STORM SEWERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Storm Sewers

B. Abandonment of Storm Sewers

1.02 DESCRIPTION OF WORK

A. Construct storm sewers.

B. Abandon storm sewers.

1.03 SUBMITTALS

Follow the General Provisions (Requirements) and Covenants.

1.04 SUBSTITUTIONS

Follow the General Provisions (Requirements) and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Follow the General Provisions (Requirements) and Covenants.

1.06 SCHEDULING AND CONFLICTS

Follow the General Provisions (Requirements) and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT AND PAYMENT

A. Storm Sewer:

1. **Trenched:**
   - **a. Measurement:** Each type and size of pipe installed in a trench will be measured in linear feet along the centerline of the pipe from center of intake or manhole to center of intake or manhole. Where the end of the pipe discharges to a ditch or waterway, measurement will be to the end of the pipe, exclusive of aprons. Lengths of elbows and tees will be included in the length of pipe measured.
   - **b. Payment:** Payment will be made at the unit price per linear foot for each type and size of pipe.
   - **c. Includes:** Unit price includes, but is not limited to, trench excavation, dewatering, furnishing bedding material, placing bedding and backfill material, joint wrapping, connectors, testing, and inspection.

1.08 MEASUREMENT AND PAYMENT (Continued)

2. **Trenchless:**
   a. **Measurement:** Each type and size of pipe installed by trenchless methods will be measured in linear feet along the centerline of the pipe.
   b. **Payment:** Payment will be made at the unit price per linear foot for each type and size of pipe.
   c. **Includes:** Unit price includes, but is not limited to, furnishing and installing pipe; trenchless installation materials and equipment; pit excavation, dewatering, and placing backfill material; pipe connections; testing; and inspection.

B. Storm Sewer with Casing Pipe:

1. **Trenched:**
   a. **Measurement:** Each type and size of pipe installed with a casing pipe in a trench will be measured in linear feet along the centerline of the casing pipe from end of casing to end of casing.
   b. **Payment:** Payment will be made at the unit price per linear foot for each type and size of pipe.
   c. **Includes:** Unit price includes, but is not limited to, furnishing and installing both carrier pipe and casing pipe, trench excavation, dewatering, furnishing bedding material, placing bedding and backfill material, furnishing and installing annular space fill material, casing spacers, pipe connections, testing, and inspection.

2. **Trenchless:**
   a. **Measurement:** Each type and size of pipe installed by trenchless methods with a casing pipe will be measured in linear feet along the centerline of the casing pipe from end of casing to end of casing.
   b. **Payment:** Payment will be made at the unit price per linear foot for each type and size of carrier pipe.
   c. **Includes:** Unit price includes, but is not limited to, furnishing and installing both carrier pipe and casing pipe; trenchless installation materials and equipment; pit excavation, dewatering, and placing backfill material; casing spacers; furnishing and installing annular space fill material; pipe connections; testing; and inspection.

C. Removal of Storm Sewer:

1. **Measurement:** Each type and size of pipe removed will be measured in linear feet from end to end.

2. **Payment:** Payment will be made at the unit price per linear foot for each type and size of pipe removed.

3. **Includes:** Unit price includes, but is not limited to, removal, disposal, and capping (if specified) of pipe.

PART 2 - PRODUCTS

2.01 STORM SEWERS

A. Reinforced Concrete Pipe (RCP):

1. Comply with ASTM C 76.

2. Minimum Class III, Wall B (Iowa DOT Class 2000D).

3. Use tongue and groove joints with cold applied bituminous or rubber rope gasket jointing materials, unless otherwise specified. If specified, use rubber O-ring or profile gasket complying with ASTM C 443.

4. If specified, wrap exterior of each joint with engineering fabric.

B. Reinforced Concrete Arch Pipe (RCAP):

1. Comply with ASTM C 506.

2. Minimum Class A-III (Iowa DOT Class 2000D).

3. Use tongue and groove joints with cold applied bituminous or rubber rope gasket jointing materials, unless otherwise specified.

4. If specified, wrap exterior of each joint with engineering fabric.

C. Reinforced Concrete Elliptical Pipe (RCEP):

1. Comply with ASTM C 507.

2. Minimum Class HE III (Iowa DOT Class 2000D) or Class VE III (Iowa DOT Class 2000D).

3. Use tongue and groove joints with cold applied bituminous or rubber rope gasket jointing materials, unless otherwise specified.

4. If specified, wrap exterior of each joint with engineering fabric.

D. Reinforced Concrete Low Head Pressure Pipe (RCPP):

1. Comply with ASTM C 361; minimum Class C 25.

2. Use tongue and groove joints. Comply with ASTM C 361 for rubber O-rings or profile gaskets.

E. Polyvinyl Chloride Pipe (PVC):

1. Use pipe complying with the following:
   a. Types of PVC pipes:
      1) Corrugated exterior, smooth interior, ASTM F 949.
      2) Solid wall, ASTM D 3034 or ASTM F 679.
      3) Closed profile, ASTM F 1803.
      4) Composite, ASTM D 2680.
   b. PVC plastic meeting ASTM D 1784, Cell Classification 12454. Do not exceed 10 parts by weight per 100 of PVC resin in the compound for additives and fillers, including but not limited to stabilizers, antioxidants, lubricants, and colorants.
   c. Minimum pipe stiffness of 46 psi.

2.01 STORM SEWERS (Continued)

d. Integral bell and spigot joints with elastomeric seals according to ASTM D 3212 and ASTM F 477.

2. **Do not use in the right-of-way.** Use only outside the right-of-way in public utility easement areas where no utilities exist or are proposed (running parallel or crossing) or where the trench for the PVC pipe will not be disturbed, and where the Engineer allows.

F. High Density Polyethylene Pipe (HDPE):

1. Use pipe complying with the following:
   a. AASHTO M 294, Type S corrugated exterior and smooth interior.
   b. ASTM D 3350 minimum resin Cell Classification 335420 C.
   c. Minimum pipe stiffness at 5% deflection according to ASTM D 2412.
   d. Integral bell and spigot joints with elastomeric seals complying with ASTM F 477.
   e. Maximum 5% deflection of the average inside diameter by testing after installation according to Section 4060, 3.05.

2. **Do not use in the right-of-way.** Use only outside the right-of-way in public utility easement areas where no utilities exist or are proposed (running parallel or crossing) or where the trench for the HDPE pipe will not be disturbed, and where the Engineer allows.

G. Corrugated Metal Pipe (CMP):

1. Use pipe complying with the following:
   a. AASHTO M 36, Type I.
   b. Zinc coating complying with AASHTO M 218.
   c. Corrugated steel circular section with annular or helical corrugations.
   d. Gage of pipe according to Iowa DOT Standard Road Plan RF-32 or as specified in the contract documents.
   e. Coupling bands with annular or helical corrugations to match pipe ends.

2. **Do not use in the right-of-way.** Use only outside the right-of-way in public utility easement areas where no utilities exist or are proposed (running parallel or crossing) or where the trench for the CMP will not be disturbed, and where the Engineer allows.

H. Spiral Rib Pipe:

1. Use pipe complying with the following:
   a. ASTM A 760 Type 1R.
   b. Corrugation profile of 3/4 inch by 3/4 inch by 7 1/2 inches.
   c. Type 2 aluminized steel complying with ASTM A 929.
   d. Minimum thickness of 0.064 inch. Use gage of pipe according to manufacturer's requirements or as specified in the contract documents.
   e. Coupling bands complying with manufacturer's recommendations.

2. **Do not use in the right-of-way.** Use only outside the right-of-way in public utility easement areas where no utilities exist or are proposed (running parallel or crossing) or where the trench for the spiral rib pipe will not be disturbed, and where the Engineer allows.

2.01 STORM SEWERS (Continued)

I. Coated Corrugated Metal Pipe:

1. Use in corrosive soil or effluent conditions, or where specified in the contract documents or required by the Engineer.

2. Comply with AASHTO M 274. Use gage of pipe according to Iowa DOT Standard Road Plans RF-32 or as specified in the contract documents.

3. **Do not use in the right-of-way.** Use only outside the right-of-way in public utility easement areas where no utilities exist or are proposed (running parallel or crossing) or where the trench for the coated CMP will not be disturbed, and where the Engineer allows.

J. Corrugated Metal Arch Pipe (CMAP):

1. Use pipe complying with the following:
   a. AASHTO M 36, Type II.
   b. Zinc coating complying with AASHTO M 218.
   c. Corrugated steel Type I pipe reformed into a pipe-arch having an approximately flat bottom.
   d. Coupling bands with annular corrugations or helical corrugations to match pipe ends.
   e. Gage of pipe according to Iowa DOT Standard Road Plan RF32.

2. **Do not use in the right-of-way.** Use only outside the right-of-way in public utility easement areas where no utilities exist or are proposed (running parallel or crossing) or where the trench for the CMAP will not be disturbed, and where the Engineer allows.

K. Spiral Rib Arch Pipe:

1. Use pipe complying with the following:
   a. ASTM A 760 Type IIR.
   b. Corrugation profile of 3/4 inch by 3/4 inch by 7 1/2 inch.
   c. Type 2 aluminized steel complying with ASTM A 929.
   d. Minimum thickness of 0.064 inch. Use gage of pipe complying with manufacturer's requirements or as specified in the contract documents.
   e. Coupling bands complying with the manufacturer's recommendations.

2. **Do not use in the right-of-way.** Use only outside the right-of-way in public utility easement areas where no utilities exist or are proposed (running parallel or crossing) or where the trench for the spiral rib arch pipe will not be disturbed, and where the Engineer allows.

L. Jointing Material for Concrete Pipe:

1. **Bituminous Jointing Material:** Use a cold-applied mastic sewer joint sealing compound recommended by the manufacturer for the intended use and approved by the Engineer. Comply with AASHTO M 198.

2. **Rubber Rope Gasket Jointing Material:** Comply with ASTM C 990.

3. **Rubber O-ring or Profile Gasket:** Comply with ASTM C 443 (for RCP) or ASTM C 361 (for RCPP).

M. Bituminous Joint Primer: Material intended for use in priming concrete joints. Comply with the requirements of ASTM D 41.

2.01 STORM SEWERS (Continued)

N. Engineering Fabric: Comply with Iowa DOT Article 4196.01.

O. Non-Shrink Grout: Comply with Iowa DOT Materials I.M. 491.13.

2.02 CASING PIPE

Comply with Section 3020, 2.02 for casing pipe requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify measurements at site; make necessary field measurements to accurately determine pipe makeup lengths or closures.

B. Examine site conditions to ensure construction operations do not pose hazards to adjacent structures or facilities.

3.02 PIPE INSTALLATION

A. General:

1. Provide proper facilities for lowering the sections into place without damaging the pipe

2. Inspect pipe for defects before carefully lowering into trench. Do not install damaged or defective pipe.

3. Clean pipe interior and joints prior to lowering into trench. Keep pipe clean during construction.

4. Begin at the lowest point in the line. Lay groove or bell end pointing upstream unless specifically noted otherwise.

5. Place pipe with lifting holes at the top of the pipe and fill lift hole with non-shrink grout or manufactured plugs.

6. Assemble joints as specified by the pipe manufacturer. When specified, wrap exterior of storm sewer pipe joints with engineering fabric.

7. Cut ends of pipe at manholes, intakes, and structures. Do not hammer cut or break pipe.

8. Provide manholes and intakes as specified in the contract documents.

9. Use watertight stopper, plug, or other approved means to protect the exposed upstream ends of the pipe and prevent soil sediment from entering the storm sewer system.

B. Trenched:

1. Excavate trench and provide pipe bedding and backfill material as specified in Section 3010. If RCEP is used, provide pipe bedding as specified.

2. Prepare trench bottom to design line and grade so that only minor movement of the pipe is necessary after installation.

3. Lay pipe to design line and grade.
   a. Install pipe to line and grade specified in the contract documents. Set field grades to invert of pipe.
   b. At no additional cost to the Jurisdiction, correct misalignment, displacement, or otherwise defective pipe by removing, relaying, or replacing pipe.

4. Provide uniform bearing for full pipe barrel length. Excavate bell holes as necessary for uniform support of pipe barrel on bedding material.

5. Do not lay pipe in water or on saturated soil or bedding, or allow water to rise in trench around pipe prior to placing backfill material.

3.02 PIPE INSTALLATION (Continued)

6. Do not disturb installed pipe and bedding when using movable trench boxes and shields. Block or anchor pipe as necessary to prevent joint displacement.

C. Trenchless: Comply with Section 3020.

3.03 STORM SEWER INSTALLED WITHIN A CASING PIPE

Comply with Section 3020, 3.04 for installation of storm sewer within casing pipe.

3.04 PIPE JOINTING

A. General:

1. Clean joint surfaces to remove soil or foreign material prior to jointing pipe.

2. Assemble joints according to pipe manufacturer's recommendations. Use equipment that does not apply damaging forces to pipe joints.

B. Reinforced Concrete Pipe (RCP), Reinforced Concrete Arch Pipe (RCAP), and Reinforced Concrete Elliptical Pipe (RCEP):

1. Use cold applied bituminous or rubber rope gasket jointing materials unless otherwise specified.
   a. Apply joint material to entire tongue, or to top half of tongue and bottom half of groove, in sufficient quantity to fill the joint. Close the joint between pipes.
   b. Fill remaining voids in the joint, both inside and outside of pipe, with joint material. Smooth the joint material on the inside of pipes 24 inches and larger.

2. If a rubber O-ring or profile gasket is specified for RCP, coat the rubber gasket and joint with soap-based lubricant immediately prior to closing the joint.

3. If wrapped pipe joint is specified, comply with Figure 4020.211. Secure engineering fabric in place to prevent displacement while placing backfill material.

4. Place pipe such that joint openings on the outside or inside of the pipe do not exceed 1/8 inch at the bottom and 5/8 inch at the top.

C. Reinforced Concrete Low Head Pressure Pipe (RCPP); Polyvinyl Chloride Pipe (PVC) and Corrugated PVC Pipe; and High Density Polyethylene Pipe (HDPE): Coat gasket and joint with soap-based lubricant immediately prior to closing the joint.

D. Corrugated Metal Pipe (CMP) and Corrugated Metal Arch Pipe (CMAP): Lap coupling bands to form a tightly closed joint upon installation.

E. Connections between Dissimilar Pipes:

1. Use manufactured adapters or couplings approved by the Engineer.

2. Where adapters or couplings are not available, the Engineer may authorize use of a concrete collar as shown in Figure 4020.211.

3.05 TOLERANCES

The following tolerances apply to utilities installed by open trench construction. For trenchless construction, comply with Section 3020.

A. Ensure horizontal and vertical alignment of gravity sewer lines does not vary from design line and grade at any point along the pipe by more than 1% of the inside diameter of the pipe or 1/4 inch, whichever is larger.

B. Tolerance is allowed only if design line and grade is sufficient to prevent backslope when tolerance limits are reached.

C. Reverse slope on pipe is prohibited. Remove and reinstall pipe to proper grade.

3.06 CONFLICTS

A. Provide temporary support for existing water, gas, telephone, power, and other utilities or services that cross the trench.

B. Compact backfill material under existing utility crossing as specified in Section 3010, or construct utility line supports where specified in the contract documents or as directed by the Engineer.

3.07 STORM SEWER ABANDONMENT

A. Prior to placing the sewer plug, the Engineer will verify the sewer line is not in use.

B. Construct sewer plug by completely filling the end of the pipe with concrete. Force concrete into the end of the pipe for a distance of 16 inches, or one-half the pipe diameter, whichever is greater.

C. If noted on the plans, fill the line to be abandoned with flowable mortar or CLSM (comply with Section 3010) by gravity flow or pumping.

3.08 CONNECTION TO EXISTING MANHOLE OR INTAKE

Comply with Section 6010, 3.05.

3.09 CLEANING, INSPECTION, AND TESTING

Clean, inspect, and test according to Section 4060.

END OF SECTION