

## SECTION 5200 - STORM SEWER

### PART 1 - GENERAL

- 1.01 SCOPE:** This Section covers installation of storm sewer mains and culverts. Topics include permits and fees, trench widths, pipe laying, bedding, initial backfill, encasement, water crossings, underdrain installation, slope anchors, encasement, and alignment tests.
- 1.02 RELATED WORK:** Refer to the following sections for related work:
- |                                |  |
|--------------------------------|--|
| Site Restoration               | Section 1000-General Requirements          |
| Trenching                      | Section 2100-Trenching and Tunneling       |
| Concrete Cradle Material       | Section 4000-Concrete Material and Methods |
| Manholes and Pipe Material     | Section 5000-Manhole Construction          |
| Filter Fabric for General Uses | Section 2000-Earthwork                     |
- 1.03 SUBMITTALS:** Contractor shall submit the following for review:
- A. Sieve analysis of bedding material.
- 1.04 KDHE REQUIREMENTS:** Contractor is notified that the Kansas Department of Health and Environment has requirements for the protection of potable water systems that may affect the work covered by this Section.
- 1.05 TIMING OF CONNECTION TO EXISTING SEWER SYSTEM:** To prevent trench water from entering the existing sewer system, the new main shall remain isolated from the existing system until backfill and acceptance tests are complete.

### PART 2 - PRODUCTS

#### 2.01 STORM SEWER AND CULVERT PIPE:

- A. Reinforced Concrete Pipe (RCP): RCP pipe shall conform to ASTM C76 for round pipe, ASTM C506 for arch pipe, and ASTM C507 for elliptical pipe. Unless otherwise specified, Class III, wall B shall be provided. Joints shall be tongue-in-groove with preformed, flexible sealants and shall conform to ASTM C990. End sections shall be flared and shall meet the concrete material, steel area, and workmanship requirements for Class III or A-III pipe. Fittings shall be manufactured from green precast stock, carefully mitered, and shall have reinforcing cages welded together at the joint.

Reinforced concrete box sections shall conform to ASTM C789 for normal installations and ASTM C850 for installations under roadways with less than 2 feet of cover. Design tables shall be appropriate for the loading conditions. Designs not taken from the design tables shall be sealed by a registered professional engineer.

B. High Density Polyethylene Pipe (PE or HDPE): HDPE pipe and fittings shall conform to ASTM F2306. Pipe shall be made from virgin PE compounds confirming to cell class 435400C in ASTM D3350. Joints shall be integral bell and spigot with rubber gaskets. Joint shall be water tight as defined in ASTM F2306. Pipe manufacturer shall be certified through the Plastic Pipe Institute third party certification program.

**2.02 POLYETHYLENE (PE) UNDERDRAIN:** Corrugated PE tubing for underdrains shall conform to KDOT Standard Specifications Subsection 1908.

**2.03 FILTER FABRIC:** Filter fabric for underdrains shall be a geotextile meeting the requirements of KDOT Standard Specifications Subsection 1710.

<u>Property</u>	<u>Limit</u>	<u>Method</u>
Tensile Strength	150 lbs.	ASTM D4632
Puncture Strength	80 lbs.	ASTM D4833
Trapezoid Tear	100 to 40	ASTM D4571

**2.04 BEDDING:** KDOT Standard Specifications Section 1100, CA-5, Coarse Aggregate for Concrete, washed stone or gravel, meeting the following gradation:

<u>Sieve Size</u>	<u>Percent Retained</u>
1-inch	0
3/4-inch	0 - 5
3/8-inch	40 - 60
No. 8	95 - 100

**2.05 SELECT BACKFILL:** Site excavated or imported noncohesive material free of clay lumps, rocks larger than 3 inches, organics, trash, or frozen material.

**2.06 ENCASMENT MATERIAL:** As referenced in Part 1.

**2.07 TEMPORARY PLUGS:** Temporary plugs shall be a model recommended by pipe manufacturer; watertight to a static head of 25 feet.

**2.08 PIPE MATERIAL FOR SPOT REPAIR:** Sewer pipe that is deteriorated or damaged shall be replaced with the same material as existing, except clay pipe, which may be replaced with PVC (SDR 26) using an approved flexible connector made specifically for connecting these materials. Grouted inserts of any kind will not be allowed. Connection shall be made at existing bells or joints.

**PART 3 - EXECUTION**

**3.01 TRENCHING:** See reference in Part 1 for trench excavation, protection, dewatering, and general backfill. Trench width, measured at 1 foot above the exterior top of pipe, shall be at least 15 inches greater but not more than 24 inches greater than the exterior width of the pipe. Excessive width trenches shall be corrected by use of bedding material throughout the initial backfill zone.

**3.02 PIPE LAYING:** Installation of pipe shall proceed from the downstream end of the project with bell ends facing upstream. Alignment and grade shall be uniform between manholes, and a positive system of grade control shall be used for maintaining alignment. Due to difficulty of compacting beneath wide pipes, loose bedding material shall be shaped to receive the full length of the pipe except where required to mate joints. The ends of the installed pipe shall be plugged whenever the work is not in progress. Joint installation shall follow the manufacturer's recommendation.

**3.03 INITIAL BACKFILL:** Select backfill shall be placed from the upper limit of the bedding to a level 12 inches above the exterior top of pipe. Limestone bedding material shall not be used with ductile-iron pipe. Material shall be placed uniformly on both sides of the pipe and compacted with hand operated equipment to 95 percent of standard density as determined by ASTM D698.

**3.04 BEDDING:** Unless otherwise specified, granular bedding material shall be placed uniformly on both sides of the pipe to the limits given below and compacted to 95 percent of standard density as determined by ATSM D698. Depth of granular bedding material below the exterior bottom of pipe shall meet the following minimums:

<u>Pipe Diameter</u>	<u>In soil</u>	<u>In rock</u>
24 inches and less	4 inches	6 inches
27 inches to 60 inches	4 inches	9 inches
66 inches and greater	6 inches	12 inches

The top limit of granular bedding material shall be springline (the widest part) of the pipe.

**3.05 UNDERDRAIN INSTALLATION:** Underdrain shall have minimum grade of 1 percent unless shown otherwise on the drawings. Upstream ends of underdrain shall be capped. Junctions shall be made with manufactured wyes and tees. Granular bedding material shall extend from a minimum of 4 inches below the pipe to a minimum of 8 inches above the pipe. Granular bedding shall be enclosed by filter fabric lapped a minimum of 1 foot.

**3.06 SLOPE ANCHORS:** Slope anchors shall be minimum of 12 inches thick and shall extend a minimum of 2 feet from the exterior of the pipe on all sides. They shall be cast against undisturbed earth in the trench walls and bottom. In rock, the walls and anchors shall be keyed a minimum of 6 inches into undisturbed rock. Anchors shall be cast against pipe bells or a capped cross on bell-less pipe. Whenever there is more than 8 feet of vertical fall between manholes, anchors shall be placed at intervals not to exceed 8 feet of vertical fall.

- 3.07 CONCRETE ENCASUREMENT:** Concrete encasement shall extend a minimum of 6 inches beyond the outside wall of pipe; except the top level of encasement at drainage course crossings shall be as shown on the detail drawing. Encasement shall be reinforced with four No. 6 reinforcing bar for sizes up to and including 24 inches. Reinforcing for larger sizes shall equal 0.4 percent of the cross sectional area of the concrete. Reinforcing bar shall be placed with 3 inches of cover from the bottom and sides of the encasement. Laps shall be 16 bar diameters.
- 3.08 ALIGNMENT TESTING:** To verify alignment and workmanship, installed pipe may be lamped or televised. Lamped sections shall have no elongation of the silhouette or evidence of debris or dirt in the pipe. Televised pipe shall be inspected for a smooth, structurally sound, straight main. Pipe may also be televised at the end of the warranty period. Unacceptable defects include displacement at joints, intrusion of foreign material, and cracked or distressed pipe.

Pipe not passing alignment tests shall be repaired or replaced and retested.

**STANDARD DETAILS RELATED TO THE WORK OF THIS SECTION:**

UG 5200-A PLUNGE POOL FOR OUTLET IN LINE WITH STREAM

UG 5200-B TOE WALL FOR FLARED END SECTION

UG 5200-C STORM SEWER OUTLET LATERAL TO STREAM – SHEET 1 OF 2 – PLAN VIEW

UG 5200-D STORM SEWER OUTLET LATERAL TO STREAM – SHEET 2 OF 2 – TOE BANK PROTECTION

UG 5200-E LEVEL SPREADER – SHEET 1 OF 2 – PLAN VIEW

UG 5200-F LEVEL SPREADER – SHEET 2 OF 2 – RIGID LIP CROSS SECTION

END OF SECTION 5200