

SECTION 2700 – STORM SEWER

STORM SEWER

PART 1 – GENERAL

1.01 Section Summary

- A. Construction of storm sewer systems including pipes, manholes, catch basins, and appurtenances.

1.02 Related Sections

- A. Section 1200 – Temporary Erosion and Sediment Control
- B. Section 1700 – Adjustment of Structures
- C. Section 2000 – Trench Excavation and Backfill
- D. Section 2800 – Subsurface Drainage
- E. Section 3200 – Concrete Curb and Gutter

1.03 References

- A. American Society of Testing Materials (ASTM)
 - 1. A48 – Specification for Gray Iron Castings.
 - 2. A153 – Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 3. A615 – Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 4. C76 – Specification for Reinforced Concrete Culvert, Drain, and Sewer Pipe.
 - 5. C139 – Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
 - 6. C150 – Specification for Portland Cement.
 - 7. C206 – Specification for Finishing Hydrated Lime.
 - 8. C361 – Specification for Reinforced Concrete Low Head Pressure Pipe.

8. C443 – Specification for Joints for Circular Concrete Sewer and Pipe, Using Rubber Gaskets.
 9. C478 – Specification for Precast Reinforced Concrete Manhole Sections.
- B. North Dakota Department of Transportation “Standard Specification for Road and Bridge Construction” 2008 Edition, As Revised.
1. Section 714 – Culverts, Storm Drains, Edge Drains, and Underdrains.
 2. Section 722 – Manholes, Catch Basins, and Inlets.
 3. Section 708.04 – Riprap and Aggregate Cushion.
 4. Section 858 – Geotextile Fabrics.
- 1.04 Submittals
- A. Contractor to supply the Engineer with shop drawings for all structures, castings, and other manufactured materials.

PART 2 – PRODUCTS

- 2.01 Concrete and Mortar
- A. All concrete products shall use Type 1 Portland Cement (conform to ASTM C150), washed sand, and crushed aggregate free of deleterious materials.
 - B. Mix designs shall be approved by the Engineer and must obtain 4000 psi compressive strength at 28 days.
 - C. Use non-shrink mortar for brick work and sealing of structures. Use one part cement to 2 parts sand.
- 2.02 Frames and Castings
- A. All frames and castings shall conform to ASTM A48, class 35 cast iron.
 - B. The type and style of casting is shown on the Plan or is indicated on the detail plate.
 - C. All storm manhole castings without a grate opening shall be stamped “STORM SEWER.”
 - D. Covers shall have 2 concealed pick holes, Type F.
- 2.03 Storm Manholes and Catch Basins
- A. Structures shall conform to ASTM C478.

- B. All structures shall be precast, no block structures are allowed.
- C. All manhole joints shall have rubber o-ring gaskets meeting ASTM C443.
- D. Structure bases shall be precast concrete.
- E. Steps shall be steel reinforced polypropylene plastic.
- F. Catch Basin Manholes shall be the only approved junction structure where both inlet pipes and an opening for accepting storm water are needed.

2.04 Reinforced Concrete (RCP) Pipe

A. General

- 1. All reinforced concrete pipe shall conform to ASTM C76, wall B with circular reinforcing.
- 2. Each pipe shall be marked with name of manufacturer, plant, date of manufacture, pipe class, and specification design.

B. Tongue and Groove RCP

- 1. Unless otherwise stated on the plan, this type of joint shall be specified.
- 2. Gaskets shall be used only when specified or as directed by the Engineer.
- 3. All joints shall be securely wrapped with Geotextile fabric.

C. Bell and Spigot RCP

- 1. Joints shall use o-ring gasket made of synthetic rubber.
- 2. Bell and spigot joints shall conform to ASTM C361.

2.05 Trash Racks

- A. All grates and hardware shall conform to ASTM A153.
- B. Size and configuration of bars shall be shown on the detail plate.
- C. Trash rack must be securely attached to the end section.
- D. Trash rack only required on outlet sections.

2.06 Slotted Inlet Drains

- A. Inlet Pipe: Shall be Corrugated Steel Pipe (CSP) of the size specified on the Plan and shall conform to AASHTO M36.

1. Coupling band shall be 10-1/2 inches minimum with a 1/2 inch carriage bolt.
- B. Slotted Drain System: Shall be fabricated and attached to the CSP and shall be coated according to AASHTO M111.
 1. Butt welded No 4 rebar, 9 inches in length, with 1-1/2 inches of cover, shall be attached to the slots.
 2. Inlet slots shall have a 1-3/4 inch opening at the surface that will expand to 3 inches at the top of pipe.
 3. Inlet slots shall be vane type, spaced every 6 inches.

2.07 Rip Rap

- A. Material: Field stone or crushed stone not to exceed 12 inches in diameter but not less than 4 inches in diameter. Stone shall not be sandstone, shale, or soft limestone. Stone shall not abrade or crush.
- B. Geotextile Fabric: Shall be type RR or type R1 as defined by NDDOT Spec. Section 858.

PART 3 – EXECUTION

3.01 General

- A. All excavation and bedding requirements shall conform to the detail plates or Section 2000 – Trench Excavation and Backfill.
- B. Contractor shall be responsible for all bypass pumping and drainage required during construction.
- C. Establish temporary erosion control as Specified in Section 1200 – Temporary Erosion and Sediment Control as soon as practical.

3.02 Connect to Existing

- A. Connect to Existing Structure
 1. Cut hole into side of structure and insert pipe flush with interior wall.
 2. Mortar void between pipe and structure to provide a water tight seal. Apply mortar to give an even surface.
 3. Reconstruct invert to provide flow through the structure.
- B. Connect to Existing Pipe

1. Utilize tongue and groove joint if possible and wrap with Geotextile fabric.
2. If butt joint must be used, wrap joint with Geotextile fabric and place a 12 inch thick and 12 inch wide concrete collar around the joint.

3.03 Pipe Installation

- A. Lay pipe to alignment, grade, and location staked in the field or shown on the Plans. No deviation is allowed unless approved by the Engineer. Deviation from grade in excess of 0.05 percent may be cause for rejection and remove and replace pipe at the Contractor's expense.
- B. Lay pipe upgrade with tongue/spigot ends pointing in the direction of flow.
- C. Joints shall be wrapped with Geotextile fabric 24 inches wide centered on the joint and secured to the pipe.
- D. Dirt or other foreign materials in the pipe must be removed prior to installation. Contractor is responsible for system maintenance until accepted by the City of Minot.
- E. Where storm sewer outlets to grade or where line is terminated by a flared end section, the last 3 joints shall be tied together with 2 U-bolt fasteners per joint and as recommended by the pipe manufacturer.

3.04 Structure Installation

- A. Shall be installed level. No deviation is allowed.
- B. Precast slab shall be placed on compacted granular bedding.
- C. Inverts shall be poured to half equivalent pipe size of the inlet and outlet pipe to allow for a free and uninterrupted flow. All surfaces must be smooth and slope to flow line. Preformed inverts are not allowed.
- D. Install short precast manhole section (maximum of 16 inch height) below the eccentric cone or precast top slab.
- E. Vertical wall of the eccentric cone section shall be on the downstream side.
- F. Steps shall be placed over the downstream pipe. When pipe size is in excess of 24 inches, place steps where most appropriate for access.
- G. Install rings and casting in conformance to Section 1700 – Adjustment of Structures. A minimum of 2 rings must be installed.
- H. All pipe connections must be neatly sealed with mortar and have a smooth finish.

I. All lift holes must be mortared.

3.05 Slotted Drains

A. Fabricate and install according to manufacturer's instructions.

B. Top of inlet slots shall be 1/2 inch below the surface of the concrete curb and gutter.

C. Insert CSP into structure a maximum of 4 inches. Excess shall be cut off and void around pipe shall be sealed neatly with grout.

3.06 Bulkhead

A. Bulkheads shall be built with non-shrink grout. Bulkhead shall provide a water tight seal.

3.07 Rip Rap

A. In general, conform to NDDOT Spec Section 708.04 except as modified herein:

1. Grout and wire mesh shall not be used unless specified on the Plan.
2. Rip Rap placement size and shape shall be Specified on the Detail Plate.

3.08 Field Quality Control

A. General

1. Contractor shall provide all labor and materials necessary for inspections and tests.
2. Engineer shall be present and observe all required testing. Contractor shall notify Engineer 48 hours before testing.

B. System Cleanup

1. Contractor shall ensure pipe and manholes are clean and free of material.
2. If system is dirty due to Contractor negligence, the system will be cleaned at the sole expense of the Contractor. Jetting may be required. Complete before final inspection.

C. Testing

1. Testing shall begin only after the system has been cleaned.

2. Lamping: Engineer will verify installation is true to line and grade, joints are home, pipe has not broken, and deflection has not occurred.

3.09 Measurement and Payment

- A. Storm Sewer Pipe: Shall be paid for by the lineal foot (LF) for each size, type, class, and depth increment specified. Measurements shall be from center to center of manholes. Price shall include all materials and labor necessary including excavation, pipe, Geotextile fabric, bedding and backfill.
- B. Catch Basin, Catch Basin Manhole, and Manhole Structure: Shall be paid for by each (EA) for the size and type specified on the Plan up to 8 feet in depth. Price shall include all material and labor necessary to install the structure including the casting frame and cover, adjusting rings, and adjustment to finish grade.
- C. Structure Overdepth: Shall be paid for by the lineal foot (LF) for structure depths greater than 8 feet. Measurement will be made from rim elevation to invert. Price shall include all materials and labor necessary for installation of manhole riser sections.
- D. Slotted Drain: Shall be paid for by the lineal foot (LF) for the size and type specified on the Plan. Measurement shall be from the end cap of the CSP to the end of the CSP inserted in the structure. Price shall include all materials and labor necessary including fabricated slotted drain system, rebar, and fittings.
- E. Flared End Section with Trash Guard: Shall be paid for by each (EA) for the size and type specified on the Plan. Price shall include all material and labor necessary for installation including tie bars and Trash Guard.
- F. Rip Rap: Shall be paid for by the cubic yard (CY) delivered and in place. Price shall include Geotextile fabric and aggregate cushion.
- G. Bulkhead: Shall be paid for by each (EA) and shall include all materials and labor necessary for complete installation.

END OF SECTION