

SECTION 02630
STORM DRAINAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Storm drainage piping including irrigation lines within City rights of way.
2. Accessories.
3. Catch basins.
4. Cleanouts.
5. Manholes.
6. Head Walls.
7. Bedding and cover materials.

B. Related Sections:

1. Section 02060 – Aggregate.
2. Section 02324 – Trenching.
3. Section 03300 - Cast-in-Place Concrete.

1.2 REFERENCES

- A. City of Cañon City Grading, Erosion, & Sediment (GESG) Plan Manual.
- B. Urban Drainage and Flood Control District (UDFCD) Criteria Manual.
- C. City of Cañon City Illicit Discharge Detection & Elimination (IDDE) Manual.
- D. Colorado Department of Transportation:
 1. 2017 CDOT Standard Specifications for Road and Bridge Construction.
 2. CDOT M & S Standards 2012.
- E. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
 2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 3. ACI 305 - Hot Weather Concreting.
 4. ACI 306 - Cold Weather Concreting.
 5. ACI 318 - Building Code Requirements for Structural Concrete.
- F. ACI 306 - Cold Weather Concreting.
- G. Concrete Reinforcing Steel Institute:
1. CRSI Manual of Standard Practice.

H. American Society for Testing and Materials:

1. ASTM C76- Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
2. ASTM C443- Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
3. ASTM C478- Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
4. ASTM C923- Standard Specification for resilient Connectors Between Reinforced Concrete Manhole Structures.
5. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
6. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
7. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

1.3 SUBMITTALS

- A. Product Data: Submit data indicating pipe, pipe accessories, and shop drawings for inlet boxes, manhole covers, steps, and grates.
- B. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents:
 1. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.
 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with 2017 CDOT Standard Specifications for Road and Bridge Construction, CDOT M&S Standards 2012, and City of Cañon City Standards.

- B. Maintain one copy of each document on site.
- C. Video Inspection, at Engineer's discretion, shall be required per Engineer's inspection criteria for all new storm sewer installed.

1.6 COORDINATION

- A. Design the Work to incorporate existing storm sewers systems and City's Master Drainage Plan.
- B. All erosion, sediment, and illicit discharge control shall be in accordance with applicable Federal, State, and City regulations including the City of Cañon City GESD & IDDE Manuals.

PART 2 PRODUCTS

2.1 STORM DRAINAGE PIPING

- A. Reinforced Concrete Pipe: ASTM C76; mesh or bar reinforcement; inside nominal diameter of 12-inches minimum, bell and spigot ends.
 - 1. Fittings: Reinforced concrete.
 - 2. Joints: ASTM C443, rubber compression gasket
- B. Corrugated Steel Pipe: Nominal diameter of 12-inches minimum, 12 gauge; helical lock seam; galvanized steel.
 - 1. Fittings: Corrugated steel.
 - 2. Joints: Corrugated steel pipe coupling bands, galvanized steel, 0.052 inches thick x 10 inches wide; connected with two neoprene "O" ring gaskets and two galvanized steel bolts.
- C. Plastic Pipe: ASTM D3350, High Density Polyethylene (HDPE) material, A.D.S. N-12, corrugated, smooth wall interior, inside nominal diameters of 12-inches minimum, bell and spigot style ends.
 - 1. Fittings: Same material and manufacturer.
 - 2. Joints: rubber o-ring gasket, silt-tight.

2.2 ACCESSORIES

- A. Pipe and Structure Grout: Specified in Section 03300.
- B. Rip Rap Grout: 70 percent sand, 30 percent 3/8 inch aggregate, 6-9 inch slump, 5-8 percent entrained air, minimum compressive strength 3500 psi.

C. Reinforcement: Specified in Section 03300.

2.3 CATCH BASINS/INLETS AND CLEAN OUTS

A. Inlet Box & Grate:

1. Construction: Pre-cast, HS-20 loading.
2. Grate & Frame: HS-20 loading – heavy duty, bicycle safe.
3. Nominal Minimum Inside Dimension: 2 x 2 foot.

B. Type R Inlet:

1. Construction: Pre-cast, according to CDOT M & S Standards 2012. Nominal Minimum Inside Dimension: 3.5 x 3.5 foot.

C. Concrete Clean Out:

1. Construction: Cast-in-place, HS-20 loading.
2. Lid: Approved 3/8" inch steel cut to fit.
3. Nominal Minimum Inside Diameter: 2 x 2 foot.

2.4 MANHOLE

A. Construction: Pre-cast, ASTM C478, HS-20 loading.

B. Lid: Neenah R-1706-1.

C. Steps: Aluminum or gray iron and cast in place when concrete is cast and be 9 ¼ inch x 12 ½ inch. As an alternate, steps may be polypropylene (M.A. Industries PS2-PFS or equal) and can be press fit into preformed holes.

D. Nominal Minimum Inside Diameter: for manholes 6 feet or less in depth - 4 foot, for manholes greater than 6 feet in depth - 6 foot.

E. Manhole Sections: Reinforced pre-cast concrete as specified in Drawings in accordance with ASTM C478 with gaskets in accordance with ASTM C923.

2.5 HEAD WALL

A. Concrete: Specified in Section 03300.

B. Reinforcement: Specified in Section 03300.

2.6 PRE-CAST CONCRETE

A. Provide all units shown in Plans and as needed for a complete and proper installation.

B. Design Criteria- Design units in accordance with:

1. ACI 304 and 318.
2. CRSI Manual of Standard Practice.
3. Applicable ASTM Standards.

2.7 BEDDING AND COVER MATERIALS

- A. Bedding: Flow Fill as specified in Section 02320 or uniformly graded rock wrapped in drainage fabric or Fill Type Class 6 as specified in Section 02060, see City of Cañon City Standard Detail W-3.
- B. Cover and Backfill: Fill Type Class 6 as specified in Section 02060 or Flow Fill as specified in Section 02320.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify trench cut and excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

3.2 PREPARATION

- A. Remove old culvert, and related debris and dispose of.
- B. Hand trim excavations to required elevations. Correct over excavation with material as directed by Engineer.
- C. Remove large stones or other hard matter, which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 02324 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

- A. Per City of Cañon City Standard Detail.
- B. Install pipe, fittings, and accessories as indicated in accordance with ASTM D2321 with the exception that minimum cover shall be 1 foot. Seal joints watertight.
- C. Place pipe on minimum 4 inch deep bed of Type Class 6 aggregate.
- D. Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 10 feet.
- E. Install aggregate at sides and over top of pipe as indicated. Install top cover to minimum compacted thickness of 12 inches, compact to 97 percent according to ASTM D698.

3.5 INSTALLATION - CATCH BASINS, CLEANOUTS, AND MANHOLES

- A. Lift pre-cast structures at lifting points designated by manufacturer.
- B. When lowering manholes and drainage structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.
- C. Form bottom of excavation clean and smooth to correct elevation, install and compact bedding material. Flow fill can be used in place of bedding material, as specified in Section 02320.

- D. Form and place Cast-In-Place Concrete base pad, with provision for storm sewer pipe end sections according Section 03300.
- E. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.
- F. Set pre-cast structures bearing firmly and fully on bedding.
- G. Move pre-cast boxes into position in a manner that is not detrimental to the construction of the concrete or reinforcement.
- H. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.
- I. Assemble multi-section structures by lowering each section into excavation. Lower, set level, and firmly position base section before placing additional sections.
- J. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.
- K. Mount grate/lid and frame level in grout, secured to top section to elevation indicated.
- L. Install aggregate at sides and around box as indicated on Drawings. Compact to 97 percent according to ASTM D698.
- M. Grout flow line inverts and pipe connections the full wall width.
- N. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.
- O. Pipes stubbed into boxes shall be saw-cut to length such that ends do not protrude into the interior of the box in excess of 4 inches.
- P. Manholes shall be placed a minimum of every 500 feet and at connections under the traveled roadway.
- Q. Cleanouts shall be placed a minimum of every 50 feet and at connections outside the traveled roadway.

3.6 HEAD WALL

- A. Install required reinforcement as indicated.
- B. Form and place concrete to the dimensions indicated according to Section 03300.

3.7 FIELD QUALITY CONTROL

- A. Request inspection prior to and immediately after placing aggregate cover over pipe.
- B. Compaction Testing: In accordance with ASTM D698.
- C. When tests indicate work does not meet specified requirements, remove work, replace and retest.

3.8 PROTECTION OF FINISHED WORK

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
 - 1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
 - 2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION