SECTION 4000--STORM SEWERS

4001 SCOPE. This section covers the furnishings of all labor, materials, and equipment for the complete installation of storm sewers and appurtenances in accordance with the contract documents. The work shall consist of the construction of storm sewers for the removal of water from collection points, in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the contract drawings or established by the engineer. Unless otherwise indicated in these specifications, the phrase "Storm Sewer" shall refer to pipe sewers, box culvert sewers, or paved or rock lined channels.

4002 REINFORCED CONCRETE PIPE. All reinforced concrete pipe shall conform to ASTM C76, Class III. This specification covers reinforced concrete pipe of 15- to 108-inches in diameter and is intended for use in conveyance of storm water and for the construction of culverts.

Installation shall conform to the requirements of Section 6000 *Excavation, Trenching, and Backfilling*. No pipe culverts shall be placed until the embedment below the proposed reinforced concrete pipe have been approved by the engineer.

4003 CORRUGATED METAL PIPE. Corrugated metal storm sewer pipe shall be furnished with connecting bands, elbows, and fittings. Corrugated metal storm sewer pipe shall have annular ends. The same type of pipe base metal (steel or aluminum) shall be used throughout any individual run or installation of pipe or for pipe extensions. Materials shall conform to the requirements provided in the current edition of the Standard Specifications for State Road and Bridge Construction, Kansas Department of Transportation. **All Ultra-Flo pipe shall be aluminized type 2.**

Corrugated metal culvert pipe gauge requirements shall conform to Design Aids 4-1 and 4-2 of the Design Criteria. In no case shall any pipe be lighter than 16 gauge.

Corrugated metal storm sewer pipe shall be handled in such a manner that it is not chipped, dented, or bent. If in handling the culvert the base metal is exposed in any way, it shall be rejected or repaired to the satisfaction of the engineer.

The excavation, trenching, and backfilling of corrugated metal pipe storm sewers shall be performed in accordance with the requirements of Section 6000 of these specifications. No pipe culverts shall be placed until the embedment below the pipe has been approved by the engineer.

A. CORRUGATED METAL PIPE; ALUMINIZED TYPE 2: Sheet steel for aluminized CMP shall conform to ASTM A-929 or AASHTO M-274. Pipe manufacture shall conform to ASTM A-760 or AASHTO M-36. Fitting shall be fabricated from the same material as the pipe.

4004 SMOOTH INTERIOR CORRUGATED POLYETHYLENE PIPE. This specification applies to high density polyethylene corrugated pipe with an integrally-formed smooth interior. This specification is applicable to nominal sizes 12- to 60-inch diameter. Requirements for test methods, dimensions, and markings are those found in AASHTO Designation M-294, Type S. Pipe and fittings shall be made of polyethylene compounds which meet or exceed the requirements of Type III, Category 4 or 5, Grade P33 or P34, Class C per ASTM D-1248 with the applicable requirements defined in ASTM D-1248. Clean rework material may be used.

The pipe and fittings shall be free of foreign inclusion and holes, and visible defects. The ends of the pipe shall be cut squarely and cleanly so as not to adversely effect joining.

The nominal size for the pipe and fittings is based on the nominal inside diameter of the pipe. Corrugated fittings may be either molded or fabricated by the manufacturer. Fittings produced by manufacturers other than the supplier of the pipe shall not be permitted without the approval of the city engineer. Joints shall be made with integral bell or split couplings, corrugated to match the pipe corrugations, and engage a minimum of 4 corrugations. A neoprene gasket shall be utilized with the coupling to provide a soil-tight joint. Installation shall be in accordance with Section 6000 of these specifications. A manufacturer's certifications that the project was manufactured, tested, and supplied in accordance with this specifications shall be furnished.

4005 CATCH BASINS, INLETS, AND JUNCTION BOXES. The methods of excavation and backfilling for catch basins, inlets, and junction boxes shall conform to the requirements of Section 6000 *Excavation, Trenching, and Backfilling* and Standard Details of these specifications.

Reinforced concrete catch basins and inlets shall conform to the standard concrete inlet drawings and shall be constructed of concrete having a minimum 28-day compressive strength of 4000 psi. Concrete cover over steel reinforcement shall be not less than 1-1/2 inches for covers and 1-1/2 inches for walls and floors. All exposed concrete shall have smooth steel trowel or brushed finish. Interiors of structures shall have the forms removed and surface voids filled.

Foundations for all standard catch basins and inlets shall have a minimum 28-day compressive strength of 3000 psi.

The floors of all catch basins, inlets, and junction boxes shall have inverts. Inverts shall be constructed of concrete conforming to the requirements of Section 2000 *Concrete*, with the exception that the concrete shall have a minimum 28-day compressive strength of Class I 3000 psi.

All catch basins, inlets, pipes, and junction boxes shall be thoroughly cleaned of any accumulation of silt, debris or foreign matter of any kind, and shall be free from such accumulations at the time of final inspection.

4006 REINFORCED CONCRETE BOX CULVERTS. The work performed herein covers the installation of concrete work in strict accordance with the applicable provisions of Section 2000 *Concrete,* Section 6000 *Excavation, Trenching, and Backfilling,* Standard Details, all of these

specifications, the current edition of the Standard Specifications for State Road and Bridge Construction, Kansas Department of Transportation, and the applicable contract drawings.

4007 PAVED DITCHES AND RIPRAP Paving concrete for paved ditches shall conform to the applicable provisions of Section 2000 *Concrete* of these specifications and shall conform to the standard drawings or approved equal.

The concrete shall be placed beginning at the lower end of the portion of the ditch to be lined and progressing toward the upper end. If required on the contract drawings, the concrete shall be reinforced with the type of reinforcement and in the manner indicated. Contraction or construction joints shall be spaced and formed as indicated on the contract drawings.

The surface shall be finished with a wooden float. A light brooming may be required for a more acceptable finish. Immediately after the finishing operations are completed, the concrete shall be protected and cured in conformance with the requirements specified in Section 2000 *Concrete.*

Riprap shall be placed at the locations and to the dimensions shown on the contract drawings in accordance with the specified requirements.

Riprap shall be graded as necessary to form a dense blanket. The finished surface shall present an even surface conforming to the lines, grades, and sections given. Riprap shall be placed to a minimum depth of eighteen inches (18”). All riprap shall be placed on top of filter fabric.

Riprap shall be placed in such a manner that voids created by larger pieces are filled in by smaller pieces and no voids extend directly through the riprap to the surface below. The riprap shall be placed in rows transversely to the center line of the ditch and in the manner indicated on the drawings. The riprap shall be placed with ends and sides abutting and the joints between rows breaking with the joints in the preceding row.

Riprap shall consist of durable field or quarry stones. Riprap pieces shall range in weight from five (5) pounds to two hundred (200) pounds. Not less than 75 percent (75%) shall be within the range of one hundred (100) pounds to two hundred (200) pounds.

Stone for riprap shall be free from earth, soapstone, shale, shale-like or other easily disintegrated material that will tend to decrease the durability of the material after placement.

When grouted stone riprap is indicated the spaces between stones of grouted riprap shall be filled with grout consisting of one (1) part Portland Cement and three (3) parts of fine aggregate with sufficient water to form a plastic mix. The grout shall be poured and broomed into the spaces until they are completely filled.

4008 HEADWALLS, WINGWALLS, ENDWALLS, AND END SECTIONS. Construction will be according to details in the approved plans. Precast concrete or fabricated metal end sections may be used in place of cast-in-place concrete structures with the engineer's approval. Shop drawings will be submitted for precast box culvert pieces.

Materials will be in accordance with Section 2000 *Concrete* and Section 4000 *Storm Sewers* and Standard Details of this Specification. The same type of pipe base metal (steel or

aluminum) shall be used throughout any individual run or installation of pipe or for pipe extension, including end sections.

The end sections for pipe culverts shall be installed in accordance with the requirements specified in Section 6000 of these specifications.

The area excavated for the pipe and headwalls shall be backfilled with suitable material and the material shall be compacted in accordance with the provisions of Section 6000 of these specifications.

4009 RESTORATION OF SURFACE CONSTRUCTION. The restoration of concrete and asphalt pavement, gravel surfacing, walks, drives, curbs, and other surface construction removed or damaged during the progress of the work covered by this section shall conform to the applicable provisions of Section 7000 *Restoration of Surface Construction* of these specifications.