SECTION 55 – PIPE FOR STORM DRAINS AND CULVERTS (FAA D-701)

55-1 GENERAL

The Contractor shall perform all work required by the plans for construction of pipe for storm drains, precast polymer trench drains and culverts in accordance with the Standard Specifications, or the Standard Plans referenced, except as specified otherwise in FAA Specification Item D-701, as included and modified hereafter, and as shown on the plans.

Unless otherwise noted on the plans, all Reinforced Concrete Pipe shall be ASTM C 76 ClassV rated, or as shown on the Storm Drain pipe profile sheets in the plans.

Some storm drain pipe will be installed in areas of limited-time night construction as shown on the phasing sheets in the plans. The Contractor is responsible for determining the difficulties associated with installation of pipe under these conditions. He shall plan his construction approach accordingly and include additional costs associated with construction in these areas in his unit prices.

ITEM D-701 PIPE FOR STORM DRAINS AND CULVERTS

DESCRIPTION

701-1.1 *This item shall consist of the construction of pipe culverts and storm drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.*

MATERIALS

701-2.1 *Materials shall meet the requirements shown on the plans and specified below.*

701-2.2 PIPE. *The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements.*

Reinforced Concrete Pipe .....ASTM C 76
Reinforced Concrete D-Load Pipe.....ASTM C 665
Reinforced Concrete Arch Pipe .....ASTM C 506
PVC Pipe .....ASTM M 304

All pipe used on the project shall be Class V, per ASTM C76 unless otherwise indicated on the plans. PVC pipe shall be Schedule 80.

701-2.3 CONCRETE. *Concrete for pipe cradles shall have a minimum compressive strength of 2000 psi at 28 days and conform to the requirements of ASTM C 94.*

701-2.4 RUBBER GASKETS. *Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C 443.*

701-2.5 JOINT MORTAR. *Pipe joint mortar shall consist of one part portland cement and two parts sand. The portland cement shall conform to the requirements of ASTM C 150, Type I. The sand shall conform to the requirements of ASTM C 144.*

701-2.6 JOINT FILLERS. *Poured filler for joints shall conform to the requirements of ASTM D 1190.*

701-2.7 PLASTIC GASKETS. *Plastic gaskets shall conform to the requirements of AASHTO M 198 (Type B).*

[701-2.8. CONTROLLED LOW STRENGTH MATERIAL (CLSM). Controlled low strength material shall conform to the requirements of Item Section24 of these specifications (FAA Item P-153). When CLSM is used all joints shall have gaskets.]

CONSTRUCTION METHODS

701-3.1 EXCAVATION. *The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 6 inches on each side. The trench walls shall be approximately vertical.*

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 12 inches or one-half inch for each foot of fill over the top of the pipe (whichever is greater) but for no more than three-quarters of the nominal diameter of the pipe. The width of the excavation shall be at least 1 foot greater than the horizontal outside diameter of the pipe. The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The Engineer shall

determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

The excavation for pipes that are placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the plans.

701-3.2 BEDDING. *The pipe bedding shall conform to the class specified on the plans. When no bedding class is specified or detailed on the plans, the requirements for Class C bedding shall apply.*

a. Rigid Pipe. *Class A bedding shall consist of a continuous concrete cradle conforming to the plan details.*

Class B bedding shall consist of a bed of granular material having a thickness of at least 6 inches below the bottom of the pipe and extending up around the pipe for a depth of not less than 30 percent of the pipe's vertical outside diameter. The layer of bedding material shall be shaped to fit the pipe for at least 10 percent of the pipe's vertical diameter and shall have recesses shaped to receive the bell of bell and spigot pipe. The bedding material shall be sand or selected sandy soil, all of which passes a 3/8 inch sieve and not more than 10 percent of which passes a No. 200 sieve.

Class C bedding shall consist of bedding the pipe in its natural foundation to a depth of not less than 10 percent of the pipe's vertical outside diameter. The bed shall be shaped to fit the pipe and shall have recesses shaped to receive the bell of bell and spigot pipe.

a. PVC and Polyethylene Pipe. *For PVC and polyethylene pipe, the bedding material shall consist of coarse sands and gravels with a maximum particle size of 3/4-inch. For pipes installed under paved areas, no more than 12 percent of the material shall pass the No. 200 sieve. For all other areas, no more than 50 percent of the material shall pass the No. 200 sieve. The bedding shall have a thickness of at least 6 inches below the bottom of the pipe and extend up around the pipe for a depth of not less than 50 percent of the pipe's vertical outside diameter.*

701-3.3 LAYING PIPE. *The pipe laying shall begin at the lowest point of the trench and proceed upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade.*

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical and elliptically reinforced pipes shall be placed with the manufacturer's top of pipe mark within five degrees of a vertical plane through the longitudinal axis of the pipe.

In areas of limited extent, such as night construction areas, it may be infeasible to proceed with pipe laying in an upgrade manner. In these areas, if approved by the Engineer, the Contractor may proceed otherwise, but must provide, to the satisfaction of the Engineer, other methods of stabilizing pipe sections to ensure that no separation of joints occurs.

701-3.4 JOINING PIPE. *Joints shall be made with (1) portland cement mortar, (2) portland cement grout, (3) rubber gaskets, (4) plastic gaskets, or (5) coupling bands.*

Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the pipe and shall be finished smooth on the inside. Molds or runners shall be used for grouted joints in order to retain the poured grout. Rubber ring gaskets shall be installed to form a flexible watertight seal.

a. Concrete Pipe. *Concrete pipe may be either bell and spigot or tongue and groove. The method of joining pipe sections shall be such that the ends are fully entered and the inner surfaces are reasonably flush and even. Joints shall be thoroughly wetted before mortar or grout is applied.*

b. PVC and Polyethylene Pipe. *Joints for PVC and Polyethylene pipe shall conform to the requirements of ASTM D 3212 when water tight joints are required. Joints for PVC and Polyethylene pipe shall conform to the requirements of AASHTO M 304 when soil tight joints are required. Fittings for polyethylene pipe shall conform to the requirements of AASHTO M 252 or M 294M.*

701-3.5 BACKFILLING. *Pipes shall be inspected before any backfill is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense. Loose soil, formwork and debris shall be removed prior to backfilling.*

*Material for backfill shall be fine, readily compatible soil, granular material selected from the excavation or a source of the Contractor's choosing**[, or shall be CLSM conforming to Section 24 of these specifications]**. It shall not contain frozen lumps, stones that would be retained on a 2-inch sieve, chunks of highly plastic clay, or other objectionable material. No less than 95 percent of a granular backfill material shall pass through a 1/2 inch sieve, and no less than 95 percent of it shall be retained on a No. 4 sieve.*

When the top of the pipe is even with or below the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches on both sides of the pipe and shall be brought up one foot above the top of the pipe or to natural ground level, whichever is greater. Care shall be exercised to thoroughly compact the backfill material under the haunches of the pipe. Material shall be brought up evenly on both sides of the pipe.

When the top of the pipe is above the top of the trench, the backfill shall be compacted in layers not exceeding 6 inches and shall be brought up evenly on both sides of the pipe to 1 foot above the top of the pipe. The width of backfill on each side of the pipe for the portion above the top of the trench shall be equal to twice the pipe's diameter of 12 feet, whichever is less

For PVC and polyethylene pipe, the backfill shall be placed in two stages; first to the top of the pipe and then at least 12 inches over the top of the pipe. The backfill material shall meet the requirements of paragraph 701-3.2c.

All backfill shall be compacted to the density required under Section 23 of these specifications - Earthwork (FAA Item P-152).

METHOD OF MEASUREMENT

701-4.1 *See Section 55.2*

BASIS OF PAYMENT

701-5.1 *See Section 55.3*

MATERIAL REQUIREMENTS

ASTM C 14	*Concrete Sewer, Storm Drain, and Culvert Pipe*
ASTM C 76	*Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe*
ASTM C 94	*Ready Mixed Concrete*
ASTM C 144	*Aggregate for Masonry Mortar*
ASTM C 150	*Portland Cement*
ASTM C 443	*Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets*

ASTM C 506	*Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe*
ASTM C 507	*Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe*
ASTM C 655	*Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe*
ASTM C 1433	*Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers*
ASTM D 1056	*Flexible Cellular Materials—Sponge or Expanded Rubber*
ASTM D 3034	*Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings*
ASTM D 3212	*Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals*
ASTM D 6690	*Joint and Crack Sealants, Hot-Applied, for Concrete and Asphalt Pavements*
ASTM F 477	*Elastomeric Seals (Gaskets) for Joining Plastic Pipe*
ASTM F 794	*Poly (Vinyl Chloride) Ribbed Drain Pipe & Fittings Based on Controlled Inside Diameter*
ASTM F 949	*Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings*
AASHTO M 190	*Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches*
AASHTO M 198	*Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets*
AASHTO M 304	*Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter*

END ITEM D-701

55-2 METHOD OF MEASUREMENT

The length of pipe to be paid shall be measured in linear feet of pipe in place, completed, and approved of the various sizes and types indicated. It shall be measured horizontally along the centerline of the pipe from centerline to centerline of drainage structures. The several classes, types and size shall be measured separately. All fittings shall be included in the footage of the pipe being measured. Where pipe is to be placed and capped or plugged for future connection, all materials and costs associated with capping or plugging the pipe in the manner indicated on the plans shall be considered incidental to the placement of the pipe, and no separate measurement or payment will be made.

55-3 BASIS OF PAYMENT

Payment will be made at the contract unit price per linear foot for each kind of pipe of the type and size designated. These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, trenching, bedding, placement, backfill, and for capping or plugging where required by the plans; installation of these materials; and for all labor, supervision, equipment, tools, and incidentals necessary to complete the item.

No additional payment will be made for difficulties encountered when constructing pipes in areas of night construction, or in other areas subject to construction phasing restrictions.

Payment shall be made under:

Item 55.1 Construct **[ ]**" RCP Storm Drain Class **[ ]**.....per linear foot

Item 55.11 Construct **[ ]**" x **[ ]**" Arch RCP Storm Drain.....per linear foot

Item 55.14 Construct **[ ]**" PVC Storm Drain.....per linear foot

END OF SECTION 55

THIS PAGE LEFT BLANK INTENTIONALLY