Project Manual

Water Distribution System Improvements

Wildcat Bluff

Benton County Conservation

Center Point, Iowa

SEH No. BENCC 173778

September 2023

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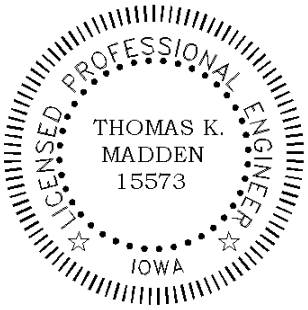
CERTIFICATION



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Iowa.

Thomas K. Madden, PE — 9/22/2023 (Date)

License Number 15573

My License renewal date is: December 31, 2024.

Responsible for the following sections:

All

APPROVAL TO CONSTRUCT

PERMIT NO 2024-0197W

DATE 02/23/2024

IDNR ENVIRONMENTAL SERVICES DIVISION

BY _____

PERMIT ISSUED WITHOUT REVIEW

Justin D. Pettit

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VALVES, GAUGES AND PLUMBING ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Valves.
   1. Gate Valves
   2. Pressure Gauges
   3. Ball Valves
   4. Water Meter
   5. Sample tap

1.02 SUBMITTALS

A. Submit detailed product data and descriptive literature to include dimensions, materials of construction, and Operation and Maintenance Manuals.

B. Provide shop drawings to show installation arrangement and cross-sections of major component assemblies.

1.03 EQUIPMENT AND MATERIAL REQUIREMENTS

A. **All material and equipment in direct contact with raw or finished water shall be NSF61 certified.**

B. **Materials and equipment otherwise not able to be NSF61 certified shall be RoHS compliant.**

PART 2 PRODUCTS

2.01 GATE VALVES

A. Acceptable Manufacturer: Clow or equal. All gate valves shall be the product of one manufacturer.

B. Gate valves shall meet or exceed the requirements of AWWA C509. Valves shall be resilient wedge with non-rising stem and hand wheel operator. All valves shall be rated for 250 psi.

C. Valve bodies shall be ductile or cast iron. Valve ends shall be flanged with standard ANSI bolt patterns.

D. Unless otherwise shown on the drawings, valves shall have hand wheel operators with an arrow cast into the wheel indicating direction of opening. Valves located 6-feet or more above the floor shall be mounted horizontally and have chain wheel operators. All valves shall open counterclockwise.

2.02 BALL VALVES

A. Valves for pipe 2” and smaller shall be full port brass ball type valves with lever operators, TFE seats and seals. Valves shall be rated at 200 psi minimum.

2.03 PRESSURE GAUGES

A. The pressure gauges shall be general purpose with steel case and suitable for potable water use.

B. Full scale accuracy shall be +/- 3% or less.

C. Pressure range shall be 0 – 100 psi with 2 psi gradation on a 2” diameter dial.

D. Pressure gauges shall be ¼” NPT bass bottom with isolation valve.

2.04 WATER METER

A. Water meter shall be Sensus Model Omni T2 or equal.

B. The meters shall be sized as shown on the drawings, capable of operation within a flow range to 80 gpm. The maincase shall be cast Water Works bronze. The size, model, and direction of flow shall be cast on both sides of the maincase.

C. The register shall be permanently, hermetically sealed. The register shall be assembled to the measuring chamber in a tamperproof manner. Sweep hand reading and odometer wheel will conform to the most recent version of AWWA C-701.

D. Meter ends shall be compatible with the inlet and outlet piping. Adequate transition fittings shall be provided to accomplish installation but shall not interfere with the meter accuracy or operation.

E. The meter shall have an accuracy of 100% +/- 1.5% of actual throughput. The meter shall meter a minimum of 95% at 0.75 gpm.

F. The turbine meter must have a minimum of five years of satisfactory operation in other similar applications. The meter manufacturer must provide a guarantee that the meter is free of defects in material and workmanship for a period of one year of unit operation. The meter manufacturer shall submit in writing, a price schedule of its factory maintenance program for the complete meter.

G. Valves shall have resilient seats located on the valve disc and shall provide a 360 degree continuous, uninterrupted seating.

H. Body of valve shall be ASTM, Class B gray iron or ASTM A536 grade 65-45-12 ductile iron.

2.05 SAMPLE TAP

A. Sample tap to be smooth nose without internal threads.

2.06 PRESSURE RELIEF VALVE

A. Pressure relief valve shall be ASMA certified Kunkle Series 900 safety relief valve rated at a minimum of 35 gpm discharge rate at 100 psi.

B. A stainless steel check valve shall be installed between the water supply and relief valve if valve is not NSF61 certified or RoHS compliant.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer’s recommendations and as indicated on the drawings.

B. Gate valves shall be installed with stem in a vertical position unless specifically identified on the drawings.

C. Valve operators shall always be installed so as to not create interferences with other equipment.

D. Valves shall be supported on each end by floor supports when located in a horizontal plane.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Excavation for trenches and appurtenances.
   2. Bedding for utility piping.
   3. Backfill for trenches, manholes, intakes, utility pipe/structure removals and appurtenances.
   4. Compaction for backfill.

B. References:
   1. Statewide Urban Design and Specifications (SUDAS), Standard Specifications, most current version.
   2. Iowa Department of Transportation (IDOT) Standard Specifications for Highway and Bridge Construction, Series 2015, including all current supplemental specifications.

PART 2 PRODUCTS

2.01 BEDDING MATERIALS

A. Bedding material for Polyvinyl Chloride (PVC) or Polyethylene (PE), pressure pipe shall be SUDAS Class I bedding material.

B. Native soil materials meeting bedding material requirements will be acceptable for use.

2.02 TRENCH BACKFILL

A. Backfill around pipe:
   1. Initial Backfill for pressure pipe: Use Bedding Material. Conform to trench detail(s) as referenced.

B. Remaining backfill (for all types of pipe):
   1. Backfill with trench excavated material.

PART 3 EXECUTION

3.01 EXISTING UTILITIES

A. Protect existing utilities.

B. In event of break in existing water main, gas main, sewer, or electric or communication cable, immediately notify responsible official of organization operating utility affected.

3.02 TRENCH EXCAVATION (EARTH)

A. Strip and stockpile topsoil for use in surface restoration.

B. Keep trench width below top of pipe as narrow as possible in accordance with Article 3.10; provide adequate width for proper pipe jointing operations and for placing and compacting backfill.

C. Slope walls of trench or sheet trench as required to comply with safety requirements; maintain walls of excavation vertical below top of pipe.

D. Excavate to full depth by machine. Hand trim excavation for accurate placement of pipe to elevations indicated.

E. If soft, spongy, or otherwise unstable material is encountered which may not provide suitable foundation for pipe:
   1. Notify Owner's Representative immediately.
   2. Owner's Representative will authorize remedial measures in writing as required.
   3. Removal and replacement of questionable material will be authorized only if dewatering methods are unsuccessful in stabilizing trench bottom.

3.03 WIDTH OF EXCAVATION

A. The trench shall be opened along the lines laid out by the Owner's Representative and to a depth necessary for the laying of pipe at the grades shown on the Drawings or established by the Owner's Representative.

B. The width of trenches shall be such as to provide adequate space for workmen to place and joint the pipe properly as well as compact the earth below the haunches of the pipe and provide adequate safety measures.

C. The width of the trench measured at a point 1' above the top of the pipe shall be no wider than the widths given in the following tabulation:

Pipe Diameter	Trench Width (1' above top of pipe)
15" or smaller	Not more than 12" on either side of the pipe
16" to 36"	Outside diameter plus 16"
36" or over	Outside diameter plus 24"

D. The Owner's Representative may order the Contractor to provide a higher class of bedding or to furnish and install pipe of greater strength or both in the event the Contractor excavated the trench to a width greater than that specified. All additional costs incurred by the Contractor in connection with the above requirement shall be at his own expense with no additional compensation being made therefore.

3.04 EXCAVATION BELOW GRADE

A. Where the excavation is carried beyond or below the lines and grades given by the Owner's Representative, the Contractor shall, at his own expense, refill and compact all such excavated space with suitable granular material.

3.05 TRENCH LENGTH

A. Allowable length of trench opening: The Contractor shall not have more than a total of 100' of trench open in advance of and behind the pipe laying operations, unless otherwise authorized by the Owner's Representative. The excavated material shall be neatly and compactly piled along one side of the trench, the other side being kept clear to facilitate the work and to provide for public traffic, unless otherwise permitted by the Owner's Representative under unusual circumstances.

3.06 DEVIATIONS OCCASIONED BY OTHER STRUCTURES OR UTILITIES

A. Wherever obstructions are encountered during the progress of the work and interfere to such an extent that an alteration in the Drawings is required, the Owner's Representative shall have the authority to change the Drawings and order a deviation from the line and grade or arrange with the Owners of the structures for the removal, relocation or reconstruction of the obstructions.

B. Where gas, water, telephone, electrical, hot water, steam or other existing utilities are an impediment to the vertical or horizontal alignment of the proposed pipe line, the Owner's Representative shall order a change in grade or alignment or shall direct the Contractor to arrange with the Owners of the utilities for their removal.

C. If a change in line or grade of a sewer conduit is necessary, the Owner's Representative will order the addition of any manholes required.

3.07 SHEETING, SHORING AND BRACING

A. Construct sheeting, shoring and bracing where required to hold walls of excavation to protect adjoining properties, existing pavement, utilities, trees, structures, and other similar features. Sheeting, shoring and bracing shall be considered incidental to the project.

B. Open-cut trenches shall be sheeted and braced as required by any governing federal or state laws and municipal ordinances, and as may be necessary to protect life, property, or the work.

C. When sheeting is used:
   1. It shall be so driven as to prevent adjacent soil from entering the trench either below or through such sheeting.
   2. The trench width shall be increased accordingly.
   3. The Owner's Representative may order the sheeting driven to the full depth of the trench or to such additional depths as may be required for the protection of the work.

D. Where the soil in the lower limits of a trench has the necessary stability, the Owner's Representative, at his discretion, may permit the Contractor to stop the driving of sheeting at some designated elevation above the trench bottom. The granting of permission by the Owner's Representative, however, shall not relieve the Contractor in any degree from his full responsibility under the Contract.

E. Design of sheeting, shoring and bracing shall be responsibility of Contractor and shall comply with OSHA requirements.

F. Sheeting which may be removed, in opinion of Owner's Representative, without endangering utilities or structures shall be considered incidental and shall not be paid for.

G. Sheeting and bracing which have been ordered left in place shall be cut off at the elevation ordered by the Owner's Representative. Trench bracing, except that ordered left in place, may be removed when the backfilling has reached the respective levels of such bracing. Sheeting, except that ordered left in place, may be removed after the backfilling has been completed or has been brought up to such an elevation as to permit its safe removal.

H. Sheeting and shoring, the removal of which, in opinion of Owner's Representative, might cause damage to pipe, utilities or structures shall be left in place.

I. When movable trench shield is used below center line of pipe, it shall be lifted prior to any forward movement to avoid pipe displacement, unless moved by rearward thrusting jacks.

3.08 DEWATERING

A. Execute Work in the dry.

B. Provide equipment for handling water encountered.

C. No pipe shall be laid or concrete poured on excessively wet soil.

D. Prevent surface water from flowing into excavation; promptly remove any water accumulated.

E. Divert stream flow and/or sewage away from areas of construction.

F. Water pumped from excavations shall not be discharged to existing sanitary sewers.

G. Methods used shall not cause settlement or damage to adjacent property.

H. Dewatering is incidental to this project.

3.09 PILING EXCAVATED MATERIAL

A. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways.

B. Fire hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, or other utility controls shall be left unobstructed and accessible until the work is completed.

C. Gutters shall be kept clear or other satisfactory provisions made for street drainage.

D. Natural watercourses shall not be obstructed.

3.10 INSTALLING PIPE BEDDING

A. Bedding installation and trench bottom for Polyvinyl Chloride (PVC) or Polyethylene (PE) pressure pipe:
   1. Install Class P-3 type bedding in accordance with SUDAS trench detail SW104.
   2. Finely divided loose material left in trench bottom shall be hand worked with a shovel to provide uniform bearing and support for full length of pipe. If trench bottom material is not suitable for hand working to uniform bearing surface, provide 4" thick layer of pipe bedding consisting of sand or gravel as specified.
   3. Place bedding in layers not to exceed 12" and compact by hand held tamping device. Compact to at least 98% maximum density as determined by ASTM D 698.
   4. Provide bell holes at each pipe joint; allow access completely around circumference of pipe for proper jointing operations.
   5. Where trench is in rock, place 6" minimum depth of pipe bedding consisting of sand or gravel as specified.

3.11 BACKFILLING TRENCHES

A. Backfill trench immediately after Owner’s Representative has recorded location of connections and appurtenances.

B. Pull wood sheeting, to be removed, ahead of backfilling to prevent formation of voids. Steel sheeting may be pulled after backfilling.

C. Initial Backfill for pressure pipe: place according to Class P-3 type bedding per SUDAS SW 104

D. Remaining backfill:
   1. Consolidate by mechanical compaction; fill upper portion of trench and consolidate by mechanical compaction to 90% maximum density as determined by ASTM D 698; finish with 4 inches topsoil in turf areas and 4 inches of road stone in roadway and prepare for surface restoration; notify Owner’s Representative before mounding over trench or leveling off. Subsequent settlement: Refill, compact, and level.

3.12 FIELD QUALITY CONTROL

A. Contractor shall employ services of a certified, independent firm specializing in construction observation and testing to verify compliance with contract documents.

B. Field density testing to verify compaction will be performed in accordance with one of the following methods: ASTM D 2922 with ASTM D 3017 or ASTM D 1556.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

D. Contractor may perform field density tests at a rate of one test per each two vertical feet of compacted backfill at 200 foot intervals (segments) along trenches. A trench segment of less than 200 feet in length will require the same testing as a full 200 foot long segment.

3.13 CLEANUP

A. Clean up each portion of construction as it is completed.

B. Cleanup operations in public right-of-way shall be kept within 200’ of construction operations.

C. Clean up and remove rubbish, debris, and surplus material.

D. Leave site in neat condition.

E. Reopen to traffic as soon as practicable.

END OF SECTION

SECTION 33 11 00

WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Well discharge piping outside of well.
   2. Valves and boxes.
   3. Flushing hydrants.

1.02 REFERENCES

A. Iowa Department of Transportation (Iowa DOT) Standard Specifications for Highway and Bridge Construction, Series 2015, including all current supplemental specifications.

B. American Water Works Association (AWWA) Standards, most current version.

C. ASTM:
   1. A126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings
   2. A536 - Ductile Iron Castings
   3. B88 - Seamless Copper Water Tube
   4. B152 - Copper Sheet, Strip, Plate, Rolled Bar
   5. D429 - Tests for Rubber Adhesion to Rigid Surfaces
   6. D2842 - Test for Water Absorption of Rigid Cellular Materials
   7. D1248 - Polyethylene Plastics Extrusion Materials for Wire and Cable
   8. F593 - Stainless Steel Bolts, Hex Cap Screws, and Studs
   9. F594 - Stainless Steel Nuts

D. AWWA:
   1. C105 - Polyethylene Encasement for Ductile -Iron Pipe Systems
   2. C110 - Ductile-Iron and Gray-Iron Fittings
   3. C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
   4. C150 - Thickness Design of Ductile Iron Pipe
   5. C151 - Ductile-Iron Pipe, Centrifugally Cast for Water or other Liquids
   6. C153 - Ductile-Iron Compact Fittings for Water Service
   7. C502 - Dry-Barrel Fire Hydrants
   8. C504 - Rubber-Seated Butterfly Valves
   9. C509 - Resilient-Seated Gate Valves for Water Supply Service
   10. C515 - Reduced-Wall, Resilient-Seated Gate Valves, for Water Supply Service
   11. C600 - Installation of Ductile Iron Water Mains and their Appurtenances
   12. C605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
   13. C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch for Water Distribution

1.03 SUBMITTALS

A. Manufacturer's catalog data for pipe, pipe joints, hydrants, valves, and valve boxes.

B. Certificates from manufacturer evidencing compliance with AWWA Standards listed herein for pipe, pipe joints, valves, valve boxes, and hydrants.

C. Certification by nationally recognized, independent organization that components, materials, and treatment chemicals in contact with potable water conform to ANSI/NSF Standard 60 or 61, as applicable.

1.04 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of pipe runs, connections, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 FIELD MEASUREMENTS

A. Verify that field measurements and elevations are as identified.

1.06 REGULATORY REQUIREMENTS

A. Conform to Iowa Department of Natural Resources (Iowa DNR) Design Standards, Chapter 8 for materials and installation of the Work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Inspection:
   1. Inspect all pipe and products during the unloading process.
   2. Notify Engineer of any cracked, flawed or otherwise defective products.
   3. Remove all products found to be defective by the Engineer from the Site.

B. Handling and Storage: Handling and storage of products shall be in accordance with Section 2.2 of AWWA C600.

PART 2 PRODUCTS

2.01 WATER MAIN PIPE

A. Discharge pipe and fittings shall be the following:
   1. 2-inch PVC conforming to ASTM D 2241, SDR 26, with a pressure rating of 160 psi. Joints shall be integral bell or separate coupling with elastomeric gaskets or glued joints.
   2. 2-inch DR 11 polyethylene conforming to AWWA C901, with a pressure rating of 200 psi. Pipe dimensions shall conform to ASTM F114. Polyethylene pipe fittings shall be molded and be DR 11, 200 psi rated. Joints shall be joined by the butt fusion method.

2.02 VALVES AND BOXES (3” OR GREATER)

A. Gate Valves:
   1. Resilient Seated: AWWA C509.
   2. Working Pressure: 200 psi minimum.
   3. Ends: Mechanical Joint corrosion resistant bolts per AWWA C111.
   4. Operating Stem: Non-Rising with O-ring Seals.
   5. Operating Nut: 2-inch Square, Open Left.
   6. Markings to be cast on the bonnet or body:
      a. Open indicating arrow.
      b. Manufacturer’s name.
      c. Pressure rating.
      d. Year of manufacture.
      e. Size.
   7. Quality Standard: Mueller A-2370-20 or equal.

B. Tapping Valves and Sleeves
   1. Tapping Valves:
      a. General: Conform to applicable requirements for gate valves.
      b. Type: Mechanical joint.
      c. Quality Standard: Mueller Co. H-667, or equal.
   2. Tapping Sleeves:

a. General: Conform to applicable requirements for cast iron fittings.
b. Type: Mechanical joint.
c. Quality Standard: Mueller Co. H-615 or H-616, or equal.

C. Boxes:
1. Cast Iron, 5-1/4-inch shaft.
2. Vertical, 3-piece, Buffalo type.
3. Box length to provide for 6 feet of pipe cover.
4. Adjustable to 6 inches up or down from standard box length.
5. Cover: “Water” cast into cover.
6. Provide two operating keys for valve operation.
7. Quality Standard: Clow F-2450 or equal.

2.03 CONNECTING SLEEVES

A. General: Conform to applicable requirements for cast iron fittings.

B. Quality Standard: Sleeves used to connect old pipes to new pipes shall be Clow F-1200, Mueller Co. H-785 or H-786, or approved equivalent. Sleeves may also be used to connect new pipes if approved by the OWNER/ENGINEER.

2.04 FLUSHING HYDRANTS

A. Manufacturer: Kupferle Eclipse #2 or equal post hydrant with 2” connection, single nozzle and self draining.

B. Provide permanent markings which indicate:
1. Manufacturer’s name.
2. Year of manufacture.
3. Bury depth.

2.05 YARD HYDRANTS

A. Manufacturer: Woodford Iowa Model Y34 freeze less yard hydrant.
B. Bury depth: 5.5 foot.

2.06 CURB STOPS AND BOXES (FOR VALVES LESS THAN 3”)

A. Valve:
1. Type: Mueller H-15154 Mark II Oriseal, or equal.
a. Inlet: Compression fitting compatible with pipe material.
b. Outlet: Compression fitting compatible with pipe material.
2. Mueller B-25155 Ball Curb Valve, or equal.
a. Inlet: Compression fitting compatible with pipe material.
b. Outlet: Compression fitting compatible with pipe material.

B. Box:
1. Type: Minneapolis Pattern, Extension.
2. Length: 6 feet.
3. Complete with lid and pentagon plug.
4. Adjustable to 6 inches up or down from specified length.
5. Provide stationary rods for all sizes.

2.07 ACCESSORIES

A. Concrete for Thrust Blocks: Concrete type for thrust blocks shall have a minimum compressive strength of 3500 psi at 28 days. Strength determination shall be in accordance with ASTM C39 unless otherwise approved by ENGINEER.

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Connection to Existing System:
   1. Pressure Tap:
      a. Install tap in location shown on the Drawings.
      b. Use approved tapping machine designed specifically for tapping under pressure.
      c. Install tapping sleeve and gate valve as part of assembly.
      d. Install blocking as required.
   2. Cut-In Connection:
      a. Isolate segment of pipe to be cut and drain water from the line.
      b. Connect tee and sleeve assembly to pipe ends.
      c. Install blocking as required.
   3. Connect to Inplace Fitting:
      a. Isolate segment of inplace pipe and remove blocking as required.
      b. Remove plug and drain water from the line.
      c. Install blocking as required.
   4. General:
      a. The CONTRACTOR shall coordinate the times of shutting off existing mains with City Officials and the OWNER/ENGINEER. It will be the CONTRACTOR'S responsibility to notify users as to when and for how long they will be without water service. The CONTRACTOR shall give the City, the OWNER/ENGINEER, and all residents affected, at least 12 hours' notice before the interruption of service.
      b. Connections shall be completed and service restored as rapidly as possible.
      c. The CONTRACTOR shall verify the location and size of existing water mains at the connection location, prior to beginning construction of new water mains.
      d. Size and configuration of fittings may differ from that shown on the Plans. Pipe fittings shown on the Plans to connect existing water mains are based on information available about existing mains.
      e. If additional or different fittings are required, they shall be furnished and installed by the CONTRACTOR at the Contract unit price, with no extra compensation for delivery, handling, or installation.

B. Pipe Installation:
   1. Install pipe at the alignment and grade shown on the Drawings.
   2. Provide a minimum of 5.5 feet of cover over the pipe.
   3. Install appurtenances in the locations shown on the Drawings.
   4. Remove all dirt and foreign material from the pipe interior prior to installation.
   5. See Section 31 23 33 for pipe foundation and backfill procedures.
   6. Install HDPE water main pipe in accordance with AWWA C906.
   7. Install PVC water main in accordance with AWWA C605.
   8. Handle pipe and accessories in manner to ensure delivery to trench in sound, undamaged condition.
   9. Take particular care not to injure pipe coating or cement lining.
   10. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.
   11. Clean pipe interior of foreign material before lowering into trench; keep clean at all times by securely closing open ends of pipe and fittings.
   12. Lay pipe in the dry.
   13. Minimum earth cover; 6-feet, unless shown otherwise.
   14. Cutting of Pipe for Closure Pieces:
      a. For installation of valves, hydrants, and fittings, or for any other reason, shall be done in a neat and workmanlike manner, without damage to the pipe or cement lining therein, and so to leave a smooth-cut end at right angles to the axis of the pipe.
      b. Unless otherwise approved by the ENGINEER, all cutting of pipe shall be done by means of mechanical pipe cutters of an approved type, except that the cutting of pipe already in place, where the use of mechanical cutters would be difficult or impracticable, may be done with diamond point chisels or other hand tools which will cut the pipe without damaging impact or shock.

15. Carefully protect joint material from injury while handling and storing pipe.
16. Keep weight off joint material on spigot.
17. Use no pipe with joints deformed, gouged, or otherwise impaired.
18. Unless otherwise directed, pipe shall be laid with bell ends facing in the direction of laying.
19. Use suitable fittings where grade or alignment required offsets greater than manufacturer's recommended joint deflections.
20. Plug or cap and block pipe ends or fittings left for future connections.
21. Uncover existing mains to which connections are to be made a sufficient time ahead of pipe laying operations to determine fittings required.
22. Make connections between exiting and new water mains with specials and fittings to suit actual conditions.
23. Temporarily cap/plug end of pipe at the end of the days work or any break in construction activities to prevent entry of foreign material.

C. Valve and Box Installation:
1. Verify that subgrade material is adequate to support valve assembly.
2. Install valves with stems vertical and plumb.
3. Install boxes plumb and centered over the valve nut.
4. Verify that box remains plumb and centered during backfill.
5. Adjust box cover to required grade.

D. Flushing Hydrant Installation:
1. Verify that subgrade material is adequate to support hydrant.
2. Place thrust block, crushed rock and tar paper in accordance with Drawing details.
3. Install and maintain hydrant in a plumb position.
4. Where groundwater is present, plug drain hole and affix “Pump After Use” tag to the hydrant.
5. A drainage pit, 2-feet in diameter and 18-inches deep, shall be excavated below each hydrant and filled compactly with porous backfill, under and around the bowl of the hydrant, and to a level 6-inches above the hydrant drainage opening. The porous backfill shall be completely covered with impermeable fibre-filled paper to prevent backfill from filtering into the drainage pit.

E. Thrust Restraint:
1. Install thrust restraints at all bends, tees and plugs.
2. Concrete Blocking:
   a. Place between the fitting and undisturbed trench wall.
   b. Minimum thickness: 12 inches.
   c. Minimum area in square feet shall be in accordance with the following:

Pipe	Tee or Plug	1/4 Bend	1/32 and 1/8 Bend	1/16 Bend
6-inch or less	2.9	3.1	1.6	0.8
8-inch	3.7	5.3	2.9	1.4
10-inch	5.7	8.1	4.4	2.2
12-inch	8.1	13.4	6.6	3.2
16-inch	15.1	21.4	11.6	5.9
20-inch	23.2	30.2	18.1	9.3
24-inch	33.6	48.5	26.1	13.3

   d. Size blocking based on the larger main.
   e. Verify that bolts are accessible after concrete is poured.
3. Timber Blocking:
   a. Use for temporary blocking only for maximum 8-inch mains.
   b. Minimum timber size: 4-inch by 4-inch.
4. Restrained Joints:
   a. All water mains shall be restrained by use of retainer glands at the required locations.
   b. Hydrants shall be considered as 90-degree bends, and shall be restrained as such.
   c. All methods of restraining pipes shall be approved by the OWNER/ENGINEER.
   d. Pipe installed in casing pipe shall be restrained joint.

F. Curb Stop and Box:
    a. Install at the location shown on the Drawings.
    b. Verify that subgrade material is adequate to support the curb box assembly.
    c. Install boxes plumb and centered over the tee head.
    d. Verify that box remains plumb and properly aligned during backfill.
    e. Adjust box cover to required grade.
    f. Key all curb stops after backfill to ensure proper operation.

3.02 WATER MAIN CONFLICTS

A. Horizontal Separation of Gravity Sewers from Water Mains: Comply with Iowa Statewide Urban Design and Specifications (SUDAS), Current Edition.
    1. Separate gravity sewer mains from water mains by a horizontal distance of at least 10 feet unless:
        a. The top of a sewer main is at least 18 inches below the bottom of the water main, and
        b. The sewer is placed in a separate trench or in the same trench on a bench of undisturbed earth at a minimum horizontal separation of 3 feet from the water main.
    2. When it is impossible to obtain the required horizontal clearance of 3 feet and a vertical clearance of 18 inches between sewers and water mains, the sewers must be constructed of water main materials meeting the requirements of SUDAS Section 5010, 2.01. However, provide a linear separation of at least 2 feet.

B. Separation of Sewer Force Mains from Water Mains: Comply with Iowa Statewide Urban Design and Specifications (SUDAS), Current Edition.
    1. Separate sewer force mains and water mains by a horizontal distance of at least 10 feet unless:
        a. The force main is constructed of water main materials meeting a minimum pressure rating of 150 psi and the requirements of Section 5010, 2.01 and
        b. The sewer force main is laid at least 4 linear feet from the water main.

C. Separation of Sewer and Water main Crossovers: Comply with Iowa Statewide Urban Design and Specifications (SUDAS), Current Edition.
    1. Vertical separation of sanitary and storm sewers crossing under any water main should be at least 18 inches when measured from the top of the sewer to the bottom of the water main. If physical conditions prohibit the separation, the sewer may be placed not closer than 6 inches below a water main or 18 inches above a water main. Maintain the maximum feasible separation distance in all cases. The sewer and water pipes must be adequately supported and have watertight joints. Use a low permeability soil for backfill material within 10 feet of the point of crossing.
    2. Where the sanitary sewer crosses over or less than 18 inches below a water main, locate one full length of sewer pipe of water main material so both joints are as far as possible from the water main.
    3. Where the storm sewer crosses over or less than 18 inches below a water main, locate one full length of sewer pipe of water main material or reinforced concrete pipe (RCP) with flexible O-ring gasket joints so both joints are as far as possible from the water main.

D. Surface Water Crossings: Comply with the Recommended Standards for Water Works, 2012 Edition.
    1. Above-water Crossings: Ensure the pipe is adequately supported and anchored; protected from vandalism, damage, and freezing; and accessible for repair or replacement.
    2. Underwater Crossings: Provide a minimum cover of 5 feet over the pipe unless otherwise specified in the contract documents. When crossing water courses that are greater than 15 feet in width, provide the following:
        a. Pipe with flexible, restrained, or welded watertight joints,
        b. Valves at both ends of water crossings so the section can be isolated for testing or repair; ensure the valves are easily accessible and not subject to flooding, and
        c. Permanent taps or other provisions to allow insertion of a small meter to determine leakage and obtain water samples on each side of the valve closest to the supply source.

3.03 DISINFECTION

A. Perform disinfection in accordance with SUDAS Section 5030 – Testing and Disinfection.

B. CONTRACTOR shall perform all testing.

3.04 PRESSURE AND LEAK TESTING

A. Perform pressure and leak testing in accordance with SUDAS Section 5030 – Testing and Disinfection.

B. CONTRACTOR shall perform all testing.

3.05 BACTERIA SAMPLING

A. Test water mains according to AWWA C651, including collection of two consecutive sets of acceptable bacteria samples 24 hours apart. If the initial disinfection procedure fails to produce satisfactory bacteriological results or if other water quality is affected, repeat disinfection procedure.

3.06 PUTTING WATER MAIN IN SERVICE

A. Put the completed water system in service only after obtaining permission from the Jurisdiction.

END OF SECTION

SECTION 33 21 11

WELL ACCESSORIES

PART 1 GENERAL

1.01 DESCRIPTION

A. Pressure tanks.

1.02 REFERENCES

A. Construction methods and materials shall comply with American Water Works Association (AWWA) A100, 2012 Edition of Ten States Standards and Iowa Department of Natural Resources (IDNR) standards. Other testing and material standards referenced shall be as follows:
   1. ASTM - American Society of Testing and Materials.
   2. IDOT - Iowa Department of Transportation.
   3. Standard Methods - Standard Methods for Examination of Water and Waste Water, APHA, AWWA, WEF.
   4. AWS - American Welding Society Standards referenced shall be current editions.

1.03 EQUIPMENT AND MATERIAL REQUIREMENTS

A. **All material and equipment in direct contact with raw or finished water shall be NSF61 certified.**

B. **Materials and equipment otherwise not able to be NSF61 certified shall be RoHS compliant.**

PART 2 PRODUCTS

2.01 PRESSURE TANKS

A. Pressure tanks shall be Amtrol Well X-Trol WX – 255, or equal, with 81-gallon capacity.

B. A total of 2 pressure tanks shall be installed (162-gallon capacity).

C. All pressure tanks shall be disinfected according to AWA C652.

PART 3 EXECUTION

3.01 INSTALLATION OF PIPING AND ACCESSORIES

A. Accessories shall be installed in accordance with equipment manufacturer's published recommendations. Piping and appurtenances that convey water must be certified ANSI/NSF 61 standards.

B. Visual leak detection will be performed upon completion. Any leaks shall be corrected.

C. All piping and equipment shall be disinfected by charging the system with chlorinated water. System shall be flushed and tested for bacteria prior to use. A failed bacteria test shall be followed up with another chlorine charge and flushed until bacteria test passes.

D. Disinfection
   1. Disinfect all newly installed appurtenances and piping in accordance with AWWA C651.
      a. Tablet or Continuous Feed Method:
         1) Hold chlorine solution in pipe for a minimum period of 24 hours.
            a) Initial dosage: 50 ppm minimum.

b) Residual dosage after hold period: 10 ppm minimum.

2. Flush system within 24 hours after disinfection is completed.
3. Sampling and Testing:
   a. After final flushing, obtain 2 sets of samples taken a minimum of 24 hours apart.
   b. Each sample set shall include:
      1) One sample for every 1,200 feet of main.
      2) One sample at each dead-end.
      3) Ensure that 1 sample is obtained from each branch of main.
      4) Minimum sample required: 2
   c. Perform coliform tests on each sample.
   d. Rechlorinate if any sample tests positive for coliform.

END OF SECTION

SECTION 40 23 10

PROCESS PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Process water piping and fitting materials within buildings and structures.
   2. Installation of process piping and fittings.

PART 2 PRODUCTS

2.01 PIPE

A. PVC:
   1. Schedule 80 ASTM, D1785.
      a. Glue Joint
      b. Fittings: Schedule 80 PVC, ASTM D2467.
   2. DR 21, ASTM D2241.
      a. Glue Joint
      b. Fittings: Schedule 80 PVC, ASTM D2467.

2.02 ANCHOR BOLTS AND NUTS

A. Interior Fittings: Zinc coated steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide piping as shown on the Contract Drawings.

B. Install vertical piping runs plumb and horizontal runs parallel with structure wall unless otherwise noted on the Drawings.

C. Alignment for piping smaller than 4 inches may not be shown on Drawings. Install with clearance and allowance for:
   1. Expansion and contraction.
   2. Operation and access to equipment, doors, windows, hoists, and moving equipment.
   3. Headroom and walking space for working areas and aisles.
   4. System drainage and air removal.

D. Provide hangers and supports in accordance with Manufacturer requirements.

END OF SECTION

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