



**SPECIAL PROVISIONS  
FOR  
WATER MAIN RELOCATON**

**Pottawattamie County  
BROS-1642(687)--8J-78**

**Effective Date  
December 19, 2023**

**THE STANDARD SPECIFICATIONS, SERIES 2023, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

**234004.01 GENERAL**

- 1.1 Furnish and install all pipe, fittings, structures, and accessories required for water main construction as shown on Plans and/or specified herein.
  - 1.1.1 Shipment and Storage: Do not telescope small pipe inside larger pipe for shipment or storage. Handle by use of appropriate slings, hoists, skids or other approved means. Dropping or rolling is not permitted. Pipe with damage to cement mortar lining will be rejected; field patching not permitted.
- 1.2 Before installation of new facilities, verify sizes, measurements, type and location of existing public or private piping and appurtenances at points of connection to the new facilities. This work shall be considered incidental to the Project.
- 1.3 Make necessary field measurements to determine piping laying lengths; work pipe into place without forcing or springing.
- 1.4 Do work in accordance with best present-day installation and construction practices and manufacturer's recommendations.
- 1.5 All water main work shall conform with the contract documents. If the Contractor wants to request changes to the water main plans or wants authorization for additional work, the Contractor shall notify the Engineer.
- 1.6 The Contractor shall do the necessary pavement removal, excavation, and trench shoring/bracing, to enable the Water Works to install the proposed valve(s), tapping valve(s), and sleeve(s) on the existing water mains.
  - 1.6.1 The Contractor shall excavate all material to a depth of approximately 1 foot to 1

foot 6 inches below the bottom of the existing main; comply with safety rules of the State and Federal governments. This Special Provision shall not relieve the Contractor from complying with appropriate safety regulations.

- 1.6.2 When unstable material is encountered in the bottom of the excavation, the Engineer may authorize the Contractor to place 1 1/2 inch clean granular material. This material will be paid for separately at the Contract unit price for Granular Bedding for Water Main, 1 1/2 inch Clean. The granular material shall not be used without authorization from the Engineer.
  - 1.6.3 The pavement removal and replacement work shall be paid for at the Contract unit prices. Thrust blocking shall be constructed by the Contractor. The excavation, backfilling, trench shoring/bracing, and thrust blocking shall be considered incidental to the Project unless a Contract item is provided.
  - 1.6.4 The Water Works will provide and install the proposed tapping valves and sleeves noted on the plans as work by the Water Works.
- 1.7 The Contractor shall notify the Water Works at least 2 full working days, excluding Saturdays, Sundays, and Holidays before the Contractor needs the Water Works to tap existing mains, tap new mains for house services or purification. After receiving passing sampling and pressure test results, the Contractor shall coordinate tapping with Water Works. Refer to 1.19 for information regarding cut and connect operations.

If for one or more of the following reasons the Water Works cannot tap the main on the date as established above, the Contractor shall reschedule a new date when the Water Works personnel are available. A minimum of 2 full working days, excluding Saturdays, Sundays, and Holidays prior notice by the Contractor will be required by the Water Works for rescheduling taps. Refer to 1.19 for information regarding shut-off notice re-distribution costs.

- 1.7.1 If the Contractor does not have the tapping site ready or it is unsafe for the Water Works personnel.
  - 1.7.2 Weather conditions will not permit work to be performed by the Contractor or Water Works.
  - 1.7.3 The Water Works reserves the right to reschedule the work for emergencies as necessary, without notice or compensation to the Contractor.
- 1.8 The material required as noted on the Plans as “temporary” shall be provided by the Contractor. The material shall include the required bolts and retainers. These items shall be installed by the Contractor at locations noted on the plans and as directed by the Engineer. The Contractor shall remove these materials as directed by the Engineer. This work including “temporary” material shall be considered incidental to the project.
- 1.9 After award of Contract, and before construction begins submit following information and drawings for Engineer's review. Resubmit for review as necessary.
- 1.9.1 Manufacturer's specifications and/or catalog data listing for the following:
    - 1.9.1.1 Restrained Joint Ductile Iron Pipe
    - 1.9.1.2 Mechanical Joint Fittings
    - 1.9.1.3 Polyethylene Encasement
    - 1.9.1.4 Gate Valves with Stainless Steel Bolts
    - 1.9.1.5 Valve Boxes – Heavy Duty

- 1.9.1.6 Oversized Solid Sleeves – Long Body
- 1.9.1.7 Insulation with Aluminum Jacket
- 1.9.1.8 Pipe Support
- 1.9.1.9 Cast-in-Place Retaining Wall & Collar
- 1.9.1.10 Retaining Wall Sleeve
- 1.9.1.11 Pipe Seal at Wall Opening

1.9.2 Such other information as Engineer may request.

- 1.10 Incorporate no materials in work until mill and/or factory test certifications, as requested by Engineer, have been furnished which show that materials comply with Specifications.
- 1.11 Any delays in obtaining materials not shown on the plans that are necessary for the construction of the new water main improvements, any delays during revision of the water alignment or any delays caused by obstructions encountered during construction, shall not result in any additional costs to the Contracting Authority or any time extensions.
- 1.12 Contractor shall not backfill fittings and other appurtenances until the Engineer has seen the completed work and recorded the location. The Engineer may require the Contractor to expose the work at the Contractor's expense, if backfilling proceeds prior to the work being recorded.
- 1.13 Contractor shall not deviate from the contract documents without prior approval from Engineer.
- 1.14 Water mains shall not be constructed without staking provided by the Engineer. Contractor shall not remove or disturb staking until authorized by the Engineer. Work done without staking or prior to replacement of staking removed by the Contractor may be subject to rejection and/or replacement at the Contractor's expense. The cost of restaking may be deducted from the cost of work completed under the Contract. Staking shall not begin before a Contract is approved and fully executed.
- 1.15 When the planned water main improvements require the shutdown of an existing in service main, the Contractor shall notify the Water Works at least 1 full working day (excluding Saturdays, Sundays and Holidays) in advance of wanting water shut-off notices delivered to affected residents and/or businesses. The distribution of shut-off notices shall only be performed by Water Works personnel. A minimum advance notice of water service shut-off of 24 hours is required for residential users and 48 hours is required for commercial and industrial users. The hours of advance notice do not include Saturdays, Sundays or Holidays.

One distribution of shut-off notices shall be provided by the Water Works for each planned service interruption. The Contractor shall complete all required work within the requested shut-off period and shall not request the distribution of shut-off notices until the Contractor's work has progressed far enough to ensure the required work will be ready to be performed in the requested shut-off time frame.

Distribution of additional shut-off notices required due to failure by the Contractor to commence and/or complete all the required work within the requested shutoff period shall be redistributed by the CBWW at a cost of \$500.00 for each redistribution. The \$500.00/Ea. charge per redistribution for that work will be deducted from the Contract payment for the water main construction. Standard notification requirements shall apply. The redistribution fee may be waived at the Water Works' discretion if weather is the only reason the work was not completed during the requested shut-off period.

## 2. PIPE MATERIALS AND COVERINGS

- 2.1 Ductile Iron Pipe (DIP): Conforming to latest edition of ANSI/AWWA C-150/A21.50 and manufactured in accordance with ANSI/AWWA C-151/A21.51.
- 2.1.1 Minimum thickness - Class 52 for 6 inch to 12 inch pipe.  
Minimum thickness Class 51 for 16 inch and larger pipe.
- 2.1.2 Mechanical, push-on and restrained joint pipe shall conform to the latest edition of ANSI/AWWA C-111/A21.11.
- 2.1.3 Restrained joint pipe, when specified on the Plans, shall be SNAP-LOK or BOLT-LOK as manufactured by Griffin Pipe Products Company or approved equal.
- 2.1.4 Joint gaskets – styrene butadiene rubber (SBR) gaskets shall be used per AWWA C-111/A21.11 unless specified otherwise on the Plans.

2.2 Pipe Lining: Cement line inside in accordance with ANSI/AWWA C-104/A21.4.

2.3 Pipe Coating: Coat outside with asphaltic coating in accordance with ANSI/AWWA C-151/A21.51. Coat inside with asphaltic coating in accordance with ANSI/AWWA C-104/A21.4.

2.4 Polyethylene Encasement: All of the proposed water main, and all portions of the existing water main exposed due to the construction of the proposed water mains shall have 8 mil (nominal) polyethylene encasement (LLDPE). This work shall conform to the current American National Standard, ANSI/AWWA C-105/A21.5 specification. The encasement shall be wrapped with a self adhesive tape suitable for direct burial at a minimum of 2 foot intervals and both sides of all joints.

Water main with aluminum jacket shall not require encasement. Water main installed in a steel casing shall not require encasement.

Any damaged polyethylene encasement around pipe or fittings shall be repaired by the Contractor, as directed by the Engineer, prior to placement in the water main trench at no additional cost. Any subsequent damage to polyethylene during construction (i.e., taps) shall be repaired by the Contractor and approved by the Engineer.

2.5 Insulation and Aluminum Jacket. All pipe insulation shall be 2 inch thick urethane or polyisocyanurate foam insulation. Insulation shall be provided in two half-shells and shall be STYROFOAM or TRYMER 2000 brand as manufactured by Dow Plastics or approved equal. R-value for installed insulation shall meet or exceed 7.50. R-value calculated as: Insulation thickness (t, inches)  $\square$  manufacturer's stated K-factor (K, thermal conductivity at 180 days and 75° F mean temperature, BTU in/hr • ft<sup>2</sup> • °F) [R = t  $\square$  K].

A factory fabricated 0.016 inch smooth aluminum alloy jacket as manufactured by Childers Products Company, Inc., or approved equal shall cover the insulation. All jacketing shall have a smooth pattern and an integrally bonded moisture barrier over the entire surface in contact with the insulation. The insulation and aluminum jacket for all bends and pipe joints shall also be factory fabricated. (Except as allowed by Engineer under special conditions.)

The aluminum jacket shall extend a minimum of 2 feet below the finish ground grade. The insulation below that elevation shall be encased in polyethylene meeting the requirements of Section 2.4 of these provisions. Joints shall be secured with stainless steel screws.

### 3. VALVES, AND VALVE BOXES

- 3.1 Gate Valves: Resilient-seated or resilient wedge, manufactured in accordance with AWWA C-509 or C-515.
- 3.1.1 Nonrising stem; "O" ring stem seal; 2 inch square operating nut; ductile iron body and bonnet, (for AWWA C-509 no cast iron) bronze mounted.
- 3.1.2 Open counter-clockwise (left).
- 3.1.3 Valve ends shall be mechanical joint unless otherwise specified.
- 3.1.4 Acceptable gate valves are the following:
- 1) Mueller A-2362-20 (valve sizes 2 inch through 12 inch: AWWA C-509)
  - 2) Mueller A-2361-20 (valve sizes 2 inch through 48 inch: AWWA C-515)
  - 3) Clow Model No. 2639; Figure F-6100
  - 4) American Flow Control Series 2500
  - 5) U.S. Pipe A-USPI-20 or A-USP2-20
  - 6) M & H Valve Company Style 7000 (valve sizes 4 inch through 12 inch: AWWA C-515); Style 4067 (valve sizes 14 inch and 16 inch)
  - 7) American AVK Series 45 (AWWA C-515); Series 25 (AWWA C-509)
  - 8) Or Equal pre-approved by the Engineer.
- 3.1.5 Valves shall have stainless steel bolts. Galvanized bolts shall not be used.
- 3.1.6 Coatings on all exposed internal or external surfaces will comply with AWWA C-550 and NSF/ANSI Standard 61.
- 3.1.7 Contractor shall provide and install a 4 inch thick solid concrete block under all valves for support. Minimum block size shall be equal to valve diameter. Pressure treated or cedar wood wedges, 1 1/2 inch nominal width, shall be provided and installed by the Contractor between the valve and block as necessary.
- 3.1.8 Joint gaskets - styrene butadiene rubber (SBR) gaskets shall be used per AWWA C-111/A21.11 unless specified otherwise on the Plans.
- 3.2 Tapping Valves and Sleeves
- 3.2.1 Tapping valves and tapping sleeves will be furnished and installed by the Water Works or their authorized representative unless shown otherwise on the plans.
- 3.2.2 Acceptable tapping valves and tapping sleeves are the following:
- 1) ROMAC SST stainless steel tapping sleeve with D.I. flange with gasket glued to flange or Mueller H-615 sleeve for mechanical joint. Mueller H-667 tapping valve.
  - 2) Clow F-5205 mechanical joint sleeve and F-5093 tapping valve.
  - 3) Power Seal type 3490 stainless steel tapping sleeve.
- 3.2.3 Concrete thrust blocks are required on all tapping valves. Thrust blocks shall be installed by the Contractor.
- 3.2.4 Contractor shall provide and install a 4 inch thick solid concrete block under all valves for support. Minimum block size shall be equal to valve diameter. Pressure treated or cedar wood wedges, 1 1/2 inch nominal width, shall be provided and installed by the Contractor between the valve and block as necessary.

3.2.5 Refer to Sections 1.7 and 1.8.

### 3.3 Valve Boxes

3.3.1 Use valve boxes for all valves unless shown otherwise on the Plans.

- 1) Valve boxes shall be Tyler Series 6860, 29U-Domestic Heavy Duty or 30U-Non-Domestic Heavy Duty, Star Model VB-0006 (Heavy Duty) Valve Box, or equal approved by the Engineer.
- 2) Cast iron, screw type; with cast iron drop cover.
- 3) Inside diameter: 5 1/4 inch.
- 4) Lid shall be labeled "Water" with raised lettering.
- 5) A No. 6 (Standard) separate full pot base shall be used.
- 6) Bottom section shall be 24 inch or 18 inch; top section shall be 26 inch or 16 inch; middle section if required shall be 24 inch. 36 inch bottom sections shall never be used. Field cutting or modifications to the valve box sections shall not be permitted.

3.3.2 If valve boxes are required to extend beyond 74 inches (three pieces) and are not noted in the Plans as "extra depth," the Water Works will provide the additional section(s). Contractor should anticipate up to 3 weeks for delivery upon approval of Water Works providing materials. No additional compensation will be provided for the Contractor's installation.

### 3.4 Polyethylene Encasement

3.4.1 All valves shall be wrapped with polyethylene. Polyethylene around MJ bolts shall be installed without piercing or damaging the polyethylene. Refer to Section 2.4.

3.5 Any product determined by the Contractor to be an "or equal" shall be submitted for approval PRIOR to the Shop Drawing submittals. Contractor shall provide relevant product information for both the "equal" and specified product with all differences marked/noted on the "equal." By submitting an "equal" for review, the Contractor states the "equal" meets or exceeds all specified requirements and is of equal or greater quality and/or manufacturing workmanship and that it is the Contractor's opinion (NOT supplier's opinion) that the "equal" product is as good as or better than the specified product. The Owner may require a product demonstration, at no cost, while considering an "equal." If an "equal" is accepted by the Owner and Engineer, the item shall be submitted as a Shop Drawing for review. "Equals" submitted as a Shop Drawing without prior acceptance will be rejected without consideration given to suitability as an "equal."

## 4. FITTINGS

4.1 Fittings for ductile iron pipe 3inch through 64 inch in diameter shall comply with latest edition of ANSI/AWWA C-110/A21.10 with a working pressure 250 psi. Ductile-iron compact fittings shall comply with latest edition of ANSI/AWWA C-153/A21.53.

4.1.1 Mechanical, push-on, and restrained joint shall conform to the latest edition of ANSI/AWWA C-111/A21.11.

4.1.2 Cement lining and asphaltic coating inside in accordance with ANSI/AWWA C-104/A21.4. Coat outside with bituminous coating in accordance with ANSI/AWWA C-153/A21.53.

4.1.3 All fittings shall have 8 mil (nominal) polyethylene encasement. This work shall conform to the current American National Standard, ANSI/AWWA C-105/A21.5 specification. Encasement shall be taped on each side of a joint, including fittings.

- 4.1.4 Joint gaskets -- styrene butadiene rubber (SBR) gaskets shall be used per AWWA C-111/A21.11 unless specified otherwise on the Plans.
  - 4.1.5 All hydrant branch tees shall be swivel joint tees unless shown otherwise on the Plans.
  - 4.1.6 A full pipe length shall be installed on each side of all elbows, bends, and offsets, unless shown or directed otherwise.
  - 4.1.7 Sleeves required to connect the proposed water main to the existing water main and to cut and plug water mains that are to remain in service shall be provided and installed by the Contractor.
  - 4.1.8 The sleeves for 4 inch through 20 inch pipe shall be Tyler/Union or Star Products Long Body Standard Solid Sleeve or approved equal for mechanical joint pipe, with current standard wall thickness. The sleeves for 4 inch through 16 inch pipe shall be Tyler/Union or Star Products Long Body Dual Purpose Solid Sleeve or approved equal for connecting mechanical joint pipe to pipe with nonstandard wall thickness and for 20 inch pipe shall be Smith-Blair 413 transition couplings or approved equal. The coupling for 4 inch through 12 inch connections to transite pipe shall be ROMAC XR501 extended range couplings, or Hymax Couplings manufactured by Total Piping Solutions, Inc., or approved equal. For connection to transite pipe larger than 12 inch, Large Diameter Hymax Couplings manufactured by Total Piping Solutions, Inc. shall be used, or approved equal.
  - 4.1.9 Contractor shall provide and install a 4 inch thick solid concrete block under all fittings and sleeves for support. Minimum block size shall be equal to the outside diameter at the widest location. Pressure treated or cedar wood wedges, 1 1/2 inch nominal width, shall be provided and installed by the Contractor between the valve and block as necessary.
  - 4.2 Polyethylene encasement shall be installed on all fittings. Polyethylene around MJ bolts shall be installed without piercing or damaging the polyethylene. Refer to Section 2.4.
  - 4.3 Shop Drawings shall be submitted for all items in this Section. Refer to Section 1.10.
5. BOLTS FOR WATER MAIN
- 5.1 Bolts required for connecting joints in piping, fittings, plugs, etc. shall be high strength, low alloy steel meeting the requirements of the current revision of ANSI C111/AWWA 21.11. Cast iron bolts shall not be used.
  - 5.2 All valves shall have stainless steel bolts. Galvanized bolts shall not be used.
6. JOINT RESTRAINT
- 6.1 Concrete Thrust Blocks
    - 6.1.1 Required where piping changes direction or deadends. Concrete thrust blocks are also required on all hydrant branch tees and tapping valves.
    - 6.1.2 Carry to undisturbed edge of trench for bearing.
    - 6.1.3 No bolts, joints or drain holes shall come into contact with the concrete thrust

block. If necessary, a sheet of 8 mil polyethylene shall be used to protect these areas before the concrete is placed. The polyethylene shall not block the drain holes.

- 6.1.4 Size and location of thrust blocking to conform to detail as shown on Plans.
- 6.1.5 Thrust blocks shall be poured in place concrete having a minimum 28 day compressive strength of 4000 psi. Submit mix design that documents the required strength as a Shop Drawing submittal. Provide the Engineer a copy of the concrete ticket at the time of installation. Do not install thrust blocks without an approved Shop Drawing for the concrete mix. Thrust blocks shall have a minimum of 3 days cure before the main is filled and flushed (subjected to pressure), unless the appurtenance being blocked also has retainer rings and approved rodding. The sides of the thrust blocks shall be formed using wood or steel to conform to the Plan details. Pre-cast concrete thrust blocks may be permitted for "cut and connect," "cut and plug," and temporary installations when specifically authorized by individual location by the Engineer. Pre-cast concrete thrust blocks shall be encased in the approved concrete mix before backfilling.

## 6.2 Retained Fittings

- 6.2.1 Provide retained or securely jointed pipe joints to prevent joint separation at all mechanical joint fittings, including sleeves, and where piping changes direction or deadends in addition to concrete thrust blocks.
- 6.2.2 Retained pipe joints for below ground installation shall include use of either retainer glands or wedge action restrainers. No additional payment shall be made for this work.
- 6.2.3 Retainer glands or wedge action restrainers shall have set screws with shear heads to prevent damage to the pipe lining. Set screws shall be the Ford Meter Box Company, Inc. Auto-Tork screws, Star Pipe Products Stargrip Series 3000 Mechanical Joint Wedge Action Restraint with Break-off Torque Control Nuts, Sigma One-Lok Wedge-Action Restraining Gland or approval equal.
- 6.2.4 Shop Drawings shall be submitted for all items in this Section. Refer to Section 1.10.

## 6.3 Tie Rods and Nuts

- 6.3.1 When noted on the plans and/or when the Water Works requests tie rods, the Water Works will provide the rodding material, and the Contractor shall cut and install the material as directed by the Engineer. The installation of this material shall be considered incidental to the Project.

## 6.4 Restrained Fittings

- 6.4.1 Restrained pipe joints shall be locked mechanical joint. "American Ductile Iron Pipe Flex Ring" Restrained Joint Fittings shall not be used.
- 6.4.2 Restrained pipe at fittings, when specified on the Plans, shall utilize BOLT-LOK Pipe spigots as manufactured by Griffin Pipe Products Company or approved equal. "American Ductile Iron Pipe MJ Couple Joint" Restrained Joint Pipe may be used with prior authorization from the Engineer. "American Ductile Iron Pipe Flex Ring" Restrained Joint Pipe and "Clow Water Systems Company Super-

Lock” Restrained Joint Pipe shall not be used.

6.4.3 Shop Drawings shall be submitted for all items in this Section. Refer to Section 1.10.

6.5 Polyethylene Encasement

6.5.1 Encase all metallic restraint materials and devices. Refer to Section 2.4.

## 7. PIPE INSTALLATION

- 7.1 When lifting polyethylene encased pipe, use a fabric type sling or a suitably padded cable, padded chain or other means to prevent damage to the polyethylene. Any damaged polyethylene shall be repaired or replaced before backfilling.
- 7.2 Lay pipe in the dry trench (no standing water) and to minimum depths shown on Plans. Polyethylene encasement shall be placed around pipe prior to lowering pipe into trench.
- 7.3 Clean pipe interior of foreign material before lowering into trench; keep clean at all times by securely closing open ends of pipe and fittings with watertight plug to prevent ingress of foreign material at all times when pipe jointing operation is not in progress. If water is in the trench, the seal shall remain in place until the trench is pumped dry.
- 7.4 Place pipe in trench in sound, undamaged condition; do not injure pipe coating or lining; do not use end hooks to install or move pipe.
- 7.5 Cut pipe in neat and workmanlike manner without damage to pipe; mechanical pipe cutters subject to approval of Engineer; bevel cut ends of push-on type pipe.
- 7.6 Before installation visually inspect for cracks, gouges, or other defects; damaged or unsound pipe shall not be used.
- 7.7 Deflect pipe joints, as shown on plans, in accordance with pipe manufacturer's recommendations.
- 7.8 Plug or cap and block all pipe ends or fittings left for future connections.
- 7.9 Uncover existing mains a sufficient time ahead of pipe laying operations to determine fittings required to make connections; make connections between existing and new water mains with sleeves and fittings as required.
- 7.10 Install pipe in accordance with best construction practices as specified in AWWA Standard C-600 and manufacturer's recommendations.
- 7.11 All newly constructed water main and appurtenance shall be backfilled prior to December 1<sup>st</sup>. All water main and appurtenances that are under construction on or after December 1<sup>st</sup> shall be protected from the elements throughout the workday and backfilled at the end of each workday.
- 7.12 In the event the project will not be completed by the Contract completion date, and work will be suspended for a winter shutdown, the Engineer may require the new partially completed water main be temporarily connected to the existing water main until work resumes in the spring. The temporary connection(s), and any other work required by the Engineer in preparation for the winter shutdown, shall be completed by the Contractor as directed by the Engineer. All labor, costs and temporary materials required to prepare the

project for a winter shutdown and resume work in the spring shall be at the Contractor's expense and shall be considered incidental to the project.

8. WATER VALVE INSTALLATION

8.1 Water Valves

- 8.1.1 Install with stems vertical and centered in box.
- 8.1.2 Check all valve bolts when installed; tighten as necessary.
- 8.1.3 Tamp the area the box will be placed on. Thoroughly tamp earth backfill as it's placed around each valve box.
- 8.1.4 Contractor shall provide and install a 4 inch thick solid concrete block under each valve. Minimum block size shall be equal to valve diameter.
- 8.1.5 Encase in polyethylene per Section 3.4. Refer to Section 2.4.
- 8.1.6 All valve boxes shall be easily accessible for operation by the Water Works through the entire project, including the winter.
- 8.1.7 All valve boxes shall set at finish grade prior to December 1<sup>st</sup>.

9. TRENCH BACKFILL

Water main trench backfill shall be per the water main details as shown on the plans. This work shall be monitored, coordinated, and tested by the Engineer.

- 9.1 Backfill trench immediately after the Engineer has recorded location of connections and appurtenances, or at the Engineers direction.
- 9.2 Allow no more than 200 feet of trench to be open at one time. Install appurtenances and backfill as work progresses.
- 9.3 Backfill with material excavated from trench except where other backfill is specified by the Engineer.
  - 9.3.1 Backfill material shall be free of large stones, large clods, organic material, rubbish, frozen, or unsuitable materials.
  - 9.3.2 Consolidate backfill material by mechanical or hydraulic compaction equipment.
  - 9.3.3 Refer to the Water Main Details, as shown on the Plans, for backfill density requirements.
- 9.4 If excavated material is excessively wet and/or density requirements cannot be obtained because of moisture content, Contractor shall cease operation until the Engineer determines whether corrective action is required.
  - 9.4.1 Refer to Sections 14 and 15 for information regarding measurement and payment for select backfill.
- 9.5 Contractor shall excavate the trench to the depth(s) directed by the Engineer for the testing lab to obtain the trench density test and replace and recompact the test area. This

work is incidental to the Project.

9.6 The Contractor shall give the Water Works timely notice of readiness for density test. Testing labs employed by the Water Works typically require a minimum of 24 hours notice. Minimum testing frequency for density testing of trench backfill is as follows:

9.6.1 One test first 100 feet of water main trench backfilled by Contractor. The results from this test will determine if the material and the method of compaction being used by the Contractor is obtaining the required density.

9.6.2 Testing of trench backfill shall continue at 200 feet to 250 feet intervals to the end of the water main trench.

9.7 The Engineer shall order the density tests. Contractor ordered tests shall be paid for by the Contractor unless prior approval is obtained from the Engineer.

9.8 The Engineer reserves the right to charge the Contractor (or deduct from the project payment) for retesting for failed tests.

## 10. SEPARATION OF WATER MAINS AND SANITARY SEWERS

### 10.1 General

10.1.1 The following factors should be considered in providing adequate separation:

- 1) Materials and type of joints for water and sewer pipes.
- 2) Soil conditions.
- 3) Service and branch connections into the water main and sewer line.
- 4) Compensating variations in the horizontal and vertical separations.
- 5) Space for repair and alterations of water and sewer pipes.
- 6) Off-setting of pipes around manholes.

### 10.2 Horizontal Separation of Gravity Sewers from Water Mains

10.2.1 Separate gravity sewer mains from water mains by a horizontal distance of at least 10 feet unless:

- 1) The top of a sewer main is at least 18 inches below the bottom of the water main, and
- 2) The sewer is placed in a separate trench or in the same trench on a bench of undisturbed earth at a minimum horizontal separation of 3 feet from the water main.

10.2.2 When it is impossible to obtain the required horizontal clearance of 3 feet and a vertical clearance of 18 inches between sewers and water mains, the sewers must be constructed of water main materials meeting the requirements. However, provide a linear separation of at least 2 feet.

### 10.3 Separation of Sewer and Water Main Crossovers

10.3.1 Vertical separation of sanitary sewers crossing under any water main should be at least 18 inches when measured from the top of the sewer to the bottom of the water main. If physical conditions prohibit the separation, the sewer may be placed not closer than 6 inches below a water main or 18 inches above a water main. Maintain the maximum feasible separation distance in all cases.

10.3.2 Where the sewer crosses over or less than 18 inches below a water main, locate one full length of sewer pipe of water main material so both joints are as far as possible from the water main. The sewer and water pipes must be adequately supported and have watertight joints. Use a low permeability soil for backfill material within 10 feet of the point of crossing.

10.4 Sewer manholes

10.4.1 No water pipe shall pass through or come in contact with any part of a sewer manhole. A minimum horizontal clearance of 10 feet shall be maintained.

11. WATER MAIN DISINFECTION

11.1 None of the work performed by the Contractor under this section shall be done unless the Engineer is present. Conduct water main disinfection per ANSI/AWWA C-651-05. Contractor shall provide the calcium hypochlorite (conforming to ANSI/AWWA B-300) required for disinfection.

11.1.1 After installation of all piping, all segments of the mains shall be flushed prior to chlorination. All valves and flushing or air release taps shall be operated and all hydrants flushed to be sure that all dirt and debris has been flushed from all of the piping, including dead end sections beyond mainline valves installed by the Contractor. All dead ends that cannot be flushed with a hydrant shall be flushed through a Temporary Flushing Device. Refer to Plan Details.

11.1.1.1 The Temporary Flushing Device for water mains with a diameter smaller than 12 inch shall be either a Combination Blowoff and Sampling Tap with a minimum pipe diameter of 2 inch, or a Temporary Fire Hydrant.

11.1.1.2 The Temporary Flushing Device for water mains with a diameter of 12 inch or greater shall be a Temporary Fire Hydrant.

11.1.2 Contractor shall provide and install all necessary valves, adaptors, and pipe for the Temporary Flushing Device. The Temporary Flushing Device shall include an adaptor to accommodate a defuser or special equipment for neutralizing heavily chlorinated water. Contractor shall remove the materials after flushing and disinfection of the new water main is completed. This work shall be incidental to the Project.

11.1.3 Contractor shall flush the new water main until the turbidity of the water is at or less than 5.0 NTU as measured by the Water Works. The Contractor shall take all steps necessary to reduce the turbidity in the new water main to this level.

11.1.4 Continuous-Feed Method: At a point not more than 10 feet downstream from connections to existing mains inject at a constant rate a solution of Calcium Hypochlorite and water until the entire main has a chlorine residual of 50 ppm; allow system to stand full of solution for 24 hours. Minimum free chlorine residual at pipe extremities: 10 ppm at end of 24 hour test period; if requirement is not met, repeat disinfection procedure. The Contractor shall operate all valves and all hydrants in the new main to assure complete disinfection; repeat test procedure if necessary.

Slug Method (Contractor's Option): The contractor is required to place calcium hypochlorite granules in the main during construction; completely filling the main

to eliminate air pockets; flushing the main to remove particulates; and slowly flowing through the main a slug of water dosed with chlorine to a concentration of 100 mg/L. The slow rate of flow ensures that all parts of the main and its appurtenances will be exposed to the highly chlorinated water for a period of not less than 3 hours. At a point not more than 10 feet downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 100 mg/L free chlorine. To ensure that this concentration is achieved, the chlorine concentration should be measured at regular intervals. The chlorine shall be applied continuously and for a sufficient period to develop a solid column, or slug, of chlorinated water that will, as it moves through the main, expose all interior surfaces to a concentration of approximately 100 mg/L for at least 3 hours. The free chlorine residual shall be measured in the slug as it moves through the main. If at any time it drops below 50 mg/L, the flow shall be stopped; chlorination equipment shall be relocated at the head of the slug; and, as flow resumes, chlorine shall be applied to restore the free chlorine in the slug to not less than 100 mg/L. As the chlorinated water flows passed fittings and valves, related valves and hydrants shall be operated so as to disinfect appurtenances and pipe branches.

A minimum 3/4 inch purification tap(s) shall serve as the injection point(s). The 3/4 inch minimum "purification taps" shall be installed in the main by the Water Works. The Contractor shall provide and install all remaining material, including copper piping, valves, and other fittings necessary for constructing a purification tap for an injection point for the calcium hypochlorite. At the direction of the Engineer, the Contractor shall perform the required excavation, install and subsequently disconnect copper piping and valve at these injection sites. The Contractor shall maintain access to injection sites until the new main tests pathogenic bacteria-free, then furnish and compact backfill at these sites. The copper and appurtenances shall become Contractor salvage when the removal is directed. This work will be incidental to the Project unless a Contract item for "Water Main Tap for Purification" is provided. The tap and installation done by the Water Works shall be done at no charge unless the Contract item is provided.

- 11.2 The Contractor shall thoroughly flush main after the test until extremities indicate the same chlorine residual as the supply water. A diffuser shall be used for flushing and to aid in incorporating the neutralizing agents. All hydrants in the test section shall be flushed before pressure testing begins. The Contractor shall obtain permission from the City or County for the use of their sanitary sewer or storm sewer as necessary to transport the flushing water. The flushing shall be done in a manner such that the City or County sewer system is not surcharged.
- 11.3 Heavily chlorinated water will require that a neutralizing agent be added to prevent damage to the environment and/or City or County sewer systems. This work shall be done in accordance with AWWA C-651-05 Sec 4.5.2 using special equipment and neutralizing agents provided by the Contractor. Sodium Thiosulfate as manufactured by Esseco General Chemical, Parsippany, New Jersey (973) 515-1840 or equal may be used as a neutralizing agent. Use per manufacturer's recommendation to reduce the chlorine residual. Contractor shall immediately increase the amount of neutralizing agent if the flushing water chlorine residual is above acceptable levels.
- 11.4 After completion of disinfection and flushing of the chlorinated water, the Water Works will collect and deliver bacteriological samples for testing. A minimum of 24 hours must elapse between flushing and sampling. Samples must test pathogenic bacteria free, meaning but not limited to, total coliform, E. coli and pseudomonas. Samples will be delivered to the Water Works lab between 7:00 AM and 12:00 PM Monday through Friday.

Samples must be tested by the lab within 30 hours of being drawn.

Results of the testing will be available to the Engineer the following day excluding Saturdays, Sundays and Holidays. The Contractor shall not call the lab for results. A minimum of 24 hours is required for lab testing.

Samples shall be taken at fire hydrants and at the end(s) of each main. Material for sampling sites other than hydrants shall be through a Temporary Combination Blowoff and Sampling Tap constructed of smooth material, copper, schedule 80 PVC and/or brass fittings as detailed on the Plans. The outlet where the bacteria sample is taken shall not be threaded internally or externally. Materials used for sampling shall be sanitized before taking any samples. This work shall be incidental to the Project. Additional working days shall not be provided for any retesting work.

A sample shall be taken at intervals not to exceed 1,200 feet of pipe.

- 11.5 The Engineer shall require two consecutive sets of acceptable samples, taken at least 24 hours apart.
- 11.6 Hydrants shall be used as sampling points. If hydrants are not installed at the end of the main, samples may be taken from a Temporary Combination Blowoff and Sampling Tap. The Contractor shall provide and install all material necessary for constructing a sampling point for the Water Works. The Contractor shall perform the required excavation, install and subsequently disconnect piping and valve at these sample sites. The Contractor shall maintain access to sampling sites until the new main tests pathogenic bacteria free then furnish and compact backfill at these sites. The piping and appurtenances shall become Contractor salvage when the removal is directed.
- 11.7 Mains shall test bacteria free for both tests before the hydrostatic test is conducted.
- 11.8 Mains that do not pass the hydrostatic test and require repairs to the new main shall be disinfected and test bacteria free prior to conducting the subsequent hydrostatic test. Additional working days shall not be provided for any testing work.

## 12. TESTING REQUIREMENTS

- 12.1 None of the work performed by the Contractor under this Section shall be done unless the Engineer is present. Test all pipe after installation in accordance with AWWA Standard C-600.
  - 12.1.1 Hydrostatic test:
    - 1) The Contractor will flush out all of the new main to remove air before testing; the Water Works will insert taps to help release trapped air. The Contractor shall plug the taps after testing as directed by the Engineer.
    - 2) Test at 150% of maximum operating pressure for 2 hours; allowable pressure drop during test period shall be 5% of test pressure.
    - 3) The Engineer will observe test to ensure compliance as required in 2) above.
    - 4) Comply with current AWWA Standard C-600 unless noted otherwise.
    - 5) Water used for pressure testing shall have a minimum chlorine residual content of 50 ppm.
- 12.2 The Contractor shall provide all test pumps, test plugs, pipe, and gages, and make all required piping connections to perform required testing.
- 12.3 Examine trench for leakage during test; replace all defective pipe or fittings disclosed

during test and repeat test until requirements have been met.

13. CUT AND PLUG / CUT AND CONNECT EXISTING WATER MAINS

- 13.1 This work will require the Contractor to locate, excavate, cut, and plug or connect the end of existing water mains after construction, disinfection, and testing the new water mains and after the water services are connected to the new main unless shown otherwise on the Plans.
- 13.2 The Contractor shall submit a schedule for this work to the Engineer for approval at least 5 days advance notice (excluding Saturdays, Sundays and Holidays) before the work is proposed to be done. The Water Works will need to shut down existing mains for this work to be done and the Contractor shall coordinate with the Water Works in doing the work.
- 13.3 The Engineer reserves the right to have the Contractor reschedule the work for emergencies, water supply concerns, main breaks and other causes as necessary by the Water Works, without notice, additional compensation or additional working days.
- 13.4 The Engineer may require this work to be performed after normal working hours or on a Saturday without additional compensation to the Contractor. If the Engineer directs the work to be done on Sundays or Holidays (observed by the Contractor), additional compensation will be made for the overtime labor expenses unless otherwise noted on the Plans.
- 13.5 The Contractor shall preassemble pipe and fittings to minimize the time that the water main has to be out of service. Contractor shall swab all preassembled pipe and fittings with a chlorine solution before installation. The Contractor shall excavate as necessary to allow Water Works to verify existing conditions and determine required fittings (including standard or over-size sleeves) and pipe lengths to accomplish the work.
- 13.6 The Water Works will not turn off water until excavation is complete and all fittings for all "cut and connects" and/or all "cut and plugs" for the shutdown are ready (pre-assembled) and stockpiled at each respective location.
- 13.7 The Engineer may require the Contractor to do more than one "cut and plug" and/or "cut and connect" simultaneously to minimize the disruption of service.
- 13.8 The Contractor shall give the Engineer a minimum of 24 hours advance notice (excluding Saturday, Sunday and holidays) of the intent to shut the water off, this is in addition to the customer notification requirements. Customers affected by this work shall have a minimum of 1 day advance notice for residential shut-offs and 2 days advance notice (excluding Saturdays, Sundays and Holidays) if any businesses are affected by the shut-off. If the "cut and plug" work is controlled by the disinfection and testing of a new water main, the Water Works will not attempt to notify the customer through direct communication or a door hanger notice form until the new water main has passed all the disinfection and testing requirements. Should renotification be required for any reason, the Water Works will notify the customer. The Water Works reserves the right to not shut the water off without proper notice.
- 13.9 Contractor shall remove (and salvage to the Water Works) all valve box lids from valves being abandoned in paved areas as part of the Project. The boxes shall be filled with concrete, flush to the paving surface. Contractor shall remove (and salvage to the Water Works) all valve boxes and lids from valves being abandoned in non-paved areas as part of the Project. This work shall be incidental to the Project unless noted otherwise on the Plans.

14. METHOD OF MEASUREMENT

14.1 Water Main Pipe and Insulation

- 14.1.1 The footage of pipe to be paid for shall be the number of linear feet of pipe in place, completed and approved. It shall be measured along the centerline of the pipe. The several classes, types and sizes shall be measured separately. All fittings and valves shall be included in the footage as typical pipe sections in the line being measured. Pipe inside a steel casing will not be paid for separately.
- 14.1.2 Polyethylene encasement shall be considered incidental to the cost of piping, including the encasement of existing water mains.
- 14.1.3 Extra depth of water main placement, to avoid conflicts with existing gravity sewers, and as necessary to connect to or cross existing mains will not be measured separately for payment. The extra depth, when required, shall be incidental to the water main bid item.
- 14.1.4 Insulation with polyethylene encasement and insulation with aluminum jacket shall be measured along centerline of pipe.
- 14.1.5 The removal of existing and temporary caps, plugs, and thrust blocking shall be incidental to the pipe installation.

14.2 Appurtenant Items

- 14.2.1 The following items placed will be counted for each type and size of the items completed in place and accepted:
  - A. Bends
  - B. Reducers
  - C. Tees
  - D. Sleeves
  - E. Plugs
  - F. Crosses
  - G. Gate Valves
  - H. Other Items listed in the Contract, or added by Change Order
- 14.2.2 The required polyethylene encasement of appurtenant items shall be considered incidental to the cost of the items.
- 14.2.3 The cost for the construction of required thrust blocks and required restraining devices shall be included in the bid items for the respective fittings, plugs, sleeves, and fire hydrant assemblies.
- 14.2.4 The cost for the flushing, purifying, and testing of the water main shall be considered incidental to the Project.

14.3 Cut and Plug Existing Water Main

- 14.3.1 The Contract unit price for each "Cut and Plug Existing Water Main" shall include any necessary concrete plugs for the abandoned water main and removal of existing pipe, fittings, and thrust blocks as necessary. Price shall include not less than 20 feet of new pipe as necessary. Price shall include any overtime costs associated with doing this work beyond the normal workday or on a Saturday when directed by the Engineer. Water main fittings required for this work will be

measured separately for payment.

#### 14.4 Cut and Connect Existing Water Main

14.4.1 The Contract unit price for each Cut and Connect Existing Water Main shall include any necessary concrete plugs for the abandoned water main and removal of existing pipe, fittings, and thrust blocks as necessary. Price shall include not less than 20 feet of new pipe as necessary. Price shall include any overtime costs associated with doing this work beyond the normal workday or on a Saturday when directed by the Engineer. Water main fittings required for this work will be measured separately for payment.

#### 14.5 Granular Materials

14.5.1 When payment is based on weight (mass), the measurement for payment will be in tons at locations shown on the plans or as directed by the Engineer. Measurement will be based on the actual scale tickets of individual loads from the supplier and provided to the Engineer by the Contractor. Scale tickets of individual loads shall be delivered to the Engineer within 24 hours of the granular material placement. Scale tickets of individual loads received by the Engineer after the 24 hour period will not be included for payment.

14.5.2 When payment is based on area, the measurement for payment will be measured in square yards for the pavement removal area that the granular material is placed under for the specified design thickness, at locations shown on the Plans or as directed by the Engineer. Contractor shall provide the Engineer copies of the scale tickets for the individual loads to verify the type of granular material used.

#### 14.6 Select Backfill for Water Main

14.6.1 Select backfill will be measured in cubic yards based on the actual number of truck loads of material hauled to the Project in each type of truck used or on actual scale tickets of individual loads from the supplier and provided to the Engineer by the Contractor at locations directed by the Engineer. Truck load counts and scale tickets of individual loads shall be delivered to the Engineer within 24 hours of the select backfill placement. Load counts or scale tickets of individual loads received by the Engineer after the 24 hour period will not be included for payment.

### 15. BASIS OF PAYMENT

#### 15.1 Water Main Pipe and Insulation

15.1.1 The footage of pipe as determined from the measurements shall be paid for at the Contract unit price per linear foot of the various classes, types and sizes. This payment shall be full compensation for furnishing, hauling and installing the pipe, polyethylene encasement, tracing wire system, for excavation, for all testing, for backfilling and compaction, for jointing, and for all labor, material, equipment, tools and incidentals necessary to complete the main, in accordance with the contract documents. Water main inside a steel casing will not be paid for separately.

15.1.2 Insulation with polyethylene encasement and insulation with aluminum jacket shall be paid for at the Contract unit price per lineal foot.

#### 15.2 Appurtenant and Miscellaneous Items

15.2.1 The number of units of each item shall be paid for at the Contract unit price per each for each item respectively. This unit price as agreed upon in the Contract, shall constitute full compensation for furnishing and placing all materials, for all excavation, for testing, for backfilling and compaction, for jointing, and for all labor, material, equipment, tools and incidentals necessary to complete the units in accordance with the contract documents.

15.2.2 Hangers, bolts, inserts and appurtenances for securing the insulated water main shall be paid as a lump sum. Refer to Pipe Materials Section.

### 15.3 Granular Materials

15.3.1 When measurement is based on weight (mass), the Contractor will be paid the Contract unit price per ton. This payment shall be full compensation for all equipment, labor, and tools necessary for excavation, furnishing, hauling, placement, compaction and removal (if required) of the granular material in accordance with the contract documents.

15.3.2 When measurement is based on square yards, the Contractor will be paid the Contract unit price per square yard for the specified design thickness. This payment shall be full compensation for all equipment, labor, and tools necessary for excavation, furnishing, hauling, placement, compaction and removal (if required) of the granular material in accordance with the contract documents.

### 15.4 Select Backfill for Water Main

15.4.1 For the number of cubic yards placed in accordance with the contract documents, the Contractor will be paid the Contract unit price per cubic yard. This payment shall be full compensation for all equipment, labor, and tools necessary for removal and disposal off site of the unsuitable material, furnishing, hauling, placement and compaction of the select backfill material in accordance with the contract documents.