SP- 231023
(New)

SPECIAL PROVISIONS
FOR
WATER MAIN

Polk County
STP-U-8477(615)--70-77

Effective Date
March 19, 2024

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.

I. GENERAL INFORMATION

A. Submittals

The Des Moines Water Works (DMWW) will review all shop drawings for materials related to water main construction. Shop drawings shall be provided to DMWW 2 weeks prior to any water main construction. DMWW will confirm all materials delivered to project match submittals prior to installation. The Contractor shall submit these shop drawings to:

Carla Schumacher
cschumacher@dmww.com
Email Subject Line: 73rd Street Shop Drawings

B. Preparation

Notify DMWW (515-323-6227) 72 hours prior to the start of any water main related construction.

Verify proposed grades prior to construction to ensure adequate finished cover will be provided over all water mains.

Expose utilities where cross proposed water main to verify location and clearance distance.

The Contractor shall arrange for all survey required to install water main on line and grade as shown on the plans.

Contractor's surveyor to notify DMWW a minimum 24 hours prior to completing survey.

Surveyor staking locations include:

- Right of way – every 100 feet
- Sidewalk – each side, every 100 feet (verify interval with DMWW before staking)
- Intakes – four corners (verify which intakes with DMWW before staking)
- Storm sewer - Water main crossing locations with storm sewer – provide invert of storm sewer and top of wm on stake
- Manhole – stake center, include diameter size on stake
- Back of new curb at 100 foot intervals
- Back of curb radius at intersections
- Hydrants and hydrant valves
- Inline valves
- Bends, tees, reducers, tapping sleeve and valve
- End of stage

The Contractor shall arrange with DMWW for all valves and hydrants to be operated only by DMWW's personnel.

A DMWW representative is to be on site during pressure testing and chlorination.

Contractor to notify DMWW 24 hours in advance of pressure test.

C. Connections to the Existing Water System

Expose existing buried pipe at locations that will be connected to new piping. Confirm location, depth, orientation, type of pipe, outside diameter, and type and location of joints.

Verify outside diameter of water main to determine if it is oversized. Procure materials as appropriate prior to altering the water main.

Connections to the existing DMWW's system shall be coordinated with the Engineer and scheduled a minimum of 48 hours in advance. Customers who will be without water shall be notified by the Contractor a minimum of 24 hours in advance. Water main shutdowns may need to be completed outside of normal working hours to minimize impact on affected customers. No additional compensation will be paid for work outside normal working hours.

D. Abandonment of Existing Facilities

Existing water mains shall be abandoned or removed as shown on the plans. Mains shall be capped and hydrant assemblies and valve boxes shall be removed incidental to water main construction.

E. Valve Box Adjustment in Final Paving

If paved area is concrete, the contractor is responsible for making sure no valve boxes are paved over and that all valve boxes are brought to the new grade.

If paved area is concrete with asphalt overlay, the contractor shall contact DMWW to arrange for a DMWW representative to adjust valve boxes.

SECTION 02 22 00 – EXCAVATING, BACKFILLING AND COMPACTING FOR WATER MAINS

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Excavating, backfilling, and compacting specifications, as applicable, for installation of water main and appurtenances.

1.02 RELATED SECTIONS

A. Section 02 22 70 – Augured Pipe Casing.

B. Section 02 61 00 – Ductile Iron and Polyvinyl Chloride Pipe for Water Mains.

C. Section 02 64 00 – Valves and Hydrants.

D. Section 02 66 00 – Water Service Transfers.

1.03 REFERENCES

A. ASTM D2922 – Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

B. ASTM D3017 – Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C. ASTM D698 – Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3).

1.04 MEASUREMENT AND PAYMENT

A. Stabilization Materials: per ton, based on quantities shown on material delivery tickets provided to Engineer.
   1. Include cost for all material, equipment, labor, and associated work necessary to complete work associated with stabilization materials in the unit bid price for Foundation Rock.
   2. Estimated quantity for Foundation Rock is not to be used as an indication of site conditions that will be encountered during the course of the work.

B. Special Pipe Embedment and Encasement Material: per cubic yard, based on quantities shown on material delivery tickets provided to Engineer.
   1. Include cost for all material, equipment, labor, and associated work necessary to complete work associated with special pipe embedment and encasement material in the unit bid price for Utility Embedment Material.
   2. Estimated quantity for Utility Embedment Material is not to be used as an indication of site conditions that will be encountered during the course of the work.

PART 2 PRODUCTS

2.01 EXCAVATED MATERIALS

A. Strip, grub, and stockpile topsoil for finished grading.

B. Backfill material to be:

1. Approved for use by Engineer.
2. Selected material taken from the excavation or select borrow material, if sufficient quantities of compliant excavated material are not available.
3. Inorganic clays, clayey sands, or inorganic and clayey silts, compatible with and having an obtainable density no less than adjacent soils.
4. Free of lumps or clods over 3 inches in the largest dimension.
5. Free of foreign debris including rocks, organic materials, and man-made debris.
6. Material that is not frozen.

2.02 BEDDING MATERIAL

A. Steel Pipe: Bed pipe using sand free of frozen material, foreign debris, including rocks, organic materials, and man-made debris.

B. Ductile iron pipe, prestressed concrete cylinder pipe, polyvinyl chloride pipe, and corrugated steel pipe: Bed pipe using material taken from the excavation with the following characteristics:
   1. Inorganic clay, clayey sand, or inorganic and clayey silt.
   2. Free of lumps or clods over 2 inches in the largest dimension.
   3. Free of foreign debris including rocks, organic materials, and man-made debris.
   4. With a soil moisture range of optimum moisture to 4% points above optimum moisture content.
   5. Material that is not frozen.

2.03 STABILIZATION MATERIAL

A. When required by field conditions, use stabilization material of crushed limestone, dolomite, or quartzite generally meeting the following characteristics:
   1. 2 inch nominal maximum size.
   2. 95% retained on a 3/4 inch screen.
   3. Generally free from deleterious substances as determined by Engineer.

2.04 BORROW MATERIALS

A. If sufficient quantity of suitable material is not available from excavations, obtain material from approved off-site sources. Off-site sources must hold a National Pollutant Discharge Elimination System (NPDES) permit from the Iowa DNR for storm water discharge associated with construction activity.

B. Conform borrow materials, including topsoil and backfill material, to specifications for excavated materials in Part 2.01.

C. Topsoil borrow material to be:
   1. Natural loam and humus with characteristics consistent with the existing topsoil on site.
   2. Finely graded and free of clumps larger than 2 inches in the largest dimension.
   3. Free of man-made materials and debris.
   4. Free of rock or organic matter, including wood and roots, greater than 3/4 inch, in the largest dimension.
   5. Comprised of less than 0.5% clay.

2.05 SPECIAL PIPE EMBEDMENT AND ENCASEMENT MATERIAL

A. When directed by DMWW, install controlled low-strength material to provide support to existing utilities.
   1. Controlled Low-Strength Material (CLSM):

a. Approximate quantities per cubic yard:
   (1) Cement: 50 pounds.
   (2) Fly ash: 250 pounds.
   (3) Fine aggregate: 2910 pounds.
   (4) Water: 60 gallons.
b. A compressive strength of at least 50 psi compressive strength at 28 calendar days.
c. Comply with material requirements of Article 2506.02 of the Standard Specifications.

2.06 MANUFACTURED SAND MATERIAL

A. When directed by DMWW, install manufactured sand.
   1. Stone sand complying with the following gradation:

Sieve	Percent Passing
3/8-inch	100
No. 4	90-100
No. 8	60-75
No. 30	15-30
No. 200	0-4

PART 3 EXECUTION

3.01 GENERAL

A. General Description
   1. Complete trenching, backfilling, and compacting for water main in accordance with Water Main Standard Details.

B. Quality Assurance
   1. Give DMWW the opportunity to review excavated or borrowed soils prior to placement as backfill.
   2. Owner will commission and compensate a qualified soils engineer to develop Proctor curves indicating moisture-density relationships for all soil types used as backfill.
   3. Use Proctor curves and soil analysis information in determining proper compaction of soils placed.

C. General Safety
   1. Blasting not permitted.
   2. Safety and protection:
      a. Provide shoring, sheeting, and bracing, as required, to protect work, adjacent property, private or public utilities, and workers.
      b. Strictly observe laws and ordinances regulating health and safety measures.
      c. Excavations that DMWW personnel are required to enter shall comply with OSHA standards.

D. Soil Testing
   1. Field tests for density and moisture content to be performed by the soils engineer, defined in Part 3.01.B above, to ensure that specified density is being obtained. Perform testing using ASTM D2922 nuclear methods or another method approved by DMWW.
   2. Take density tests at finished grade, at 3 feet below finished grade, and as directed by DMWW under special conditions. Test locations to be selected by DMWW immediately prior to performing tests. Excavate, as directed by DMWW, for tests at intermediate depths. As a minimum, take density tests at approximately 200 foot intervals along the trench. The following locations require additional testing:
      a. Over jacking pits where casing was installed.

   b. Immediately adjacent to all structures.
3. When test results indicate compaction is not as specified:
   a. Additional tests will be required in both directions from the failed test until satisfactory results are obtained.
   b. Remove, replace, and recompact all material between the satisfactory tests in lifts to meet specifications. Compaction corrections are made at no expense to DMWW.
   c. Provide density tests to recompacted areas at the same frequency as the original tests. Testing of recompacted areas performed at the Contractor’s expense.
4. Notify Engineer if petroleum-based materials are detected in soils. Appropriate action will be taken by DMWW.
5. Tests that are not conducted in the presence of DMWW, or are conducted at locations not selected by DMWW, will be rejected.

E. Protection of Utility Lines
   1. Conduct trenching operations to avoid damaging underground utilities.
   2. Protect all underground utilities. Damage resulting from trenching or backfilling to be repaired by Contractor or utility company at Contractor's expense.
   3. Underground utilities discovered by Contractor are to be protected.

3.02 DISPOSAL OF EXCAVATED MATERIAL

A. Remove excess material excavated for water main trench from site and in compliance with environmental regulations.

B. Backfill consisting of suitable material, which comes from an off-site source, must conform to Part 2.01.

3.03 TRENCH EXCAVATION

A. Strip and stockpile topsoil for finished grading. A minimum of 12 inches of topsoil must be segregated from other materials in agricultural areas.

B. Excavate trenches so as to:
   1. Follow lines and grades as indicated on plans.
   2. Provide uniform bearing on undisturbed soil and continuous support along the entire length of pipe.
   3. Prevent over-excavation in locations where suitable subgrade conditions exist.
   4. Provide vertical trench walls to an elevation no less than 12 inches above the pipe.

C. Correct unstable trench bottoms, as determined by Engineer, as follows:
   1. Over-excavate the trench to stable soil or to a maximum of 2 feet below the bottom of the pipe.
   2. If stable soil is reached, bring trench back to grade using suitable backfill material or bedding material compacted to 90% Standard Proctor Density.
   3. If stable soil is not reached after 2 feet of over-excavation, place 1 foot of the specified trench stabilization material in the trench bottom and compact. Bring trench back to grade using suitable backfill material or bedding material compacted to 90% Standard Proctor Density.
   4. Place pipe only after trench bottom has been fully stabilized.

D. Remove stones encountered during excavation. When large rocks are encountered, remove to an elevation 6 inches below the bottom of the proposed improvement. Fill voids created through removal of stones with approved backfill material and thoroughly compact to 90% Standard Proctor Density.

E. Excavate trench bottoms deeper at location of bell joints to permit body of pipe to rest uniformly supported upon trench bottom. Use bell holes no longer than is necessary for practical installation of pipe.

F. The length of trench to be opened at one time is as follows:
   1. In extended runs, open trench length is not to exceed 100 feet.
   2. In street crossings, trench shall not be open in more than one lane at a time, unless specified differently in traffic control plan.
   3. Backfill driveways and entrances immediately after placement of pipe.

G. Place excavated material:
   1. As approved by DMWW when these specifications do not apply.
   2. Compactly along sides of excavation.
   3. To provide continuous access to fire hydrants and utility valves.
   4. To provide as little inconvenience as possible to public travel.
   5. To minimize damage to adjacent lawns and planted areas.

3.04 PIPE BEDDING

A. Bed pipe with 4 inch thick layer of specified bedding material for pipes 20 inch and larger.

B. Place bedding alongside of pipe to an elevation above springline (no lower than half the height of the pipe).

C. Compact bedding to a minimum of 90% Standard Proctor Density.

D. Obtain required compaction within a soil moisture range of optimum moisture to 4% points above optimum moisture content.

E. Do not damage pipe coating or wrapping system during bedding placement and compaction.

3.05 BACKFILLING

A. Perform backfilling of trenches only after pipe installation, jointing, and bedding are complete, inspected, and approved.

B. Use backfill material complying with Part 2 above.

C. Mechanically tamp backfill with impact or vibrating compaction equipment.

D. Place backfill in layers and compact to required density.

E. Backfill to be:
   1. Compacted to 90% Standard Proctor Density to a level 1 foot above the pipe.
   2. For the remainder of the trench:
      a. Compact public rights-of-way to 95% Standard Proctor Density.
      b. Compact easement areas to 90% Standard Proctor Density.
   3. Within a soil moisture range of optimum moisture to 4% points above optimum moisture content.

F. Protect pipe coating or pipe wrapping system from damage during backfill operations.

G. Hydraulic compaction or water jetting of pipe trenches is not permitted.

H. Adjust moisture content of material that exceeds optimum moisture range, but is otherwise acceptable, by spreading and aerating or otherwise drying as necessary until moisture content is within required moisture range and required compaction can be obtained.

I. Adjust moisture content of material that is below optimum moisture, but is otherwise acceptable, by wetting as necessary until moisture content is within required moisture range and required compaction can be obtained.

3.06 GRADING

A. Finish-grade surfaces with a well-compacted, free-draining, uniform surface without obstructive protrusions or depressions.

B. Place topsoil at a uniform depth equal to surrounding topsoil, but not less than 4 inches.

C. Place topsoil to a minimum depth of 6 inches when ample native topsoil is available.

D. Place topsoil only under lawn and planted areas.

3.07 CONTROL OF WATER

A. Install pipe in the dry.

B. Dewater as necessary to prevent water from entering pipe or rising around pipe.

C. Do not allow water pumped or diverted from excavation site to be:
   1. Pooled anywhere on site.
   2. Removed in such a manner as to disperse silt.
   3. Placed on surfaces heavily traveled by pedestrian traffic.

D. Do not use installed pipe as a conduit for trench dewatering.

E. Control surface water as follows:
   1. Divert surface water to prevent entry into pipe trenches.
   2. Remove surface water accumulated in pipe trenches and other excavations prior to continuation of excavation work.
   3. Remove surface water saturated soil from excavation.

F. Control groundwater as follows:
   1. Where groundwater is encountered, dewater trenches and other excavations, as necessary, to permit proper execution of the Project.
   2. When large quantities of groundwater are encountered, stabilize trenches with the specified stabilization material, and bed pipe as specified.

3.08 DISPOSAL OF UNSUITABLE OR EXCESS MATERIAL

A. Dispose of surplus material and material not suitable for backfill off-site at a location provided by Contractor.
   1. Off-site disposal locations must hold a NPDES permit from the Iowa DNR for storm water discharge associated with construction activity.
   2. Contractor to provide transportation of such material.

3.09 CLEANUP AND RESTORATION

A. Clear the site in and around the excavation of mud and construction debris to a condition equal to, or better than, that existing prior to trenching work.

B. Remove construction remnant materials from site.

C. Repair damage to adjacent property suffered during installation work to a condition equal to, or better than, that condition existing prior to trenching work.

**** END OF SECTION ****

SECTION 22 80 00 - HORIZONTALLY DIRECTIONAL DRILLED WATER MAIN

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. As designed, project calls for open cut installation.

B. If DMWW allows installing water main using trenchless method in some areas of the project, requirements in this specification will be followed.

C. Install water main using horizontal directional drilling techniques. Drill a small-diameter pilot hole along a predetermined directional alignment, followed by enlargement of the pilot hole to a suitable diameter for installation of the water main.

1.02 RELATED SECTIONS

A. Section 02 22 00 – Excavating, Backfilling, and Compacting for Water Mains.

B. Section 02 60 00 – Protection of Water Supply.

C. Section 02 61 00 – Ductile Iron and Polyvinyl Chloride Pipe for Water Mains.

D. Section 02 67 40 – Pressure Testing Water Mains.

1.03 SUBMITTALS

A. Submit detailed description of procedures to be followed during horizontal directional drilling process.

B. Submit details describing equipment and materials to be used at the site.
  1. Water main: type, diameter, wall thickness, weights, tensile strength at yield, factor of safety, certifications, applicable standards, and other technical information required by the DMWW to ensure conformance to the contract documents.
  2. Include information on the thrust, pullback, and torque capabilities of drilling machine.
  3. Include information on sediment removal methods and water transport methods for drilling fluid system.

C. Provide list of names of personnel that will be present at the jobsite for the following positions: site superintendent, driller, and guidance technician.

D. Control Surveys: Submit plan showing proposed entry points, proposed exit points, existing utilities, clearance between existing utilities, drill path, and other information that will be used to control drilling operations.

E. Provide construction site layout information indicating storage areas, equipment set-up areas, construction staging areas, and locations of major supporting equipment.

F. Submit information regarding method of removing spoils from drilling fluid returns, equipment to remove spoils from the site, disposal methods, and locations where the material will be disposed.

G. Address how specification requirements on quality control items will be satisfied.

H. Submit tabulation of coordinates, referenced from drill entry point, which accurately describes location of pilot hole. Submit to DMWW on-site representative at completion of drilling pilot hole for review prior to proceeding with pre-reaming operations.

I. Provide plan and profile information for the installed water main showing permanent references and other adjacent surface and subsurface features.

J. Submit two copies of the following information:
   1. List of at least ten projects consisting of directional drilling in conditions similar to this project. Include project name, scope, duration of project, and references, with phone numbers.
   2. Résumés of personnel listed in Part 3.01.B. below.

1.04 MEASUREMENT AND PAYMENT

A. Install Regular Joint Pipe items by Open Trench: Include costs for material, equipment, and labor for work included in this Section in the unit bid price for Water Main. No additional payment shall be made for directional drilling in open trench areas.

B. Install restrained joint pipe items by Horizontal Directional Drilling: Include costs for material, equipment, and labor for work included in this Section in the unit bid price for Water Main.

PART 2 PRODUCTS

2.01 MATERIALS

A. Refer to Related Sections for materials specifications for excavation, fill, pipe, fittings, and other miscellaneous materials associated with the work.

2.02 DRILLING FLUIDS

A. Provide drilling fluids and additives to complete the work described in this Section. Provide equipment and water associated with drilling fluid program.

2.03 WATER

A. Provide sufficient volumes of water for use with drilling fluids. Ensure compatibility of water source with drilling fluids and additives.

B. Conduct tests necessary to ensure compatibility of water source with drilling fluids and additives.

2.04 EQUIPMENT REQUIREMENTS

A. Provide equipment, including auxiliary and support equipment, needed to complete the work.

B. Provide drill rig capable of generating sufficient thrust and pullback force necessary to complete the work.

C. Provide guidance system capable of:
   1. Giving X-Y coordinates of the pilot bore independent of a down-hole radio beacon strength for up to 40 feet below ground surface.
   2. Accuracy within plus or minus 5% of pilot bore depth.
   3. Displaying azimuth, inclination, and tool face orientation information on console(s) for driller at drill rig.

PART 3 EXECUTION

3.01 QUALIFICATIONS

A. Corporate experience requirements of Contractor or subcontractor completing work described in this Section: minimum 2 years continuous experience in using horizontal directional drilling for installing utilities of similar size and scope.

B. Jobsite Personnel Experience:
   1. Site supervisor: familiarity with using horizontal directional drilling techniques. Minimum 2 years progressive experience in horizontal directional drilling.
   2. Guidance Technician: minimum 2 years continuous experience using wire line (accelerometer-magnetometer) or walkover guidance systems, including minimum ten projects where technician guided a pilot hole in drilling conditions similar to this project.
   3. Driller: minimum 2 years continuous experience in horizontal directional drilling, including minimum ten projects with conditions similar to this project.

C. Control Survey: Provide staff with capability to conduct survey necessary to set reference points required to provide horizontal and vertical control of drilling operations.

3.02 EXAMINATION

A. Examine site conditions to ensure that horizontal directional drilling operations pose no hazards to adjacent utilities, structures, or roadways.

B. Determine and mark location of existing utilities that could be affected by drilling activities.

C. Handle pipe carefully.

D. Use blocking and hold-downs during shipment to prevent movement or shifting.

E. Do not telescope small pipe inside larger pipe for shipment and storage.

F. Handle pipe materials by use of slings, hoists, skids, or other approved means.

G. Dropping or rolling of pipe material is not permitted.

H. Do not store PVC pipe in direct sunlight for prolonged periods of time.

3.03 PREPARATION

A. Obtain permission from proper agencies prior to closing roads or streets. Comply with traffic control requirements.

B. Deliver clean drill pipe to site. Keep ends of drill pipe capped during transportation and storage.

C. Place barricades around the perimeter of any equipment pit.

D. Protect adjacent structures and roadways to prevent damage from horizontal directional drilling operations.

E. Construct sediment barriers to confine soil within project site. Maintain sediment barriers until the project is complete.

F. Preserve and protect existing utilities, trees, plants, and vegetation.

G. Strip topsoil from areas to be excavated and stockpile for future use.

H. Confirm and verify location of utilities before drilling pilot hole.

I. Implement use of relief casings or other methods of protection for utilities that may be affected by drilling activities.

J. Provide DMWW with minimum of1 week advance notice prior to commencing drilling activities.

3.04 INSTALLATION

A. Install water main pipe in accordance with the guidelines and recommendations of the manufacturer.

B. Install water main pipe in the location and to the line and grade shown on the plans with modifications determined from control survey.

C. Align drill path in manner that water main pipe will avoid subsurface obstructions.

D. Keep drill-staging and pipe-staging areas neat and orderly; disturb as little area as possible. Keep drill pipe clean and capped until ready for use.

E. Take directional heading for drilling on the proposed horizontal alignment of the water main pipe.

F. Provide sufficient distance from iron/magnetic objects to avoid interference with the drilling guidance system.

G. Establish reconnaissance stations at mutually agreeable intervals to calculate and plot true vertical depth, horizontal distance, and right- and left-bearing drift.

H. Provide and maintain instrumentation that will accurately locate pilot hole, measure drill string axial and torsional loads, and measure drilling fluid discharge rate and pressure.

I. Drill pilot hole along path determined from control survey.
   1. Vertical tolerance of water main centerline: ± 1 foot from planned elevation.
   2. Horizontal tolerance of horizontal portion of centerline: final azimuth ±1 degree of planned path.
   3. Tolerances listed herein do not relieve Contractor from responsibility for ensuring safe operations or from damage to adjacent structures and utilities.

J. Once drilling of pilot hole has commenced, do not track equipment or machinery over or around path until installation is completed.

K. Drill curves at radii equal to or greater than those recommended by pipe manufacturer.

L. Submit tabulation of coordinates to DMWW for review that accurately describes location and depth of pilot hole. Reference coordinates to drilled entry point. Do not begin pre-reaming operations until DMWW approves pilot hole.

M. Begin pre-reaming operations.

N. Do not impose load on pull section that exceeds 90 % of maximum allowable tensile load of the pull strength of the water main pipe without review by DMWW.

O. Connect reaming assembly with pull section using swivel to minimize torsional stress imposed on the pull section.

P. Install pull section in the reamed hole so external pressures are minimized.

Q. Install water main pipe in bore hole. Maintain tolerances specified.
   1. Clean dirt and debris from water main pipe.
   2. Conform to grade and alignment tolerances specified.

R. Drilling Fluids: Maintain drilling fluids that optimize gel strength, viscosity, and filtration control necessary to transport cuttings and maintain integrity of wellbore.
   1. Provide products in sufficient quantities to ensure rheological properties necessary to accommodate drilling operations and maintain integrity of wellbore.
   2. Make adjustments to drilling fluid operation as necessary to maintain desirable rheological properties.
   3. Maximize recirculation of drilling surface returns. Provide solids control and fluid-cleaning equipment of a configuration and capacity capable of processing surface returns and produce drilling fluid suitable for reuse.
   4. Employ best efforts to maintain full annular circulation of drilling fluids.
   5. Minimize drilling fluid returns at locations other than wellbore entry and exit points.
      a. Use of relief casing(s) to minimize pressure in the bore hole is permitted. Remove relief casings when casing pipe installation is complete.
      b. If inadvertent surface returns of drilling fluid occur, immediately contain flow with barriers and collect excess fluid. Suspend drilling operations if surface return of drilling fluid poses hazards.
   6. Properly dispose of excess drilling fluids. Comply with environmental regulations and permit requirements.
   7. Prevent all drilling fluid from entering sewer or surface waters. Immediately stop construction if fluids enter sewers or surface waters and contain drilling fluid before proceeding with construction.

3.05 BACKFILL AND COMPACTION

A. Backfill and compact boring pits as specified in Section 02 22 00.

3.06 DISPOSAL, CLEANUP, AND RESTORATION

A. Dispose of excess materials, restore, and clean up site as specified in Section 02 22 00.

B. Remove excavated material unsuitable for backfill and not used as backfill upon project.

C. Pavement repairs resulting from potholing to locate utilities shall be paid according to related pavement repair bid item.

**** END OF SECTION ****

SECTION 02 60 00 – PROTECTION OF WATER SUPPLY

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. This Section describes Iowa Department of Natural Resources (DNR) requirements for protection of water supply systems and reflects Iowa DNR updates to 567 IAC 43.3(2)”a”(3) that became effective March 16, 2022, and the Des Moines Water Works specifications on file with Iowa DNR dated October 10, 2014, that include a variance for electronic leak detection.

1.02 RELATED SECTIONS

A. Section 02 22 80 – Horizontally Directional Drilled Water Main.

B. Section 02 61 00 – Ductile Iron and Polyvinyl Chloride Pipe for Water Mains.

C. Section 02 64 00 – Valves and Hydrants.

D. Section 02 67 40 – Pressure Testing Water Mains.

E. Section 02 67 50 – Disinfection of Water Distribution Systems.

1.03 REFERENCES

A. (ASTM) C443 – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

B. 567 IAC 43.3 (2)“a”(3) new subparagraphs (3) and (4), effective March 16, 2022.

C. Des Moines Water Works Specifications on file with Iowa DNR dated October 10, 2014, with variance for electronic leak detection.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Lay water mains to avoid high points where air can accumulate. Grade piping so that proposed hydrants will be at the highest points.

B. Do not locate hydrants within 10 feet of sanitary sewers or storm drains.

C. Plug hydrant drain ports in areas where groundwater rises above water main and pump hydrant barrel dry following construction.

D. Pressure test and disinfect new water mains prior to placing them in service.

3.02 SEPARATION DISTANCE

A. **Horizontal separation of water mains from gravity sanitary and combined sewers**:
   1. When horizontal separation is at least 10 feet from edge to edge, there are no additional requirements.

2. When horizontal separation is at least 3 feet from edge to edge and less than 10 feet, with water main located at least 18 inches or more above top of sewer, sewer must be placed in a separate trench than the water main or on a bench of undisturbed earth in the same trench as the water main.
3. When horizontal separation is at least 3 feet from edge to edge and less than 10 feet, with water main located less than 18 inches above top of sewer:
   a. Option 1: Construct water main within watertight casing pipe with evenly spaced annular gap provided by watertight end seals, or
   b. Option 2: Construct sewer of water main materials.
4. When it is impossible to obtain the required 3 foot horizontal clearance edge to edge, the sewer must be replaced with water main quality materials.
5. In no case shall horizontal separation be less than 2 feet.

B. **Horizontal separation of water mains from sanitary sewer force mains**:
1. When horizontal separation distance is at least 10 feet from edge to edge, there are no additional requirements.
2. When horizontal separation is at least 4 feet from edge to edge and less than 10 feet, sewer must be constructed of water main materials.
3. In no case shall horizontal separation be less than 4 feet.

C. **Vertical separation of water mains from gravity sanitary and combined sewer crossings**:
1. When vertical separation distance is at least 18 inches or greater from edge to edge and water main is located above sewer, there are no additional requirements.
2. When vertical separation distance is at least 6 inches from edge to edge and less than 18 inches, and water main is located above sewer:
   a. Option 1: Construct water main within watertight casing pipe with evenly spaced annular gap and watertight end seals, or
   b. Option 2: construct sewer of water main materials.
3. When vertical separation distance is 18 inches or greater from edge to edge, and water main is located below sewer:
   a. Option 1: Construct water main within watertight casing pipe with evenly spaced annular gap and watertight end seals, or
   b. Option 2: construct sewer of water main materials.
4. In no case shall vertical separation be less than 6 inches edge to edge when water main is above sewer.
5. In no case shall vertical separation be less than 18 inches edge to edge when water main is below sewer.

D. **Horizontal separation of water mains from gravity storm sewers**:
1. When horizontal separation is at least 10 feet from edge to edge, there are no additional requirements.
2. When horizontal separation is at least 3 feet from edge to edge and less than 10 feet:
   a. Option 1: Construct water main of ductile iron pipe with gaskets impermeable to hydrocarbons, or
   b. Option 2: Construct water main within watertight casing pipe with evenly spaced annular gap using chocks and watertight end seals, or
   c. Option 3: Construct sewer of water main materials, or
   d. Option 4: Construct reinforced concrete pipe storm sewers with gaskets manufactured in accordance with ASTM C443.
3. In no case shall horizontal separation be less than 3 feet.

E. **Vertical separation of water mains from gravity storm sewer crossings**:
1. When vertical separation distance is at least 18 inches from edge to edge, there are no additional requirements.

2. When vertical separation distance is at least 6 inches from edge to edge and less than 18 inches, and water main is located above sewer:
   a. Option 1: Construct water main of ductile iron pipe with gaskets impermeable to hydrocarbons, or
   b. Option 2: Construct water main within watertight casing pipe with evenly spaced annular gap using chocks and watertight end seals, or
   c. Option 3: Construct sewer of water main materials, or
   d. Option 4: Construct reinforced concrete pipe storm sewers shall be constructed with gaskets manufactured in accordance with ASTM C443.
3. In no case shall vertical separation be less than 6 inches when water main is above sewer.
4. In no case shall vertical separation be less than 18 inches when water main is below sewer.

F. **Separation of water mains from sewer manholes**:
1. No water pipe shall pass through, or come in contact with, any part of a sewer manhole.
2. Provide a horizontal separation distance of at least 10 feet between water mains and sewer manholes whenever possible.
3. In no case shall the horizontal separation of water main from sanitary and combined sewer manholes be less than 3 feet.

G. Advise Engineer should physical conditions exist such that exceptions to Part 3.02 of this Section are necessary.

3.03 WATER CROSSINGS

A. Above-water Crossings:
1. Adequately support and anchor pipe used for above-water crossings.
2. Protect pipe from damage and freezing.
3. Ensure pipe is accessible for repair or replacement.

B. Underwater Crossings:
1. Use restrained joint pipe for water mains entering or crossing streams that are 15 feet in width or larger.
   a. Place top of water main a minimum of 5 feet below natural bottom of streambed.
   b. Securely anchor water main to prevent movement of pipe and provide easily accessible shutoff valves located outside the floodway at each end of the water crossing.
   c. Backfill trench with crushed rock or gravel.
   d. Seed, sod, or otherwise protect streambank from erosion upon completion of the project.
2. For smaller streams, the same requirements shall apply except that shutoff valves do not need to be located immediately adjacent to the water crossing.
3. DMWW will electronically pinpoint leaks in lieu of inserting a small meter to determine leakage and obtain water samples on each side of shutoff valve.

3.04 DEPTH OF COVER AND WIDTH OF TRENCH

A. Provide 5 feet minimum depth of cover from top of pipe to ground surface.

B. Where possible, provide an additional 6 inches of cover under pavement.

C. Insulate water mains where conditions prevent adequate earth cover.

D. Provide a trench width adequate to lay and joint pipe properly but not more than 12 inches on either side of the pipe.

**** END OF SECTION ****

SECTION 02 61 00 DI AND PVC PIPE FOR WATER MAINS

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. This Section includes water mains, fittings, as shown on the plans, complete with accessories.

1.02 RELATED SECTIONS

A. Section 02 22 00 – Excavating, Backfilling, and Compacting for Water Mains.

B. Section 02 60 00 – Protection of Water Supply.

C. Section 02 64 00 – Valves and Hydrants.

D. Section 02 67 40 – Pressure Testing Water Mains.

E. Section 02 67 50 – Disinfection of Water Distribution Systems.

1.03 REFERENCES

A. ANSI B16.1 – Cast Iron Pipe Flanges and Flanged Fittings.

B. ASTM A320 – Alloy-Steel and Stainless-Steel Bolting for Low-Temperature Service.

C. ASTM A536 – Standard Specification for Ductile Iron Castings.

D. AWWA C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.

E. AWWA C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems.

F. AWWA C110 – Ductile-Iron and Gray-Iron Fittings.

G. AWWA C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

H. AWWA C115 – Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.

I. AWWA C150 – Thickness Design of Ductile Iron Pipe.

J. AWWA C151 – Ductile Iron Pipe, Centrifugally Cast.

K. AWWA C153 – Ductile-Iron Compact Fittings.

L. AWWA C600 – Installation of Ductile-Iron Water Mains and Their Appurtenances.

M. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.

N. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In.

1.04 SUBMITTALS

A. Submit the following items for materials provided by the Contractor:
   1. Manufacturer’s certification that materials furnished are in compliance with applicable requirements of referenced standards and this Section.
   2. Drawings and manufacturer’s data showing details of pipe and fittings to comply with this Section.
   3. Class of pipe and fittings.
   4. Restrained joint details for DMWW approval.
   5. List of at least ten projects similar to this project. Include project name, scope, duration of project, and references with phone numbers.

B. Provide dimensional drawings, fabrication details, functional description, and properly identified catalog data on pipe and equipment to prove complete compliance with contract documents.

1.05 MEASUREMENT AND PAYMENT

A. Measure water main in linear feet, along centerline of pipe.

B. Costs for material, equipment, and labor for work included in this Section is incidental to the bid item cost.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE (12 INCH AND SMALLER)

A. Special Thickness Class 52 per AWWA C150.

B. Manufacture pipe in accordance with AWWA C151.

C. Provide asphaltic outside coating per AWWA C151, 1 mil in thickness.

D. Cement Mortar Lining:
   1. Provide pipe with standard thickness cement mortar lining per AWWA C104.
   2. Seal-coat cement mortar lining in accordance with AWWA C104.

2.02 POLYVINYL CHLORIDE PIPE

A. Use Class 235 (DR 18) pipe with ductile iron pipe equivalent outside diameters.

B. Manufacture pipe in accordance with AWWA C900.

C. Use restrained-joint PVC pipe for pipe installed utilizing horizontal directional drilling.

D. Use blue pipe.

2.03 FITTINGS FOR DUCTILE IRON AND POLYVINYL CHLORIDE PIPE

A. Use compact fittings in accordance with AWWA C153, or full size in accordance with AWWA C110.

B. Use ductile iron material for construction in accordance with AWWA C110.

C. Joints
   1. Mechanical in accordance with AWWA C111 with restraint.
      a. T-bolts and hex-head nuts for mechanical joints in accordance with AWWA C111.
         (1) Material: low carbon alloy weathering Cor-Ten steel.
         (2) Coating: Cor-Blue fluorocarbon resin.
         (3) Color: Blue.
         (4) Approved Manufacturers:
            (a) Birmingham Fastener Manufacturing Fluorocarbon Coated T-Head Bolt.
            (b) Or approved equal.
   2. Flanged in accordance with AWWA C115, as indicated on plans, with ANSI Class 125 full-faced flange.
      a. Gaskets: of thickness compatible with machining tolerance of flange faces. Minimum thickness: 1/8 inch.
      b. Nuts and bolts: stainless steel in accordance with ASTM A320, Type 304.

D. Pressure Rating:

Size (inches)	Pressure Rating (psi)
3 – 24	350
30 – 48	250
54 – 64	150

E. Provide asphaltic outside coating per AWWA C110, 1 mil in thickness.

F. Cement Mortar Lining:
   1. Provide standard thickness cement mortar lining per AWWA C104.
   2. Seal-coat cement mortar lining in accordance with AWWA C104.

2.04 JOINTS FOR DUCTILE IRON AND POLYVINYL CHLORIDE PIPE

A. Use push-on joints using an integral bell with an elastomeric or nitrile gasket in accordance with AWWA C111, mechanical in accordance with AWWA C111, or restrained as needed for thrust restraint.

B. Use ductile iron follower glands for mechanical joints.

C. Solvent cement joints are strictly prohibited.

D. T-bolts and hex-head nuts for mechanical joints in accordance with AWWA C111.
   1. Material: low carbon alloy weathering Cor-Ten steel.
   2. Coating: Cor-Blue fluorocarbon resin.
   3. Color: Blue.
   4. Approved Manufacturers:
      a. Birmingham Fastener Manufacturing Fluorocarbon Coated T-Head Bolt.
      b. Or approved equal.

E. Joint bonds: No. 4 AWG-HMWPE stranded copper cable per Section 13 21 00.

2.05 RESTRAINED JOINTS

A. Mechanical Joint
   1. Incorporate restraint for all mechanical joints into the design of the follower gland.
   2. Use retainer gland designed to impart multiple wedging actions against the pipe, increasing its resistance as pressure increases.

3. Restrained joints to consist of a mechanical joint with retainer gland or manufacturer's proprietary-restrained joint.
4. Conform dimensions to the requirements of AWWA C111 and AWWA C153.
5. Pressure rating:
   a. Minimum of 235 psi for PVC pipe.
   b. Minimum of 350 psi for ductile iron pipe for sizes 16 inch and smaller.
   c. Minimum of 250 psi for ductile iron pipe for sizes 18 inch and larger.
6. Color:
   a. Red for PVC pipe.
   b. Black for ductile iron pipe.
7. Materials for construction:
   a. Body, wedge segments, and break-off bolt assemblies: Grade 65-45-12 ductile iron as specified by ASTM A536.
   b. Coating to be electrostatically applied and heat-cured.
      (1) Approved manufacturers:
         (a) MEGA-BOND by EBAA Iron, Inc.
         (b) CORRSAFE by Sigma.
         (c) Starbond by Star Products.
         (d) Resicoat R2-ES by Tyler Union.
         (e) EZ Shield by SIP Industries.
         (f) Or approved equal.
8. Minimum safety factor of 2.
9. Use ductile iron retainer wedge segments heat treated to a minimum Brinell hardness number of 370.
10. Incorporate twist-off nuts, the same size as hex-head nuts for T-bolts, into the design to ensure proper actuating torque is applied during installation.
11. Approved manufacturers for PVC pipe:
    a. Megalug by EBAA Iron Inc. Series 2000PV.
    b. One-Lok by Sigma Series SLCE.
    c. Stargrip by Star Products Series 4000.
    d. TUFGrip by Tyler Union Series 2000.
    e. EZ Grip by SIP Industries Series EZP.
    f. Or approved equal.
12. Approved manufacturers for ductile iron pipe:
    a. Megalug by EBAA Iron Inc. Series 1000.
    b. One-Lok by Sigma Series SLDE.
    c. Stargrip by Star Products Series 3000.
    d. TUFGrip by Tyler Union Series 1000.
    e. EZ Grip by SIP Industries Series EZD.
    f. Or approved equal.

B. PVC Pipe Joint
   1. Provide restraint for in-line PVC pipe through the use of groove and spline or grip ring located in the bell that provides full-circumferential restrained joint.
   2. Restraint joints to have a minimum pressure rating of 150 psi.
   3. Manufacturers:
      a. Certa-Lok by North American Specialty Products.
      b. Diamond Lok-21 by Diamond Plastics.
      c. Eagle Loc 900 by JM Eagle.
      d. Or approved equal.

C. Ductile Iron Pipe Joint
   1. Restraint for in-line ductile iron pipe shall consist of the manufacturer's proprietary-restrained joint.
   2. Restraint joints to have a minimum pressure rating of 250 psi.

2.06 POLYETHYLENE PIPE ENCASEMENT MATERIAL (DUCTILE IRON PIPE AND FITTINGS)

A. Polyethylene encasement manufactured in accordance with AWWA C105.

B. Linear low-density polyethylene film.

C. Minimum thickness of be 8 mils.

D. Color: Blue.

E. Physical Properties:
1. Tensile strength 3600 psi, minimum.
2. Elongation 800 percent, minimum.
3. Dielectric strength 800 V/mil, minimum.
4. Impact resistance 600 g, minimum.
5. Propagation tear resistance 2550 gf, minimum.

F. Use flat-width tubing of the following sizes:

Pipe Size	Tubing Width
3 inches	14 inches
4 inches	14 inches
6 inches	16 inches
8 inches	20 inches
12 inches	27 inches
16 inches	34 inches
20 inches	41 inches
24 inches	54 inches
30 inches	67 inches
36 inches	81 inches

G. Provide markings containing the following information spaced every 2 feet apart:
1. Name of manufacturer.
2. Year of manufacture.
3. ANSI/AWWA C105-A21.5.
4. 8 mil linear low-density polyethylene (LLDPE).
5. Applicable range of nominal pipe diameter.
6. Warning – Corrosion Protection – Repair Any Damage.

H. Sheet material can be used to wrap irregular-shaped valves and fittings.

I. Use 2 inch wide, 10 mil thick pressure-sensitive polyethylene tape to close seams and hold overlaps.

2.07 CASING END SEAL

A. Minimum 1/8 inch thick manufactured synthetic rubber casing end seal with stainless steel bands and fasteners.

B. To be watertight.

2.08 CASING PIPE

A. Use manufactured casing spacers to position carrier pipe in casing. Do not use wood skids.

B. Meet the following material requirements:

1. HDPE Band/Panel and Riser: ASTM D 6389
2. Stainless Steel or Carbon Steel Band/Panel and Riser. Type 304 stainless steel according to ASTM A 240 or carbon steel according to ASTM A 36.
   a. Liner: Elastomeric PVC per ASTM D 149
   b. Spacer Skid/Runner: Abrasion resistant polymer with a low coefficient of friction.
   c. Fasteners: Type 304 (18-8) stainless steel per ASTM A 193.

2.09 CASING PIPE

A. PIPE

1. Use only new, steel pipe meeting the requirements of ASTM A 139, Grade B, ASTM A 252, Grade 2: ASTM A 53, Grade B; or API 5L X Grade. Pipe may be welded or seamless. Wall thickness will be specified in the contract documents.

B. JOINTS

1. Comply with American Welding Society Code D1.1. Weld all joints with full penetrating weld. Welders must be qualified according to Article 2408.03, B of the Standard Specifications. Welds must comply with Materials I.M. 558.
2. Upon approval of the Engineer, an interlocking casing pipe connection system may be used in lieu of field welding the sections of casing pipe.
3. Joints to be watertight.

C. PIPE DIAMETER

1. Minimum inside diameter as specified in the contract documents. If diameter is not specified, use a minimum inside casing diameter of at least 4 inches greater than the largest outside diameter of the carrier pipe, including pipe bells and pipe restraints.

2.10 TRACER SYSTEM

A. Tracer Wire:
1. Open Cut:
   a. No. 12 AWG Solid Single Copper Conductor
      (1) Insulation: 45 mil, high-density, high molecular weight polyethylene (HDPE) and rated for direct burial at 30 volts.
      (2) Tensile Strength: 150 pounds, minimum.
      (3) Color: Blue.
2. Directional Drilling/Boring:
   a. No. 12 AWG extra-high-strength copper clad steel conductor (EHS-CCS).
      (1) Insulation: 45 mil, high-density, high molecular weight polyethylene (HDPE) and rated for direct burial at 30 volts.
      (2) EHS-CCS Conductor: 21 percent conductivity for locating purposes with a minimum 1150 pounds break load.
      (3) Origin of copper clad steel manufacture is required and steel core must be manufactured in the United States.
      (4) Color: Blue.
   b. Install tracer wire on pipe installations with a combination of open cut and directional drilling to meet directional drilling requirements.

B. Anode Ground Rod: 3/8 inch minimum diameter, 8 foot minimum length steel rod uniformly coated with metallically bonded electrolytic copper.

C. Ground Rod Clamp: High-strength, corrosion-resistant copper alloy.

D. Wire Splice Connector:
   1. Tracer wire splices shall only be used to connect the anode ground rod to the tracer wire, at tees/crosses and at places where tracer wire has been damaged during construction. All splices must be brought to the attention of inspector and a GPS shot recorded for DMWW records.
   2. Tracer wire splices will not be allowed for:
      a. Splices between the end of a roll of wire and the beginning of a new roll. If wire roll does not contain enough wire to reach next required splice point or a Triview connection terminal, contractor shall start a new wire roll.
      b. Between anode ground rods and Triview connection terminal.
      c. At hydrant tees.
   3. Splices used for tracer wire repair must be approved by Engineer.
      a. Splice Kit: DryConn Direct Bury Lug Aqua (SKU 90220)
      b. Or approved equal.

E. Tracer Wire Connection:
   1. Rhino TriView TracerPed, or approved equal.
      a. Three internal terminals with two shunts.
      b. 5 foot white plastic triangular post.
      c. Removable top cap with lock.
      d. Three 2 7/8 inch by 14 inch custom vinyl decals No. SD-5594K.
      e. Tri-grip anchor.

PART 3 EXECUTION

3.01 HANDLING, STORAGE, AND SHIPPING

A. Handle pipe carefully.

B. Use blocking and hold-downs during shipment to prevent movement or shifting.

C. Pipe with damage to cement mortar lining will be rejected with field-patching not permitted.

D. Do not telescope small pipe inside larger pipe for shipment and storage.

E. Handle pipe materials by use of nylon straps, wide canvas or padded slings, wide-padded forks and skids, or other approved means designed to prevent damage to the polyethylene encasement. Unpadded chains, sharp edges or buckets, wire ropes, narrow forks, hooks, and metal bars are unacceptable.

F. Dropping or rolling of pipe material is not permitted.

G. Do not store PVC pipe in direct sunlight for prolonged periods of time.

H. Protect pipe to prevent dirt entering the pipe.

3.02 GENERAL PIPE INSTALLATION

A. Protect pipe joints from injury while handling and storing.

B. Use no deformed, defective, gouged, or otherwise impaired pipe.

C. Excavate and prepare trench as specified in Section 02 22 00.

D. Install ductile iron pipe in accordance with AWWA C600.

E. Install PVC pipe in accordance with AWWA C605.

F. Prepare trench bottom with sufficient exactness before pipe is installed so that only minor movement of the pipe will be necessary after installation.

G. Clean pipe interior prior to placement in trench.

H. Install pipe to line and grade shown on plans with an allowable tolerance of ± 6 inches.

I. Maintain uniform bearing along full length of pipe barrel at all times. Blocking the pipe up will not be acceptable. Excavate trench bottoms deeper at location of bell joints to permit body of pipe to rest uniformly supported upon trench bottom. Use bell holes no longer than is necessary for practical installation of the pipe.

J. Clean joint surfaces of dirt and foreign matter using a wire brush before jointing pipe.

K. Lubricate gasket and pipe bell. Provide food grade lubricant meeting manufacturer's recommendations. Use lubricant approved for use with potable water.

L. Make joints in strict accordance with manufacturer's recommendations.

M. Deflect joints within manufacturer's specifications for maximum deflections.

N. Tighten bolts on mechanical joints evenly around pipe by alternating from one side of the pipe to the other.

O. Cut pipe in a neat manner, without damage to pipe or cement mortar lining, if any. Leave a smooth end at right angles to axis of pipe. Bevel cut pipe ends for push-on-type joints in accordance with manufacturer's recommendations.

P. Do no install pipe in water, nor allow water to rise in trench above bottom of pipe.

Q. Place watertight bulkheads on exposed ends of pipe at all times when pipe installation is not actually in progress.

R. Backfill and compact around pipe as outlined in Section 02 22 00.

3.03 INSTALLATION OF POLYETHYLENE PIPE ENCASEMENT MATERIAL

A. Use polyethylene encasement material on buried ductile iron pipe, fittings, rods, and appurtenances in accordance with AWWA C105, Method A.

B. Use polyethylene tubing to encase pipe.

C. Cut tubing 2 feet longer than pipe section. Overlap tubing 1 foot at each end of pipe.

D. Gather and lap tubing to provide a snug fit.

E. Secure lap at quarter points with polyethylene tape. Secure each end of tube with a complete wrap of polyethylene tape.

F. Use polyethylene encasement to prevent contact between the pipe and bedding material. The polyethylene encasement is not intended to be a completely airtight and watertight enclosure.

G. Repair damaged polyethylene encasement material using polyethylene tape or replace damaged section(s).

H. Pick and move polyethylene-encased pipe with nylon slings; wire rope is not permitted.

3.04 CASING PIPE INSTALLATION

A. Install pipe by approved methods.

B. Fully welded all casing pipe joints. Use an interlocking connection system when approved by the Engineer.

3.05 CARRIER PIPE INSTALLATION THROUGH CASING

A. Clean dirt and debris from the interior of the casing pipe after installation.

B. Install casing spacers on carrier pipe sections as necessary to support the pipe barrel according to the pipe manufacturer's recommendations subject to the following minimum requirements:
   a. Install spacer within 1 foot of each side of the carrier pipe joint and at a maximum spacing of 6 feet.
   b. Do not allow the pipe to be supported by joint bells or restraints.
   c. Lubricate casing spacers with drilling mud or flax soap. Do not use petroleum-based lubricants or oils.

C. Ensure that thrust loads will not damage carrier pipe joints. Provide thrust collars between joint shoulders of concrete pipe.

D. Provide timbers for sufficient cushioning between the end of the pipe pushed and the jacking equipment to prevent damage to the pipe. Do not allow the steel jack face to thrust against the unprotected pipe end.

E. Position jacks so the resulting force is applied evenly to the entire end of the pipe.

F. Assemble pipe joints before pushing the carrier pipe into the casing.

G. Close the end of the casing pipe around the carrier pipe with a casing end seal.

3.06 THRUST BLOCKS

A. Provide concrete thrust blocks or collars at changes in alignment, tees, and dead ends.

B. Carry thrust blocks or collars to undisturbed soil that will provide adequate bearing.

C. The bearing area of thrust blocks or collars, in square feet, to be as shown on the plans. Minimum thickness for any thrust block to be 1.5 times outside pipe diameter or 18 inches, whichever is greater.

D. Hold thrust blocks or collars back 3 inches from all bolts, nuts, glands, or other jointing materials. Ensure joints could be remade without disturbing thrust block or collar.

E. Provide bond breaker between thrust block or collar and pipe. Polyethylene encasement material will be considered an acceptable bond breaker.

F. Provide thrust blocks at all connections to existing water mains.

3.07 TRACER SYSTEM INSTALLATION

A. Install tracer wire with buried piping.

B. Duct tape tracer wire to pipe every 5 feet in the 5 or 7 o'clock position to prevent damage to wire during backfill and future construction exposure.

C. Install anode ground rods adjacent to connections to existing piping and at each fire hydrant.

D. Terminate tracer wire in tracer wire connection next to each fire hydrant or other locations directed by DMWW.

E. Wire splice connectors can only be used to connect ground rods to tracer wire. Wire splice connectors are not allowed at any other locations unless approved by DMWW. Provide long enough roll of tracer wire to not need the use of wire splice connectors.

F. Allow DMWW to inspect underground splices prior to backfilling.

G. Tracer wire installation is considered incidental to water main installation.

3.08 TESTING AND CHLORINATION

A. Perform hydrostatic and leakage tests in accordance with Section 02 67 40.

B. Disinfect all water mains in accordance with Section 02 67 50.

C. A tracer wire test will be conducted by DMWW prior to any pavement or surface restoration. The tracer wire system including terminations at all TriViews, anode ground rods, and splice kits are to be completely installed prior to tracer wire test. Any deficiency found in tracer wire system to be corrected by Contractor at Contractor's expense.

**** END OF SECTION ****

SECTION 02 64 00 – VALVES AND HYDRANTS

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. This Section includes valves and hydrants as shown on the plans, complete with accessories.

1.02 RELATED SECTIONS

A. Section 02 22 00 – Excavating, Backfilling, and Compacting for Water Mains.

B. Section 02 60 00 – Protection of Water Supply.

C. Section 02 61 00 – Ductile Iron and Polyvinyl Chloride Pipe for Water Mains.

D. Section 02 67 40 – Pressure Testing

E. Section 02 67 50 – Disinfection

1.03 REFERENCES

A. ANSI B16.1 – Cast Iron Pipe Flanges and Flanged Fittings.

B. ASTM A320 – Alloy-Steel and Stainless-Steel Bolting for Low-Temperature Service.

C. ASTM A536 – Standard Specification for Ductile Iron Castings.

D. ASTM B584 – Copper Alloy Sand Castings for General Applications.

E. AWWA C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems.

F. AWWA C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

G. AWWA C115 – Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.

H. AWWA C153 – Ductile Iron Compact Fittings.

I. AWWA C502 – Dry-Barrel Fire Hydrants.

J. AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service.

K. AWWA C515 – Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.

L. AWWA C550 – Protective Interior Coatings for Valves and Hydrants.

M. AWWA C600 – Installation of Ductile-Iron Water Mains and Their Appurtenances.

1.04 SUBMITTALS

A. Submit manufacturer's certification that materials furnished are in compliance with applicable requirements of referenced standards and this Section.

B. Provide dimensional drawings, fabrication details, functional description, and properly identified catalog data on all items to prove complete compliance with contract documents.

1.05 MEASUREMENT AND PAYMENT

A. All material, equipment, and labor necessary to comply with this Section incidental to unit price bids.

PART 2 PRODUCTS

2.01 GATE VALVES

A. Provide resilient-seated gate valves manufactured in accordance with AWWA C509 or AWWA C515.
   1. Type of service: buried service handling potable water with a pH range of 9.5 to 9.8.
   2. Minimum pressure rating: 250 psi.
   3. Provide valves with non-rising stem.
   4. Provide 2 inch by 2 inch wrench operating nut that opens valves when turned in clockwise direction (open to the right), unless noted otherwise on plans.
   5. Valve gearing for 20 inch to 48 inch valves:
      a. Provide valve with gear box.
      b. Provide vertical valve unless otherwise specified on plans.
      c. Use the following gear ratios for the corresponding sizes:

Valve Size (inches)	Gear Ratio
20	3 to 1
24	3 to 1
30	6 to 1
36	6 to 1
42	8 to 1
48	8 to 1

      d. Totally enclosed type, oil-filled, and designed for buried and submerged service.
      e. Materials of construction:
         (1) Gear housing: ductile iron.
         (2) Gears: carbon steel.
         (3) Pinion shaft: 304 stainless steel.
         (4) Design input shaft with a ball bearing and sealed with O-rings.
         (5) Exposed hex nuts and bolts: 304 stainless steel.

B. Materials of Construction:
   1. Body and bonnet: ductile iron.
   2. Gate: cast or ductile iron fully encapsulated with synthetic rubber.
   3. Stem and stem nut: bronze.
   4. O-rings: Buna-N.

5. Exposed hex bolts and nuts: 304 stainless steel.
6. Joints:
   a. Mechanical in accordance with AWWA C111.
      (1) Gaskets: Buna-N or nitrile.
      (2) Nuts and bolts:
         (a) All T-bolts and hex-head nuts for mechanical joints in accordance with AWWA C111.
         (b) Material: low carbon alloy weathering Cor-Ten steel.
         (c) Coating: Cor-Blue fluorocarbon resin.
         (d) Color: Blue.
         (e) Approved Manufacturers:
            1) Birmingham Fastener Manufacturing Fluorocarbon Coated T-Head Bolt.
            2) Or approved equal.
   b. Flanged in accordance with AWWA C115, as indicated on the plans, with ANSI Class 125 full-faced flange.
      (1) Gaskets: Buna-N or nitrile, of thickness compatible with machining tolerances of flange faces. Minimum thickness: 1/8 inch.
      (2) Nuts and bolts: 304 stainless steel.

C. Design valve to:
   1. Allow replacement of upper O-ring while valve is under pressure in the full-open position.
   2. Not permit metal-to-metal contact between gate and body.
   3. Accommodate full-size tapping machine shell cutter.

D. Horizontal valves are required to have a cleaning system on both sides of the gate consisting of materials that are non-corrosive.

E. Interior and exterior valve coating minimum of 10 mil thick fusion-bonded epoxy per AWWA C550.

F. Operating valve through 500 cycles at rated pressure must not result in disbondment or degradation of the coating. Certification will be required for manufacturers not listed below.

G. Indicate manufacturer, casting year, size, working pressure, and body material (ductile iron) in valve casting.

H. Manufacturers' Models for 4 inch to 16 inch valves:
   1. Clow Model 2638.
   2. American Flow Control Series 2500.
   3. Mueller 2300 Series.
   4. M & H Style 4067.
   5. EJ Flowmaster.
   6. Approved equal.

I. Manufacturers' Models for 20 inch to 48 inch valves:
   1. Clow Model 2638.
   2. American Flow Control Series 2500.
   3. Mueller 2300 Series.
   4. EJ Flowmaster.
   5. Approved equal.

2.02 SWING CHECK VALVE

A. Provide swing check valves manufactured in accordance with AWWA C508.
   1. Type of service: buried service handling potable water with a pH range of 9.5 to 9.8.
   2. Minimum pressure rating: 250 psi.

B. Materials of Construction:
   1. Body and cover: ductile iron per ASTM A536.
   2. Disc: molded Buna-N (NBR) per ASTM D2000-BG.
   3. Disc accelerator: Type 302 stainless steel.
   4. Exposed hex bolts and nuts: stainless steel.
   5. Joints:
      a. Flanged in accordance with AWWA C115, as indicated on the plans, with ANSI Class 125 full-faced flange.
         (1) Gaskets: Buna-N or nitrile, of thickness compatible with machining tolerances of flange faces. Minimum thickness: 1/8 inch.
         (2) Nuts and bolts: Conform to ASTM A320, Type 304.

C. Provide full-size top access port to allow removal of the disc without removing the valve from the line.

D. Provide one-piece disc with alloy steel and nylon reinforcement.

E. Provide one-piece disc accelerator, enclosed within the valve, field adjustable, and replaceable without removing the valve from the line.

F. Interior and exterior valve coating shall be ANSI/NSF approved fusion-bonded epoxy.

G. Manufacturers:
   1. Val-Matic Series #7200 Surgebuster Swing Check Valve.
   2. Approved equal.

2.03 HYDRANTS (DES MOINES)

A. Hydrants manufactured in accordance with AWWA C502.

B. Use dry-barrel, breakaway type hydrants designed to break near ground line on impact. The breaking ring consists of a full circumference one piece or split contact retaining ring.

C. Provide flanged connections for head and base to hydrant barrel.

D. Provide 6 inch mechanical joint shoe with harnessing lugs.

E. Provide 4 1/2 inch minimum diameter main valve with bronze seat ring. Thread seat ring directly to bronze bushing or drain ring that is securely locked to hydrant shoe.

F. Provide pentagon-shaped operating nut with weather cap. Dimension from point to flat at top of operating nut: 1 3/16 inch.

G. Provide two 2 1/2 inch hose nozzles and one 4 inch pumper nozzle with caps having nut with dimensions identical to operating nut:
   1. Hose nozzle threads
      a. Outside diameter of male thread: 3 1/16 inches
      b. Diameter at root of male thread: 2 7/8 inches

c. Threads per inch: 7 1/2
d. Length of nozzle threads: 1 inch
e. Cut off at top of threads: 1/4 inch

2. Pumper nozzle threads
   a. Outside diameter of male thread: 4 31/32 inches
   b. Diameter at root of male thread: 4 19/32 inches
   c. Threads per inch: 4
   d. Length of nozzle threads: 1 1/2 inches
   e. Cut off at top of threads: 1/4 inch

H. Provide markings cast-in-bonnet that indicate direction of opening. Hydrants to open clockwise (to the right).

I. Provide anti-thrust washers for ease of operation.

J. Provide grease chamber or oil reservoir, sealed by means of O-rings, for lubrication of operation threads. Provide lubricant suitable for contact with potable water.

K. Painting:
1. Prepare surfaces to be coated according to SSPC-SP6, commercial blast cleaning.
2. Coat hydrant in accordance with AWWA C502 and coating manufacturer's instructions.
3. Tnemec epoxy paint system (Alternative 1)
   a. Coat interior surfaces, other than machined surfaces, with asphaltic coating.
   b. Coat exterior surfaces below grade with two coats of asphaltic coating.
   c. Prime exterior surfaces above grade using an aromatic urethane, zinc-rich system with 2.5 to 3.5 mils dry film thickness. Tnemec Series 90-97.
   d. Paint exterior surfaces above grade using an aliphatic acrylic polyurethane system at 2.5 to 3.5 mils dry film thickness. Tnemec Series 73.
   e. Apply a 2 to 3 mils dry film thickness of high gloss clear coat to exterior surfaces above grade after paint has been allowed to dry thoroughly. Tnemec Series 1079.
   f. Color:
      (1) Asphaltic coating: Black.
      (2) Primer: Reddish-gray.
      (3) Body: Bright Yellow (03SF).
      (4) Bonnet: Safety Green (09SF).
      (5) Caps: Bright Yellow (03SF).
4. Tnemec epoxy paint system (Alternative 2)
   a. Coat interior surfaces, other than machined surfaces, with asphaltic coating.
   b. Coat exterior surfaces below grade with two coats of asphaltic coating.
   c. Prime exterior surfaces above grade using a polyamide epoxy system, Tnemec Series 20, FC20 or 66, and paint using an aliphatic acrylic polyurethane system, Tnemec Series 75, or approved equal. Provide total dry mil thickness of 5 to 7 mils.
   d. Apply a 2 to 4 mils dry thickness of clear coat to exterior surfaces above grade after paint has been allowed to dry thoroughly.
   e. Color:
      (1) Asphaltic coating: Black.
      (2) Primer: White (AA83).
      (3) Paint: Bright Yellow (SC02).
      (4) Bonnet: Safety Green (SC07).
      (5) Caps: Bright Yellow (SC02).
5. Approved equal.
   a. System must be approved by DMWW prior to bid opening.

L. Materials of Construction:
1. Breakaway stem coupling: steel, cast iron, or stainless steel.
2. Bonnet barrel, shoe, gate, and nozzle caps: cast iron.

3. Threaded internal components exposed to water, valve seats, and nozzles: bronze.
4. Cotter pins, drive pins, bolts, and screws exposed to water: stainless steel or brass.
5. Exterior bolts, nuts, set screws, and other miscellaneous fasteners: stainless steel or bronze. Metal components in contact with water to comply with requirements of ASTM B584 copper alloy UNS No. C89520 or UNS No. C89833. Residual lead levels of the metal not to exceed 0.25% by weight as cast or extruded.

M. Manufacturers:
1. Clow Medallion.
2. Mueller Centurion.
3. Approved equal.

2.04 JOINTS FOR VALVES AND HYDRANTS

A. Use mechanical joints in accordance with AWWA C111, or restrained as indicated on plans.

B. Use ductile iron follower glands for mechanical joints.

C. Bolts:
1. All T-bolts and hex-head nuts for mechanical joints in accordance with AWWA C111.
   a. Material: low carbon alloy weathering Cor-Ten steel.
   b. Coating: Cor-Blue fluorocarbon resin.
   c. Color: Blue.
   d. Approved Manufacturers:
      (1) Birmingham Fastener Manufacturing Fluorocarbon Coated T-Head Bolt.
      (2) Or approved equal.
2. All bolts and hex nuts for flanged joints of 304 stainless steel.

D. Use flange joints having 1/8 inch rubber ring gaskets for nominal diameters of 24 inches or less and 1/8 inch rubber ring gaskets for nominal diameter greater than 24 inches.

E. Use elastomeric or nitrile gaskets in accordance with AWWA C111.

2.05 RETAINER GLANDS

A. Incorporate restraint for all mechanical joints into design of follower gland.

B. Use a retainer gland design imparting multiple wedging actions against the pipe, increasing its resistance as pressure increases.

C. Restrained joints to consist of a mechanical joint with retainer gland or manufacturer's proprietary-restrained joint.

D. Dimensions conforming to the requirements of AWWA C111 and AWWA C153.

E. Pressure rating:
1. Minimum of 235 psi for PVC pipe.
2. Minimum of 350 psi for ductile iron pipe for sizes 16 inch and smaller.
3. Minimum of 250 psi for ductile iron pipe for sizes 18 inch and larger.

F. Color:
   1. Red for PVC pipe.
   2. Black for ductile iron pipe.

G. Materials for construction:
   1. Body, wedge segments, and break-off bolt assemblies: Grade 65-45-12 ductile iron as specified by ASTM A536.
   2. Coating to be electrostatically applied and heat-cured.
      a. Approved manufacturers:
         (1) MEGA-BOND by EBAA Iron, Inc.
         (2) CORRSAFE by Sigma.
         (3) Starbond by Star Products.
         (4) Resicoat R2-ES by Tyler Union.
         (5) EZ Shield by SIP Industries.
         (6) Or approved equal.

H. Minimum factor of safety of 2.

I. Use ductile iron retainer wedge segments heat-treated to a minimum Brinell hardness number of 370.

J. Incorporate twist-off nuts, the same size as hex-head nuts for T-bolts, into the design to ensure proper actuating torque is applied during installation.

K. Approved manufacturers for PVC pipe:
   1. Megalug by EBAA Iron Inc. Series 2000PV.
   2. One-Lok by Sigma Series SLCE.
   3. Stargrip by Star Products Series 4000.
   4. TUFGrip by Tyler Union Series 2000.
   5. EZ Grip by SIP Industries Series EZP.
   6. Or approved equal.

L. Approved manufacturers for ductile iron pipe:
   1. Megalug by EBAA Iron Inc. Series 1000.
   2. One-Lok by Sigma Series SLDE.
   3. Stargrip by Star Products Series 3000.
   4. TUFGrip by Tyler Union Series 1000.
   5. EZ Grip by SIP Industries Series EZD.
   6. Or approved equal.

2.06 VALVE BOXES

A. Provide cast iron screw-type adjustable heavy-duty valve box with cast iron stay-put cover marked "WATER" for each buried valve.

B. Minimum inside diameter of valve boxes of 5 1/8 inches.

C. Weight of valve box assembled, top and bottom sections, without valve box lid as follows:

Extension Height (inches)	Weight (pounds)
27-37	71
33-43	78
39-50	85
36-52	93
39-60	100

D. Tyler No. 6850 29-U Domestic, or approved equal.

E. For an approved equal, provide proof that all parts of proposed valve box can be interchangeable with Tyler No. 6850 29-U Domestic.

F. Install valve boxes upon valve with use of a rubber Valve Box Adapter II as manufactured by Adaptor Inc., or approved equal.

2.07 POLYETHYLENE ENCASEMENT MATERIAL

A. Polyethylene encasement manufactured in accordance with AWWA C105.

B. Linear low-density polyethylene film.

C. Minimum thickness of 8 mils.

D. Color: Blue.

E. Physical Properties:
1. Tensile strength 3600 psi, minimum.
2. Elongation 800%, minimum.
3. Dielectric strength 800 V/mil, minimum.
4. Impact resistance 600 g, minimum.
5. Propagation tear resistance 2550 gf, minimum.

F. Sheet material can be used to wrap irregular-shaped valves and fittings.

G. Use 2 inch wide, 10 mil thick pressure-sensitive polyethylene tape to close seams and hold overlaps.

PART 3 EXECUTION

3.01 HANDLING, STORAGE, AND SHIPPING

A. Handle valves and hydrants carefully.

B. Use blocking and hold-downs during shipment to prevent movement or shifting.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Protect valves and hydrants from injury while handling and storing.

B. Use no defective, damaged, or otherwise impaired materials.

C. Prepare excavation as outlined in Section 02 22 00.

D. Install valves and hydrants in accordance with AWWA C600.

E. Clean interior of valve or hydrant prior to placement in trench.

F. Install valves and hydrants to line and grade as shown on plans.

G. Install valves and hydrants plumb.

H. Clean joint surfaces of dirt and foreign matter using a wire brush before jointing.

I. Lubricate gasket and bell. Provide food grade lubricant meeting manufacturer's recommendations. Use lubricant approved for use with potable water.

J. Make joints in strict accordance with manufacturer's recommendations.

K. Evenly tighten bolts on mechanical joints or flanged joints around pipe by alternating from one side of pipe to the other. Follow manufacturer’s installation specifications for electrical isolation flanges to prevent damage during bolt torquing.

L. Backfill and compact around hydrants and valves as outlined in Section 02 22 00.

3.03 VALVE INSTALLATION

A. Do not support valves off of piping.

B. Ensure valve box is centered over operating nut.

C. Install rubber Valve Box Adapter II as manufactured by Adapter Inc., or approved equal, inside of valve box centered on valve.

D. If located within pavement, the top of valve boxes shall be installed 1/4 inch below the pavement surface.

3.04 HYDRANT INSTALLATION

A. Anchor auxiliary valve to hydrant tee.

B. Install hydrant with break flange more than 1 inch and less than 7 inches above finished grade.

C. The use of hydrant extensions will not be allowed to set hydrant to appropriate height, unless approved by DMWW. Hydrant extensions, if approved, must be from same manufacture as the fire hydrant.

D. Use restrained joints in hydrant branch.

E. Set hydrant on a solid concrete cinder block not smaller than 8 inch by 16 inch by 4 inch.

F. Provide poured concrete thrust blocks behind hydrant and hydrant tee.

G. Ensure hydrant drain is free-flowing and unobstructed in areas where normal groundwater level is below drain opening.

H. Provide not less than 1 cubic yard of open-graded granular fill around base of hydrant for drainage.

I. Lubricate and exercise each of the three hydrant caps to prevent seizing. Provide food grade grease lubricant meeting manufacturer’s recommendations. Use lubricant approved for use with potable water.

3.05 INSTALLATION OF POLYETHYLENE PIPE ENCASEMENT MATERIAL

A. Use polyethylene encasement material on buried valves and buried portion of hydrants in accordance with AWWA C105.

B. Wrap valves using polyethylene sheet material to prevent contact with bedding. Secure sheet to adjacent pipe and just below valve operation nut using polyethylene tape.

C. Wrap buried portions of hydrants using 24 inch flat-width polyethylene tubing. Secure tubing to hydrant barrel just below grade using polyethylene tape.

D. The polyethylene encasement preventing contact with bedding material is not intended to be an airtight and watertight enclosure.

E. Repair damaged polyethylene encasement material using polyethylene tape, or replace the damaged section.

3.06 THRUST BLOCKS

A. Provide concrete thrust blocks at hydrants and hydrant tees.

B. Carry thrust blocks to undisturbed soil that will provide adequate bearing.

C. The bearing area of thrust blocks, in square feet, as shown on the plans. Minimum thickness for thrust block of 1.5 times outside pipe diameter or 18 inches, whichever is greater.

D. Hold thrust blocks back 3 inches from bolts, nuts, glands, or other jointing materials. Ensure joints could be remade without disturbing thrust block.

E. Provide bond breaker between thrust block and pipe or hydrant. Polyethylene encasement material will be considered an acceptable bond breaker.

3.07 REMOVAL OF ABANDONED FIRE HYDRANTS AND VALVE BOXES

A. Surface restoration items including pavement removal and replacement, seeding, or sodding, needed to remove abandoned fire hydrants or valve boxes to be paid in accordance with appropriate bid item in contract.

B. All other items related to removal of abandoned fire hydrants and valve boxes including repairs to traffic loops and lawn irrigations systems incidental to contract.

C. Remove abandoned fire hydrants by disconnecting pipe from fire hydrant at the shoe.

D. Return abandoned fire hydrants to Des Moines Water Works at 408 Fleur Drive, unless DMWW approves their disposal.

E. Backfill and restore all excavations for fire hydrant removals according to Section 02 22 00 and project paving requirements.

F. Remove abandoned valve box and entire top section, backfill the lower section and excavation, and restore according to Section 02 22 00 and project paving requirements.

**** END OF SECTION ****

SECTION 02 66 00 – WATER SERVICES TRANSFERS

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Transferring existing water services from existing water mains to new water mains to the extent shown in the plans.

1.02 RELATED SECTIONS

A. Section 02 22 00 – Excavating, Backfilling, and Compacting for Water Mains.

B. Section 02 60 00 – Protection of Water Supply.

C. Section 02 61 00 – Ductile Iron and Polyvinyl Chloride Pipe for Water Mains.

D. Section 02 64 00 – Valves and Hydrants.

E. Section 02 67 40 – Pressure Testing Water Mains.

F. Section 02 67 50 – Disinfection of Water Distribution Systems.

1.03 REFERENCES

A. ASTM B62 – Composition Bronze or Ounce Metal Castings.

B. ASTM B88 – Seamless Copper Water Tube.

C. ASTM B584 – Copper Alloy Sand Castings for General Applications.

D. AWWA C800 – Underground Service Line Valves and Fittings.

1.04 SUBMITTALS

A. Submit the following items for materials provided by the Contractor:
   1. Manufacturer’s certification that materials furnished are in compliance with the applicable requirements of the referenced standards and this Section.
   2. Drawings and manufacturer’s data showing details of the pipe and fittings to comply with this Section.

B. Provide dimensional drawings, fabrication details, functional description, and properly identified catalog data on all equipment to prove complete compliance with contract documents.

1.05 MEASUREMENT AND PAYMENT

A. Payment for installation of 1 inch to 2 inch water service transfer is made as a unit, including the connection to new water main with insulated corporation and corporation 90, installation of new curb stop and stop box, installation of pipe, connection to existing water service, excavation, backfill, and compaction.

B. Payment for installation of 4 inch and larger water service transfer is made as a unit, including the tee, valve, DI pipe, valve box, valve box adapter, needed fittings, poly wrap, bonded joints, and thrust restraint.

C. All work related to water service transfer is considered incidental to the installation of the water service transfer.

PART 2 PRODUCTS

2.01 CORPORATION VALVES

A. Type: one-quarter-turn ball valve in accordance with AWWA C800.

B. Inlet Threads: standard AWWA corporation valve inlet threads.

C. Outlet Threads: flared copper connection.

D. Provide corporations to be used on iron pipe with a dielectric insulator that prevents the passage of electric current.

E. Metal components in contact with water to comply with the requirements of ASTM B584 copper alloy UNS No. C89520 or UNS No. C89833. Residual lead levels of the metal not to exceed 0.25% by weight as cast or extruded.

F. Metal components not in contact with water to comply with the requirements of ASTM B62 copper alloy UNS No. C38600 or the material as described in Part 2.01.E.

G. Meet DMWW Rules and Regulations for Water Services.

H. Approved Manufacturers for Corporation Valves on Non-iron Pipe:
   1. A.Y. McDonald Mfg. Co., Model No. 74701B.
   2. The Ford Meter Box Company, Inc., Catalog No. FB600-NL.
   3. Mueller Co., Model No. 300 Catalog No. B-25000N.

I. Approved Manufacturers for Corporation Valves on Iron Pipe:
   1. A.Y. McDonald Mfg. Co., Model No. 74701BDB.
   2. The Ford Meter Box Company, Inc., Catalog No. SI-FB600-NL.
   3. Mueller Co., Model No. 300 Catalog No. N-35000N.

2.02 COPPER PIPE

A. Copper Tubing: ASTM B88, Type K, annealed.

B. Joints: flared.

C. Meet DMWW Rules and Regulations for Water Services.

2.03 FITTINGS (2 INCH AND SMALLER)

A. Joints: flared.

B. Metal components in contact with water to comply with the requirements of ASTM B584 copper alloy UNS No. C89520 or UNS No. C89833. Residual lead levels of the metal not to exceed 0.25% by weight as cast or extruded.

C. Metal components not in contact with water to comply with the requirements of ASTM B62 copper alloy UNS No. C38600 or the material as described in Part 2.03.B.

D. Meet DMWW Rules and Regulations for Water Services.

2.04 CURB STOP

A. Type: "T" handle, quarter-turn, ball pattern valves conforming to AWWA C800, with flared copper inlet and outlet connections.

B. Provide pre-drilled valve head for attaching stationary shutoff rod.

C. Provide valve head checks that limit rotation to 90°. Valve head to be parallel to valve body when open; valve head to be perpendicular to valve body when closed (Operate right to shutoff).

D. Metal components in contact with water to comply with the requirements of ASTM B584 copper alloy UNS No. C89520 or UNS No. C89833. Residual lead levels of the metal not to exceed 0.25% by weight as cast or extruded.

E. Metal components not in contact with water to comply with the requirements of ASTM B62 copper alloy UNS No. C38600 or the material as described in Part 2.04.D.

F. Meet DMWW Rules and Regulations for Water Services.

G. Approved Manufacturers:
   1. A.Y. McDonald Mfg. Co., Model No. 76100.
   2. A.Y. McDonald Mfg. Co., Model No. 76104.
   3. The Ford Meter Box Company, Inc., Catalog No. B22-444M-NL or B22-777M-NL.
   4. The Ford Meter Box Company, Inc., Catalog No. B22-444-NL or B22-777-NL.
   5. Mueller Co., Model No. 300 Catalog No. B-25204N.
   6. Mueller Co., Model No. 300 Catalog No. B-25154N.

2.05 CURB BOX

A. Body:
   1. Upper section: 1 inch inside-diameter steel pipe.
   2. Base section: arch base pattern, with telescoping 1 inch upper section, stainless steel rod and pin, and lid.
   3. Adjust to accommodate:
      a. 5 foot minimum service depth.
      b. 7 foot maximum service depth.
   4. Provide a positive means of preventing rotation of upper section during removal of lid.

B. Lid:
   1. Material: cast iron.
   2. Style: two-hole Erie pattern, to fit spanner wrench.
   3. Provide 1 inch NPT female-threaded brass bushing to screw onto curb box with 1 inch diameter upper section. Bushing shall be secure and rotate integrally with lid.
   4. Acceptable lids:
      a. A.Y. McDonald Mfg. Co., Model No. 5601L.
      b. The Ford Meter Box Company, Inc., Type HS.
      c. Mueller Co., Model Part No. 89982.
      d. Or approved equal.

C. Stationary Shutoff Rod
   1. Material: 304 stainless steel, single-piece construction.
   2. Diameter: approximately 1/2 inch.
   3. Rod:
      a. Self-centered in curb box.

b. Extending above curb box joint. Distance between top of rod and top of box to be:
   (1) No less than 12 inches.
   (2) No greater than 24 inches.
4. Provide a blade at the upper end of rod in a plane parallel to the curb stop valve head with thickness appropriate for operation using a stationary rod key.
5. Provide a fork at the lower end of rod to fit over and operate the valve head of a standard curb stop. Provide holes in fork to align with hole in curb stop valve head.
6. Connect rod to curb stop using stainless steel cotter pin, or approved equal, inserted through holes in rod fork and curb stop valve head.

D. Meet DMWW Rules and Regulations for Water Services.

E. Approved Manufacturers:
1. A.Y. McDonald Mfg. Co., Model No. 5601.
2. The Ford Meter Box Company, Inc., Catalog No. EA1-__#1__-40-__#2__R, with #1 being extended length of stop box housing and #2 being rod length.
3. Or approved equal.

2.06 LARGE WATER SERVICE TRANSFERS (4-INCH AND LARGER)

A. Use products listed in Sections 02 61 00 and 02 64 00.

B. Use ductile iron for all pipe.

PART 3 EXECUTION

3.01 GENERAL

A. Qualifications:
1. Plumbing work covered by this Section to be completed by a plumber who is bonded with DMWW and licensed in accordance with local plumbing codes.
2. Contractors will not be permitted to make their own 1 inch direct taps on mains installed under this contract. Contact DMWW 24 hours in advance to schedule taps.

B. Plumbing Permits and Inspections:
1. Obtain permits necessary for service transfers.
2. Arrange for and schedule required plumbing inspections in accordance with local plumbing codes.

C. Scheduling:
1. Install services only after the new water main passes pressure test per Section 02 67 40 and disinfection per Section 02 67 50.
2. The Contractor is to notify residential customers 24 hours in advance when their water service will be interrupted for service transfer.
3. The Contractor is to notify commercial and industrial customers a minimum of 24 hours in advance when water service will be interrupted for service transfer and to coordinate the interruption completely with the customer. Commercial and industrial service transfers may need to be completed outside normal working hours to minimize impact on the affected customers. No additional compensation will be paid for work outside normal working hours.

3.02 EXAMINATION

A. Confirm location, elevation, and orientation of existing utilities and modify elevation of new water services to omit conflicts with utilities while maintaining 5 foot minimum cover.

B. Verify location and size of existing service line prior to excavation and installation of new tap.

3.03 SIZE OF SERVICE LINES AND TAPS

A. Transfer water service lines according to plans and specifications as follows:
   1. Complete 1/2 inch, 3/4 inch, and 1 inch service transfers with 1 inch taps and 1 inch pipe needed to make connection.
   2. Complete 1 1/2 inch and 2 inch service transfers with 2 inch taps and pipe same size as existing.

B. Complete 4 inch and larger service transfers with valve, pipe, and fittings needed to make connection.

3.04 PREPARATION

A. Excavate in accordance with Section 02 22 00.

B. Cut pipe ends square, ream tube ends to full pipe diameter, and remove burrs.

C. Remove scale and dirt on inside and outside before assembly.

3.05 INSTALLATION

A. Schedule taps to be made by DMWW a minimum of 24 hours in advance. Such taps will be made only between the hours of 8 a.m. and 3:30 p.m. and only on the DMWW normal work days.

B. Shore excavations for taps to be made by DMWW according to OSHA Trench Shoring Standards.

C. Provide 12 inch clear area behind and below main and 48 inch clear area in front of main to be tapped.

D. Install service lines in accordance with local plumbing codes.

E. Use trenchless construction methods when installing water service lines underneath roads, driveways, shoulders, or other traffic-carrying surfaces.

F. Corporation:
   1. Install corporations no closer than 18 inches from a pipe joint, another corporation, or side of excavation.
   2. One inch corporations will be installed at a 45 degree angle above horizontal; 2 inch corporations will be installed horizontal.
   3. Corporation to face the property to be served.
   4. Corporation taps will not be allowed on dry mains.

G. Pipe:
   1. Maintain minimum separation between water piping and sewer piping in accordance with Iowa DNR requirements as described in Section 02 60 00.
   2. Maintain 5 foot minimum cover below final grade. Do not exceed 7 foot cover without DMWW's authorization.

H. Curb Stop:
   1. Set curb stop on solid bearing.
   2. Center and plumb curb box over curb stop.

3. Install stationary shutoff rod. Attach shutoff rod to curb stop as specified above.
4. Set box cover flush with finished grade and plumb.
5. Location:
   a. In public right of way.
   b. 1 to 6 feet from property line in the City of Des Moines.
   c. 1 foot from property line in Polk County.
   d. Not within driveway or sidewalk.

I. Repair leaks that develop in new service lines or water mains due to water service installation operations.

J. Coordinate necessary inspections to satisfaction of jurisdictional authority for water service lines.

K. Install large service transfers in accordance with Section 02 61 00.

3.06 RETIREMENT OF EXISTING SERVICE LINES

A. Effectively cap existing service stub after service is transferred to new main.

B. Repair of leaks that develop in existing service lines or mains due to service transfer operations are the responsibility of the Contractor and costs are incidental to service line transfer.

3.07 BACKFILL, COMPACTION, AND RESTORATION

A. Backfill and compact excavations as specified in Section 02 22 00 for trenches.

B. Restore affected areas as specified elsewhere and as shown on plans.

**** END OF SECTION ****

SECTION 02 67 40 – PRESSURE TESTING WATER MAINS

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Pressure test water mains in accordance with this Section.

1.02 RELATED SECTIONS

A. Section 02 22 80 – Horizontally Directional Drilled Water Main.

B. Section 02 61 00 – Ductile Iron and Polyvinyl Chloride Pipe for Water Mains.

C. Section 02 64 00 – Valves and Hydrants

1.03 REFERENCES

A. AWWA C600 – Installation of Ductile Iron Water Mains and Their Appurtenances.

B. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.

1.04 MEASUREMENT AND PAYMENT

A. Work under this Section incidental to contract.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

3.01 PRESSURE TESTING

A. Perform work in accordance with AWWA C600 and AWWA C605.

B. Test piping at 150 psi or as indicated on plans for 2 hours.

C. Fill and flush new piping with potable water, ensuring that all trapped air is removed.

D. Isolate new piping from the existing system.

E. Pressure test new piping in sections by isolating each section using in-line gate valves. Relieve pressure on non-test side of gate valve.

F. Pressurize new piping to test pressure at lowest point in the isolated system. Do not pressurize to more than 5 psi over test pressure at lowest point in the isolated system.

G. Monitor pressure in line being tested for a period of not less than 2 hours.

H. If at any point during that 2 hour period the pressure drops to 5 psi below test pressure, re-pressurize by pumping water into the line in sufficient quantity to bring pressure back to between test pressure and 5 psi above test pressure. Accurately measure the quantity of water required to re-pressurize the main.

I. At the end of the 2 hour period, if pressure in the line has dropped below test pressure, re-pressurize to test pressure. Accurately measure the quantity of water required to re-pressurize the main.

J. Allowable leakage, in gallons, per hour of testing shall equal (LD(P)½) / 148,000.
   L = length of pipe section being tested in feet
   D = nominal diameter of pipe in inches
   P = average test pressure in psig

K. Leakage equals total quantity of water required to keep line pressurized during the 2 hour test period and re-pressurize line at the end of the test period.

L. If average leakage per hour is less than allowable leakage, the pressure test is acceptable.

M. If average leakage per hour is more than allowable leakage, the pressure test is not acceptable. Locate and make approved repairs as necessary until leakage is within specific allowance.

N. If pressure in the isolated line never drops to test pressure, having started no more than 5 psi above test pressure, the pressure test is acceptable.

O. Repair visible leaks regardless of the quantity of leakage.

**** END OF SECTION ****

SECTION 02 67 50 – DISINFECTION OF WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Disinfect water mains and 2 inch and larger water services in accordance with this Section.

1.02 RELATED SECTIONS

A. Section 02 22 00 – Excavating, Backfilling, and Compacting for Water Mains.

B. Section 02 22 80 – Horizontally Directional Drilled Water Main.

C. Section 02 61 00 – Ductile Iron and Polyvinyl Chloride Pipe for Water Mains.

D. Section 02 61 40 – HDPE

E. Section 02 64 00 – Valves and Hydrants

F. Section 02 66 00 – Water Service Transfers.

1.03 REFERENCES

A. AWWA B300 – Hypochlorites.

B. AWWA B301 – Liquid Chlorine.

C. AWWA C651 – Disinfecting Water Mains.

1.04 MEASUREMENT AND PAYMENT

A. Work under this Section incidental to contract.

PART 2 PRODUCTS

2.01 CHLORINE

A. Calcium hypochlorite granules conforming to AWWA B300.

B. Liquid chlorine conforming to AWWA B301.

2.02 DE-CHLORINATION CHEMICALS

A. Vita-D-Chlor (Ascorbic Acid) by Integra Chemical Company.

B. Vita-D-Chlor, Neutral (Sodium Ascorbate) by Integra Chemical Company.

C. No-Chlor (Ascorbic Acid) by Measurement Technologies.

D. Approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Water for disinfection will be provided by DMWW for two disinfection attempts. If additional attempts are necessary, the Contractor will be billed for water used at the normal rate set for industrial customers.

B. Perform disinfection of piping and appurtenances only after satisfactory pressure testing.

C. Ensure piping to be disinfected is isolated from portion of distribution system that is in service.

D. Review procedures and coordinate disinfection with DMWW.

E. Perform work in accordance with AWWA C651.

F. Bacteriological samples shall be taken and tested by DMWW to ensure satisfactory disinfection.

3.02 CHLORINATION OF PIPING

A. Provide equipment and materials necessary to complete chlorination.

B. Use continuous feed method as outlined in AWWA C651.

C. Prior to feeding chlorine, fill and flush new piping to remove trapped air and particulates. Provide equipment and materials necessary to obtain a minimum flushing velocity of 3.0 fps in piping to be disinfected. When flushing velocities of 3.0 fps cannot be obtained, swab pipe until pipe is free of debris. Type of swab and procedures for use shall be approved by Engineer prior to its use.

D. Induce flow of potable water through new piping at required flushing velocity. Make provisions for diverting and disposing of flushing water that does not damage surroundings. Repair damage caused by flushing activities.

E. At a point within five pipe diameters of connection to existing distribution system, introduce highly chlorinated water in sufficient quantity to provide at least 25 mg/L free chlorine in the new piping. Provide all metering and feed equipment and temporary chlorination taps. Remove temporary chlorination taps and cap the main once the main passes.

F. Introduce highly chlorinated water continuously until entire section of new piping contains a minimum of 25 mg/L free chlorine. Do not exceed 100 mg/L free chlorine.

G. Isolate newly chlorinated piping for a contact period of at least 24 hours, and not more than 48 hours, taking care not to backflow chlorinated water into existing potable water system.

H. After the contact period, water in new piping must have a residual-free chlorine content of not less than 10 mg/L. If residual is less than 10 mg/L, rechlorinate as outlined above.

3.03 FLUSHING CHLORINATED PIPING

A. After the contact period, flush recently chlorinated piping with potable water.

B. Continue flushing until chlorine residual in new piping is equal to chlorine residual in existing distribution system.

C. Isolate new piping from existing distribution system for a period of not less than 24 hours.

D. Chlorinated water, flushed from new piping, shall be dechlorinated and disposed of so not to cause damage to the environment. Conform to state and federal requirements.

E. De-chlorinate all water from flushing activities and testing before it is released into the ground, stream, or storm sewers. Method to be approved by Engineer prior to any flushing activities.

3.04 BACTERIOLOGICAL TESTING

A. Immediately following flushing of pipelines and again at least 24 hours after flushing pipelines, samples will be taken and tested by DMWW.

B. DMWW reserves the right to take and test additional samples 48 hours after flushing.

C. Approximately one sample will be taken for each 1200 feet of new water main.

D. Additional samples may be taken at the discretion of DMWW.

E. Samples must show the absence of coliform organisms and other contaminants and meet requirements of the Iowa DNR to be considered acceptable.

F. If any sample is not satisfactory with either sampling, the piping represented by that sample must be flushed and rechlorinated by the Contractor at the discretion of, and as directed by, DMWW.

**** END OF SECTION ****