. Determine outer boundaries of available work area as defined by either easements or rights of way.
- C. Protect structures near the bore or tunneling work from damage.
- D. Relocate utilities which conflict the bore pit excavations.
- E. Install safety fence around bore pit excavations which remain open beyond the work day.

Construct fence with a single row of railroad ties laid on the ground around the perimeter of the excavation with fence posts attached at intervals no greater than 8 feet. Fasten 4 foot high orange plastic safety fence to the posts.

Maintain the fence until the bore pit excavation has been completely backfilled.

- F. Verify in accordance with New York State Industrial Code Rule 753 or as directed by each utility owner that existing utilities will not be hit or damaged by bore.
- G. Install concrete highway barriers along the roadsides of the bore pit and as shown on the Approved Plans.
- H. Place pipe onto ground within right of way or easements or other approved locations by means of machinery using slings or other approved methods. Do not dump pipe from trucks.

3.02 Casing Pipe Installations by Bore Method

- A. Unless approved by the Engineer, all bores are to be continuous.
- B. Install casing pipe by boring and jacking. Prevent unsupported excavation ahead of casing pipe. Install mechanical devices in front of casing pipe that will positively prevent auger and cutting head from leading casing pipe.
- C. Bore with an auger and cutting head arrangement that are capable of being removed from within casing in the event an obstruction is encountered.
- D. Do not allow excavation by cutting head to exceed outside diameter of casing pipe by more than 1/2". When voids occur or bored hole diameter is greater than outside diameter of casing pipe by more than 1", completely fill voids with Type 5 Select Fill.
- E. Select a cutting head suitable for soil being bored and capable of preventing free flow of soft or poor material.
- F. Weld entire circumference of each joint of casing pipe as each section is installed.

- G. Install restrained joint ductile iron water main by joining and sliding ahead each pipe length by length into casing. Furnish all necessary casing spacers, shims, concrete leveling courses, guide tracks, tools and other equipment which are required to place pipe into casing true to grade and line. Adequately support water main with casing spacers installed within casing to prevent any possible deflection or damage during and after installation. Water main shall be inspected for alignment and grade. Restrained joint water main shall extend a minimum of 5 feet beyond each end of casing.
- H. Install in accordance with manufacturers assembly and installation instructions. Confirm the number of casing spacers installed is adequate based on manufacturer's allowable max load.
- I. When water main has been successfully installed in casing pipe and pressure tested, fill space between outside of water main and casing pipe with Type 5 Select Fill. Pump Select Fill into casing space from one end of casing. Pump until Select Fill is evident at other end of casing and all visible voids are filled.
- J. Use of water or other liquids to facilitate casing installation and spoil removal is prohibited.

3.03 Casing Pipe Installation by Open Cut Method

- A. Install pipe as per Section 3.02 by open cutting instead of boring.

3.04 Boring Without Casing or Tunneling

- A. Equally spilt length of bore from the center of each utility pole, tree, planting or structure to be bored or tunneled.
- B. Maintain the minimum diameter and excavation required for insertion of water pipeline.
- C. Do not ram pipe or casing pipe instead of boring.
- D. Place Type 5 Select Fill in all voids between water pipeline and bore wall. Fill voids from one end until select fill is evident at the other end.
- E. If bore cannot be completed, the proposed bore can be attempted by tunneling with an excavating machine, if approved by the Engineer.

~ END OF SECTION ~

SECTION 02671

HORIZONTAL DIRECTIONAL DRILLING

PART 1 General

1.01 Section Includes

- A. Horizontal directional drilling (HDD) method of installation for restrained joint ductile iron pipe and for HDPE pipe used as casing.

1.02 Related Sections

- A. Section 02225 – Trenching
- B. Section 02227 – Backfilling
- C. Section 02230 – Select Fill
- D. Section 02229 – Rock Removal
- E. Section 02600 – Pipe Installation
- F. Section 02610 – Ductile Iron Pipe
- G. Section 02672 – High Density Polyethylene Pipe (HDPE) for casing
- H. Section 02675 – Pressure Testing, Flushing, Disinfecting, and Health Sampling of Water Mains
- I. Section 02700 – Concrete Thrust Blocks

1.03 References

- A. ASTM F 1962-05 – Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles Including River Crossings.
- B. ANSI/AWWA C104 – Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water.
- C. ANSI/AWWA C105 – Polyethylene Encasement for Ductile Iron Pipe Systems.
- D. ANSI/AWWA C110 – Ductile Iron and Gray Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids.
- E. ANSI/AWWA C111 – Rubber Gasket Joints for Ductile Iron Pipe and Fittings.
- F. ANSI/AWWA C150 – Thickness Design of Ductile Iron Pipe.

- G. ANSI/AWWA C151 – Ductile Iron Pipe, Centrifugally Cast, for Water.
- H. ANSI/AWWA C153 – Ductile Iron Compact Fittings for Water Service.
- I. ANSI/AWWA C600 – Installation of Ductile Iron Water Mains and Their Appurtenances.

1.04 Submittals

- A. Provide work plan data on pipe materials, fittings, accessories, grout and drilling fluids.
- B. Provide equipment list including make and model number and specifications (catalog cuts) of all major equipment proposed for use on the project. The Contractor is responsible for the final determination of the drill rig size based on the length and depth of the actual runs, the subsurface conditions expected, etc.

1.05 Qualifications

- A. HDD Contractor: Company specializing in performing the work of this Section with minimum 5 completed installations and 2 years documented experience. Documentation shall include references with name of owner, owner's representative, phone numbers, length of bore, diameter of bore, and project location.

PART 2

2.01 General Material Requirements

- A. All pipe fittings, grout and drilling fluids shall be NSF 61 certified for contact with drinking water.
- B. Pipe shall conform with Section 02610.

PART 3 Execution

3.01 Preparation

- A. Identify required lines, levels, contours, and datum.
- B. Determine locations and depths of existing utilities.
- C. Layout necessary excavations and entry and exit point pit locations to determine clearances or conflicts with existing structures. Determine outer boundaries of available work area as defined by either easements or rights-of-way. Work area shall not encroach upon private property or wetlands, or interfere with existing structures or utilities.

- D. Protect structures and existing utilities near the drilling work from damage.
- E. Relocate utilities which conflict with entry or exit pit excavations
- F. Verify in accordance with New York State Industrial Code Rule 753 or as directed by each utility owner that existing utilities will not be hit or damaged by bore.
- G. Install safety fence around bore pit excavations which remain open beyond the work day.

Construct fence with a single row of railroad ties laid on the ground around the perimeter of pit excavation with fence posts attached at intervals no greater than 8 feet. Fasten 4 foot high orange plastic safety fence to posts.

Maintain fence until bore pit excavations have been completely backfilled.

- H. Install temporary concrete barriers along the roadsides of pits and as shown on the Approved Plans.
- I. Place pipe onto ground within right-of-way or easement or other approved locations by means of machinery using slings or other methods. Do not dump pipe from trucks.

3.02 Installation – Restrained Joint Ductile Iron Pipe

- A. Use drilling equipment compatible with thrust and torque required for drilling, reaming and pulling back operation.
- B. Install water mains as shown on Approved Plans.
- C. Install only restrained joint pipe by HDD.
- D. Maintain minimum depth of cover and separation from existing utilities as specified in Section 02600 – Pipeline Installation.
- E. Limit longitudinal pull on water main not to exceed 90% of the maximum pulling force specified by the pipe manufacturer. Continuously monitor longitudinal pulling forces during pipe pull back.
- F. The vertical alignment, including alignment during installation, shall not exceed manufacturer's maximum allowable pipe deflection.
- G. Direct pilot bore drilling operation using steering and tracking systems capable of producing required alignment. Provide access for Engineer at all times to measuring or gauging devices used for HDD, including drilling logs maintained by Contractor. Track and confirm pilot bore path at least once every 15 feet during boring operations. Continuously track and confirm pilot bore path in critical locations such as bends and in the vicinity of obstacles or utilities. In areas with pockets of material or other obstacles which may divert the drill head, take

measurements whenever contact with such obstacles is expected. Immediately correct all deviations from planned bore path.

- H. Maintain a record of actual as-built installation path, including plan and profile views and vertical and horizontal location. Provide Engineer with a table showing pipe location and depth at 10-foot intervals at the conclusion of each working day. Within one day of completion of HDD, provide Engineer with an as-built set of plans.
- I. Supply water for mixing drilling fluid. Supply portable mud tanks or construct temporary bore gel pits to contain any excess drill fluids during construction. Contain drilling fluids on site and dispose of in accordance with all applicable regulations. Prevent drilling fluid wastes from discharging into any waterways or storm sewer systems.
- J. When abandoning drill hole before completion of pipe installation, submit a work procedure and plan for sealing and re-drilling drill hole to Engineer for approval. Cost for abandonment and re-drilling drill hole shall be at Contractor's expense.
- K. Pre-ream, as necessary, to establish minimum diameter bore for pullback of ductile iron pipe.
- L. Assemble restrained joint ductile iron pipe. Install polyethylene encasement as specified in Section 02610. Secure encasement as necessary to maintain on pipe during installation.
- M. Pull pipe from spigot end only.
- N. Fill the annulus of the hole surrounding ductile iron pipe with Type 5 Select Fill during pullback operation.
- O. Restore entry and exit pits.

3.03 Installation – HDPE Casing Pipe

- A. Use drilling equipment compatible with thrust and torque required for drilling, reaming and pulling back operation.
- B. Install casing pipe as shown on Approved Plans.
- C. Install only butt-fused HDPE pipe by HDD.
- D. Maintain minimum depth of cover and separation from existing utilities as specified in Section 02600 – Pipeline Installation.
- E. Limit longitudinal pull on pipe not to exceed 90% of the maximum pulling force specified by the pipe manufacturer. Continuously monitor longitudinal pulling forces during pipe pull back.

- F. The vertical alignment, including alignment during installation, shall not exceed manufacturer's maximum allowable pipe deflection.
- G. Direct pilot bore drilling operation using steering and tracking systems capable of producing required alignment. Provide access for Engineer at all times to measuring or gauging devices used for HDD, including drilling logs maintained by Contractor. Track and confirm pilot bore path at least once every 15 feet during boring operations. Continuously track and confirm pilot bore path in critical locations such as bends and in the vicinity of obstacles or utilities. In areas with pockets of material or other obstacles which may divert the drill head, take measurements whenever contact with such obstacles is expected. Immediately correct all deviations from planned bore path.
- H. Maintain a record of actual as-built installation path, including plan and profile views and vertical and horizontal location. Provide Engineer with a table showing pipe location and depth at 10-foot intervals at the conclusion of each working day. Within one day of completion of HDD, provide Engineer with an as-built set of plans.
- I. Supply water for mixing drilling fluid. Supply portable mud tanks or construct temporary bore gel pits to contain any excess drill fluids during construction. Contain drilling fluids on site and dispose of in accordance with all applicable regulations. Prevent drilling fluid wastes from discharging into any waterways or storm sewer systems.
- J. When abandoning drill hole before completion of pipe installation, submit a work procedure and plan for sealing and re-drilling drill hole to Engineer for acceptance. Cost for abandonment and re-drilling drill hole shall be at Contractor's expense.
- K. Pre-ream, as necessary, to establish minimum diameter bore for pullback of HDPE pipe.
- L. Assemble casing pipe by butt-fusing joints and fittings in accordance with the manufacturer's recommendations and AWWA C906.
- M. Pull HDPE casing pipe in accordance with the manufacturer's instructions.
- N. Fill the annulus of the hole surrounding the HDPE casing pipe with Type 5 Select Fill during pullback operation.
- O. Install restrained joint ductile iron water main in HDPE casing pipe by joining and sliding ahead each pipe length by length into casing. Furnish all necessary casing spacers, shims, concrete leveling courses, guide tracks, tools and other equipment which are required to place pipe into casing true to grade line. Adequately support water main with casing spacers installed within casing to prevent any possible deflection or damage during and after installation. Water main shall be inspected for alignment and grade.
- P. Install casing spacers in accordance with manufacturer's assembly and installation instructions. Confirm the number of casing spacers installed is adequate based on manufacturer's allowable max load.

- Q. Place Type 5 Select Fill in all voids between water main and HDPE casing pipe wall. Fill voids from one end until select fill is evident at the other end.

- R. Restore entry and exit pits.

~ END OF SECTION ~

SECTION 02672

HIGH DENSITY POLYETHYLENE (HDPE) PIPE FOR CASING

PART 1 General

1.01 Section Includes

- A. High density polyethylene (HDPE) pipe for casing.

1.02 Related Sections

- A. Section 02225 – Trenching / Excavating
- B. Section 02227 – Backfilling
- C. Section 02230 – Select Fill
- D. Section 02671 – Horizontal Directional Drilling (HDD)
- E. Section 02700 – Concrete Thrust Blocks

1.03 References

- A. ANSI / AWWA C906 – Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4" (100mm) through 63" (1575mm) for Water Distribution and Transmission.
- B. ASTM D2657 – Standard Practice for Heat Joining Polyolefin Pipe and Fittings.
- C. ASTM D2683 – Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter – Controlled Polyethylene Pipe and Tubing.
- D. ASTM D3261 – Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
- E. ASTM D3350 – Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.
- F. ASTM F1055 – Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.

1.04 Submittals

- A. Product Data: Provide data on pipe materials, pipe fittings and accessories.

- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

PART 2 Products

2.01 General Material Requirements

- A. All materials must be produced in the United States, its territories or possessions.
- B. All materials in contact with potable water shall be NSF-61 Certified.

2.02 HDPE Pipe and Fittings

- A. Pipe Specifications
 - 1. Material: PE 4710 Polyethylene.
 - 2. Pipe / Fittings: ANSI / AWWA C906.
 - 3. Pipe Joints
 - a. Butt Fused.
 - 4. Wall Thickness: DR-13.5, 160 psi pressure rating.
 - 5. Outside Diameter: Ductile iron pipe size.
 - 6. Manufacturers:
 - a. Pipe: Plexco

PART 3 Execution

3.01 Installation

- A. Install pipe in accordance with Section 02671.
- B. Examine all pipe prior to installation for defects and damage. Immediately remove from site all pipes which are known to be defective or damaged.
- C. Install casing pipe to a depth that will result in a 6 foot minimum elevation difference between the top of the proposed casing pipe and the centerline of the road.

- D. Route pipe as shown on the Approved Plans and as required by actual location of utilities and structures. Verify utility depths in advance.
- E. Install pipe in accordance with the manufacturer's instructions.
- F. Joints shall be assembled using butt fusion method.
- G. Assemble butt-fused joints and fittings in accordance with the manufacturer's recommendations.

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SECTION 02675

PRESSURE TESTING, FLUSHING, DISINFECTING & HEALTH SAMPLING OF WATER MAINS

PART 1 General

1.01 Section Includes

- A. Pressure Testing
- B. Flushing
- C. Disinfecting and Health Sampling
- D. Dechlorinating

1.02 Related Sections

- A. Section 02600 – Pipe Installation

1.03 References

- A. ANSI/AWWA B300 – Sodium Hypochlorite.
- B. ANSI/AWWA C651 – Standards for Disinfecting Water Mains.

1.04 Submittals

- A. Shop Drawing: Provide data on method of dechlorination.

PART 2 Products

2.01 General Material Requirements

- A. All materials in contact with potable water shall be NSF-61 certified.
- B. All chemicals used in the potable water system shall be NSF-60 certified.

2.02 Disinfection Chemicals

- A. ANSI/AWWA B300 – Sodium Hypochlorite

2.03 Dechlorination Chemicals

- A. Sodium thiosulfate.

PART 3 Execution

3.01 Execution of the Pressure Test

- A. Install and brace end plugs or caps as necessary.
- B. Pressure test water mains from main line valve to main line valve, tapping valve, plug or as otherwise specified. Open all hydrant guard valves and pressure test against hydrant valve.
- C. Fill test section of pipe with water from the adjacent public water supply, and remove all air from test section.
- D. Maintain test section of pipe full of water for a period of 24 hours prior to test.
- E. Use pump to raise the water pressure, based on the elevation of the highest point of test section, to a minimum pressure of 150 psi. Use a 300 psi maximum test gauge to measure the pressure.
- F. Maintain test pressure for a period of one hour without additional pumping or addition of water.
- G. Repair and re-test all sections of pipe that fail pressure test.

3.02 Execution of Flushing

- A. Do not flush any section of main until completion of a successful pressure test.
- B. Provide 24 hours notice to the Authority prior to flushing any section of main. The Authority shall review and approve both time and rate of flushing.
- C. The Authority shall operate all prior existing valves.
- D. Maintain a velocity of 3 feet per second (fps) in section being flushed. Provide outlets as required to achieve 3 fps:

NUMBER OF FLUSHING OUTLETS REQUIRED TO PROVIDE 3 FPS FLOW					
Use either taps or hydrant nozzles					
Pipe Dia.	Tap Size			Hydrant Nozzle Size	
(Inches)	1"	1-1/2"	2"	2-1/2"	4-1/2"
4	1			1	1
6		1		1	1
8		2		1	1
10		3	2	1	1
12			3	2	1
14			4	2	1
16			5	2	1

- E. Flush a minimum water quantity of 3 pipe volumes for each section of main.
- F. When foreign material, including trench/ground water, enters pipe during construction, perform additional cleaning measures, such as pigging, as directed by the Engineer.

3.03 Execution of Disinfecting and Health Sampling

- A. Do not disinfect a section of pipe until successful completion of pressure testing and flushing.
- B. Disinfect and health sample in accordance with AWWA C651, using sodium hypochlorite or calcium hypochlorite. Disinfect all sections of pipe that are 20 feet or longer using the continuous-feed chlorination, retention and health sampling method.
- C. Apply chlorine solution by means of a solution feed device at the water supply point for test section. Proportion chlorine solution flow rate to rate of water entering pipe or structure such that resulting free chlorine residual is not less than 50 parts per million (PPM).
- D. Retain chlorinated water in pipe or structure at least 24 hours, unless otherwise directed. Operate all valves and hydrants within disinfection section during retention period except for valves isolating disinfection section from the potable water system.
- E. Chlorine residual shall not be less than 25 PPM (mg/L) at any point in pipe or structure at the end of retention period. Confirm residual by testing.
- F. After the retention period, thoroughly flush pipe or structure until water in it has a chlorine residual comparable to that of the water in the adjacent public water supply system. Dispose of chlorinated water from any pipe or structure such that it will not cause damage to any vegetation, fish or animal life and in accordance with any regulatory or permit requirements.
- G. Schedule health sampling of the test section(s). As a minimum, take health samples at 1000-foot intervals of water main, at the end of each test section, at the end of every branch connection that is longer than 20 feet, and as shown on the Approved Plans. When trench water enters the main during construction, and when Engineer deems warranted, take health samples at 200-foot intervals after water has stood in the main for a minimum of 16 hours. Obtain health samples in the presence of the Engineer. Flame sampling point prior to sampling. Do not use fire hydrants for sampling points.
 - 1. In Monroe and Genesee counties, schedule health sampling with the county department of health. Pay all fees associated with sampling/testing. In Ontario and Livingston counties, schedule health sampling with the Authority.
 - 2. In Monroe and Genesee counties, take one health sample per sampling location after flushing disinfection water.
 - 3. In Ontario and Livingston counties, take two samples per sampling location. Allow main to sit for a minimum of 16 hours after flushing disinfection water. Take two sets of

samples at each sampling location a minimum of 15 minutes apart while sampling taps are left running. (Sampling Option A as specified in Section 5.1.1.1 of ANSI/AWWA C651 may be used when requested by Contractor and approved in advance by the Authority.)

4. Test samples for coliform, standard heterotrophic plate count and chlorine residual, and as required by the appropriate health department.
- H. Re-flush, re-chlorinate and re-sample all sections of pipe that fail health sample tests in accordance with this section.
- I. Provide written Health Department approval to the Engineer prior to placing the test section of pipe in service or installing any services.
- J. Apply 5% sodium hypochlorite when specified and to any pipe or appurtenance installed which does not receive 24-hour disinfection contact time. Apply solution, not more than 60 or less than 30 minutes, before installation using a wide brush or spray applicator. Use this method of disinfection for final tie-in connections only when the length of main to be disinfected is less than 20 feet. Use the continuous-feed chlorination, retention, and health sampling method for all tie-ins 20 feet and longer.
- K. After passing health sample results are achieved, if repairs are made to the main, flush, disinfect and health sample again in accordance with section 4.11 of ANSI/AWA C651.
- L. Following successful flushing, pressure testing, and health sampling, abandon all temporary facilities. Abandon these facilities in accordance with Specification 02680.
- M. Backfill and restore all excavations made to abandon temporary facilities in accordance with Specification 02227.

~ END OF SECTION~

SECTION 02680

WATER SYSTEM ABANDONMENTS

PART 1 General

1.01 Section Includes

- A. Water Main Abandonments
- B. Valve Box Abandonments
- C. Hydrant Abandonments

1.02 Related Sections

- A. Section 02655 – Water System Appurtenances

PART 2 Products

2.01 General Material Requirement

- A. All end or line cap couplings shall be produced in the United States, its territories or possessions.
- B. All materials in contact with potable water shall be NSF-61 Certified.

2.02 End Caps and Plugs

- A. As per Section 02610.

2.03 Straight and End Cap Couplings

- A. Refer to Specification 02655.

2.04 End or Line Cap Couplings

- A. ANSI/AWWA C219.
- B. Working Pressure: 150 psi.
- C. Sleeves: ASTM A536, ductile iron or ASTM A36 or ASTM A53, steel.
- D. Sleeve Length: Sleeves for 16" – 30" diameter shall have a 10" minimum length and 36" – 48" diameter shall have a 16" minimum length.

- E. Follower Rings: ASTM A536, ductile iron or ASTM A36 or AISI 1020, steel.
- F. Bolts / Nuts: ANSI/AWWA C111, High-strength, low-alloy steel; blue-fluoropolymer-coated or polytetrafluoroethylene-coated.
- G. Gaskets: ANSI/AWWA C111, SBR or Nitrile (Buna-N/NBR).
- H. Coating: Fusion-bonded epoxy.
- I. Manufacturers:
 - 1. Smith Blair: #481, blind end with plug.
 - 2. Smith Blair: #482 with plug.
 - 3. JCM: #214 with plug.
 - 4. Ford: FEC, 4" – 12".
 - 5. Ford: FEC with blind end or with plug.
 - 6. Ford: FC4 Steel end cap coupling with plug, 14" – 24".
 - 7. Romac: #EC-501 with blind end.
 - 8. Romac: #EC-501.
 - 9. PowerSeal: #3551.
 - 10. PowerSeal: #3551 with blind plug.
 - 11. Hymax®: Hymax Grip® End Cap, 4" – 12" (non-USA produced).

2.05 Pressure Treated Timbers

- A. Yellow southern pine.
- B. Minimum manufacturer's guarantee of 30 years against rotting or decay.

2.06 Nipples

- A. As per Specification 02610.

2.07 Plugs for Corporation Taps

- A. No-lead brass, copper alloy CDA/UNS C89833, C89836 or C89520 in accordance with ANSI/AWWA C800 the chemical and mechanical requirements of ASTM B584.
- B. ANSI / AWWA C800.
- C. Inlet / Outlet: CC threads.
- D. Manufacturers:
 - 1. Ford: CSP-3-A-NL, CSP-4-A-NL, CSP-6-A-NL and CSP-7-A-NL.
 - 2. Mueller: H-10033N.
 - 3. A.Y. McDonald: 73206-NL.

2.08 Concrete

- A. As per Specification 02700.

2.09 Plywood

- A. Minimum Thickness: 3/4 inch.

PART 3 Execution

3.01 Preparation

- A. Coordinate abandonment of existing water system facilities with Engineer and the Authority.
- B. Abandon existing water mains on each street after new water main and its hydrants are placed in service and all services on main to be abandoned have been transferred or replaced.
- C. Coordinate with the Authority's Operations Department for shut down of existing water mains for each water main abandonment location.
- D. Have all labor, equipment, and material on site for all water main abandonment possibilities.

3.02 Water Main Abandonments

- A. Excavate at water main and locate connection to water main to be abandoned or point of abandonment.

- B. For a corporation abandonment, remove corporation or multiple corporations from water main which is to remain in service including any tapping saddles. Thread openings if necessary and install brass plugs in water main.
- C. For an abandonment of a tee connection, remove tee, tapping sleeve and valve or other connecting fitting with 3 separate pipe cuts. Cut out a minimum of 3 feet of pipe in water main which is to remain in service. Extend cuts, if necessary, along water main to remain in service so that no existing pipe joint will be within 2 feet of a coupling. Remove a maximum of 19.5' of pipe. Install a nipple and 2 straight couplings. Plug end of abandoned water main.
- D. For an in line abandonment, cut out a maximum of 3 feet of pipe at point of abandonment. Install an end cap coupling on water main to remain in service and plug water main to be abandoned. Place an adequately sized section of plywood (minimum 3/4" thick) or steel plate against water main to be abandoned in order to contain the concrete thrust block from remainder of trench along abandoned water main. Place an adequately sized, pressure-treated timber tightly between ends of the water mains. Install concrete thrust block around timber to dimensions which meet the required undisturbed soil bearing area as set forth in the Typical Thrust Block Detail.
- E. Engineer shall determine type of abandonment to be performed and its exact location for each water main abandonment.
- F. Swab disinfect pipe openings, all fittings, and appurtenances used that will be in contact with water supply after abandonment is completed as specified in Specification 02675, Article 3.03 J.
- G. After completion of each abandonment and before backfilling, place water main back in service. Repair any leaks.
- H. Backfill abandonment excavation and restore disturbed area.

3.03 Valve Box Abandonments

- A. Abandon all valves in the position directed by the Engineer.
- B. Remove entire mainline curb boxes and valve boxes only after water main they operate has been abandoned.
- C. Excavate as necessary to remove entire curb box and rod or valve box.
- D. Backfill abandonment excavation and restore disturbed area.

3.04 Hydrant Abandonments

- A. Remove hydrants only after water main they are connected to has been abandoned.

- B. Excavate to bottom of hydrant and remove by disconnecting it at its base.
- C. Deliver these hydrants to the Authority's warehouse at 475 Norris Drive, Rochester, New York.
- D. Backfill abandonment excavation and restore disturbed area.
- E. Refer to 3.03 for hydrant valve box abandonment requirements.

~ END OF SECTION ~

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SECTION 02700

CONCRETE THRUST BLOCKS

PART 1 General

1.01 Section Includes

- A. Concrete Thrust Blocks

1.02 Related Sections

- A. Section 02600 – Pipe Installation
- B. Section 02610 – Ductile Iron Pipe

1.03 Submittals

- A. Shop Drawing:
 - 1. Concrete mix design.
 - 2. Rebar.

1.04 References

- A. ASTM C31, Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field.

PART 2 Products

2.01 Concrete

- A. Twenty-eight day strength of 2,500 pounds per square inch.
- B. Transit mix from batch plant.
- C. No fly ash or other pozzolan-containing materials.
- D. Steel reinforcement shall have a minimum Grade 60 designation.

2.02 Rebar

- A. No. 6 Steel reinforcing bars.
- B. Minimum Grade 60 designation.

- C. Bend last 3 inches of reinforcing bars 90 degrees with 1/2" radius bends.

2.03 Bond Breaker

- A. 8 mil polyethylene. Refer to Section 02610.

PART 3 Execution

3.01 Concrete Thrust Blocks

- A. Install concrete thrust blocks for all tees, tapping sleeves, reducers, plugs, caps, bends and other locations as shown. Install vertical-down thrust blocks on fittings which change the vertical alignment of the pipe in the downward direction and on horizontal fittings which are partially rotated in the downward direction. Install horizontal thrust blocks on all fittings with no change in vertical alignment. Install vertical-up thrust blocks on all fittings which change the vertical alignment of the pipe in the upward direction.
- B. Install horizontal and vertical-up thrust blocks with bearing surface directly against undisturbed soil. Install concrete between fitting and undisturbed soil. Form and install block so that its mass and the area bearing on the pipe and on the ground is as shown on the Approved Plans. When block cannot be installed against undisturbed soil, install Select Fill between bearing surface and undisturbed soil. Compact Select Fill to 90% maximum modified Proctor density. Form and install block so that block height is equal to or less than 1/2 the total depth to the bottom of the block, but not less than the pipe diameter. Form and install block such that width is between 1 and 2 times the height.
- C. Install vertical-down blocks so that a minimum 1/3 of block bears on undisturbed soil below the fittings. Install concrete between fittings and undisturbed soil. The mass of the block and/or the area bearing on the pipe and on the ground in each instance shall be as shown on the Approved Plans.
- D. Form thrust blocks, when possible, so that mechanical joint bolts are not covered nor access to them restricted.
- E. Install bond breaker between thrust blocks and fittings.
- F. Install concrete cradle for tapping sleeves.
- G. Obtain and prepare test cylinders (4 per concrete batch) in accordance with ASTM C31, Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field. Furnish cylinders to the Engineer for testing.
- H. Install rebar with vertical down thrust blocks.

~ END OF SECTION ~