SECTION 16
STORM SEWER SYSTEMS

16.01 GENERAL

Specifications in this section shall apply to the construction of storm sewer systems including excavation, trenching, backfilling, materials, and testing for culverts, inlets, headwalls, junction boxes, area inlets, riprap, ditches, and other structures.

These specifications are intended to supplement the Alabama Department of Transportation Standard Specifications for Highway Construction. They shall take precedence over the Alabama Department of Transportation Standard Specifications except on State highways. For items not covered by these specifications, the Alabama Department of Transportation standard specifications shall apply. All pipes must have an ALDOT stamp on the inside of the pipe.

16.02 TESTING RESPONSIBILITY

The cost of testing will be borne by the Contractor, unless otherwise noted in the contract documents. Testing for storm sewer components will be as outlined in Section 9 or within this section.

16.03 CONTRACTOR RESPONSIBILITY

The contractor is responsible for subsurface investigation, construction, testing, etc. and perform all work required to complete the project. The plans show certain features of topography and certain underground utilities, but they do not purport to show in complete detail all such lines or underground features. Such topography and notes on the plans are inserted from records available and are for the Contractor's convenience only and shall not be used as a basis for claims of extra compensation. Wherever necessary to determine the location of existing pipes, valves, or other underground structures, the Contractor shall examine all available records and shall make all explorations and excavations for such purpose. The Contractor at no cost to the Owner shall immediately repair any damage to existing facilities resulting from the Contractor’s operations.

In previously grassed areas, the Contractor is responsible for sodding with the same type grass. In unimproved areas, the disturbed ground shall be seeded with an approved Alabama Department of Transportation mix.

During the course of the work outlined in this section, the contractor shall do all bracing, sheathing, and shoring necessary to perform and protect all excavations, installations, and drop offs as required for safety or to conform to governing laws. The contractor is solely responsible for all safety of the work. Traffic control devices shall be installed in accordance with the Manual on Uniform Traffic Control Devices, latest edition, and meet regulations outlined in the ALDOT Standard Specifications for Highway Construction, latest edition.

The contractor is responsible for submission of all shop drawings and submittals for all materials to be used on the project prior to using the materials. The contractor shall submit three (3) copies for review and approval by the Inspection Manager for the City of Auburn.

16.04 EXCAVATION AND BACKFILLING

A. Excavation

The Contractor shall do all excavation of whatever substances encountered to the depth required to install the structure. Excavated materials not required for fill or backfill shall be removed from the site and disposed of by the Contractor at a location he deems appropriate.

Excavation for inlets, headwalls, junction boxes, and other structures shall have twelve inch (12") minimum clearance on all sides. The ground adjacent to all excavations shall be graded to prevent water from running in. Unsuitable soil shall be removed and replaced with gravel, crushed stone, or crushed slag, which shall be thoroughly tamped.

Excess excavation below required level shall be backfilled with earth, sand, gravel, crushed stone, or concrete, approved by the Engineer or Project Manager, and thoroughly tamped.

The Contractor shall remove any water accumulated in the excavation and keep the trench dewatered until the bedding is complete.

In rock, excavations shall be carried six inches (6") below the bottom of the pipe. Loose earth or gravel not larger than three fourths of an inch (3/4") in size shall be used for backfill, tamped thoroughly, and rounded to receive pipe as above.

All work with explosives shall be done in such a manner as not to endanger life or property. All storage places for explosives and inflammable materials shall be clearly marked. The method of storing and handling such materials shall conform to all Federal, State, and local laws.

B. Backfilling

After pipes have been visually checked for defects, backfilling shall be done with approved material free from large clods or stones, sticks, logs, stumps, construction debris, or other unsuitable materials.

Backfill material shall be placed evenly and carefully around and over pipe in six-inch (6") maximum layers. Each layer shall be thoroughly and carefully tamped until one foot (1') of cover exists over pipe. The remainder of backfill materials shall be placed in twelve inch (12") to eighteen-inch (18") layers and compacted.

For trenches under roadways and areas to be paved, material shall be placed in eight-inch (8") maximum layers after filling one foot (1') above pipe as previously described. Each layer shall be compacted to 95% for the underlying layers and 98% for the top 6”so that pavement can be placed immediately. The Contractor shall refill for settlement all

backfilled areas.
At inlets, junction boxes, headwalls, and other structures, all forms, trash, and debris shall be removed and cleared away.

Weep holes one and one half inch (1 ½") in diameter shall be installed in the walls of all inlets and junction boxes. The pipe end shall be covered with filter fabric, as shown on the City of Auburn standard details.

For pipes and culverts in fill section or projecting into fill section, where pipe is not structurally supported, unstable material shall be removed. A pipe bed and embankment, if required, shall be constructed of selected material and compacted. Selected material shall be placed symmetrically on each side of pipe to a point one foot (1') above the pipe in six inch (6") maximum layers and compacted.

C. Replacing Pavement

The minimum width of replaced concrete pavements shall be four feet (4') at interiors and six feet (6') at joints. Avoid cutting pavements at joints; if unavoidable, reconstruct same as or better than original joint. Depth shall be one and one third (1 1/3) times original thickness. Existing pavement edges shall be cut vertically. Use 1: 2: 3 mix, water-cement ratio five (5) gallons; use high-early-strength cement if road is to be opened in less than three (3) days.

The minimum width of replaced bituminous pavements shall be three feet (3') with base of same depth as original pavements. (Replacement should conform to the street classification and utility patch detail.) The existing pavement shall be saw cut vertically and horizontally to a straight line. Edge of existing pavement shall be painted with SS-1 or SS1h tack. The patch shall be rolled in both directions with at least a five-ton roller. When a pavement cut will be left unpaved for more than twenty four hours (24 hrs.), the cut shall be covered with steel plates of such strength to allow traffic to proceed unobstructed, or should be backfilled with crusher run stone and maintained for traffic. If the cut will be left unpaved overnight, adequate warning devices shall be used to notify motorists of the obstruction.

16.05 CULVERTS

A. General

All culverts shall be installed according to the sizes, materials, slopes, locations, and elevations as shown on the plans approved by the City Engineer. Any changes in the approved plans shall receive written approval by the City Engineer before they are implemented. Any changes made without such approval shall be done at the Contractor's risk. All reinforced concrete pipe must be stamped ALDOT approved and be bedded with the appropriate bedding material.

B. Material Properties

All pipes within the right of way and easements shall be reinforced concrete pipe, unless otherwise approved by the City Engineer. Pipe shall conform to the specifications outlined in the ALDOT Standard Specifications for Highway Construction, latest edition, Sections 500 and 800.

Culverts shall be in accordance with the following:

- Concrete Sewer Pipe and Fittings, A.S.T.M. C-14;
- Reinforced Concrete Sewer Pipe and Fittings, A.S.T.M. C-76;
- Concrete Pipe may be bell and spigot except that tongue and groove shall be used for sizes over twenty one inches (21");
- Bituminous Coated Corrugated Metal Pipe shall meet the requirements of A.A.S.H.T.O. M-36 for Type I and II Culverts. Construction requirements shall be done in accordance with Section 840, Alabama Highway Department Standards for Highway Construction.
- Precast box culvert A.S.T.M. C-850; A.A.S.H.T.O. 259

C. Construction Methods

All pipe shall be laid with ends abutting and with not more than one-inch (1") variation from established alignment at the vertical centerline or from grade at the flowline. All joints and lift holes shall be wrapped with filter material or grouted over to eliminate infiltration.

The width of the trench shall be six-inch (6") minimum, eight inch (8") maximum on each side of the pipe bell. The bottom of the trench for sewers and culverts shall be rounded so that an arc of the circumference is equal to six tenths (0.6) of the outside diameter of the pipe rests on undisturbed soil. Bell holes shall be excavated accurately to size by hand.

16.06 INLETS AND JUNCTION BOXES

A. Material Properties

Inlets and junction boxes can be poured in place or precast. Poured in place structures must use a minimum 3000 psi concrete mix and reinforcing steel as outlined on the standard details.

For culverts thirty-six inches (36") in diameter and smaller, precast reinforced concrete manholes may be used in lieu of poured-in-place concrete. Larger sizes must be approved prior to use.

B. Construction Methods

For poured-in-place structures, forms shall be clean and free from dirt. Reinforcing steel shall be free from dirt, rust, oils, or other defects. The reinforcing steel shall be placed no
closer than two inches (2") to any outside concrete surface. Edges of exposed concrete shall be chamfered. Frames, covers and gratings shall be flush with the finished surface of the concrete.

Inlet Top replacement involves forming and pouring a minimum of an eight-inch (8") thick concrete reinforced concrete pad with ring and cover over existing structures. The reinforcement shall be number five (#5) bars on six inch (6") centers both directions.

16.07 HEADWALLS

A. Material Properties

Headwalls can be poured in place or precast. Poured in place structures must use a minimum 3000-psi concrete mix and reinforcing steel as outlined on the standard details. Precast headwalls must be approved prior to use. If precast headwalls are used, the back slope from the curb and gutter and/or sidewalk must be at least 3:1. Steeper slopes will not be allowed.

B. Construction Methods

Headwalls shall have a rubbed smooth finish and the pipe shall be cut flush with the inside face of the headwall. Chamfer strips are required on all headwalls.

16.08 DITCHES

A. Material Properties

Ditches can have several forms – sodden, concrete, natural, or riprap. The material chosen must be in accordance with the engineer's design, based on erosive velocity. (See City of Auburn Storm Water Management Manual for other information).

Riprap shall consist of a protective course of stone in channels and ditches, with geotextile filter, in accordance with the Alabama Department of Transportation Standard Specifications for Highway Construction, latest edition. The riprap size to be used shall be determined by the engineer of record.

B. Construction Methods

Ditches shall be Trapezoidal, as shown on the City of Auburn standard details. Vee-bottom ditches will not be allowed.

Where earthen ditches are to be constructed, the bottom and sides shall be shaped as shown on the Plans as approved by the City Engineer. Ditches shall be constructed to provide a smooth flowing, unobstructed waterway. During the construction of the proper cross section, grade and alignment, the bottom and sides of the ditch shall be compacted to eliminate excessive erosion. Any areas disturbed during construction shall be seeded and mulched. Where hand-placed riprap ditches are to be constructed, the surface to be covered shall be fully compacted and graded to the required slope. Riprap on slopes shall commence in a trench below the toe of the slope and shall progress upward, each stone being laid by hand perpendicular to the slope with the long dimension vertical, firmly bedded against the slope and against the adjoining stone, with ends in contact, and with well-broken joints.

The finished surface of the riprap shall present an even, tight surface, not less than twelve inches (12") thick, measured perpendicular to the slope.

The stones shall be so laid that the weight of the large stones is carried by the soil rather than by adjacent stones.

Where dumped riprap ditches are to be constructed, the riprap shall be placed directly in the locations and to the contours shown on the Plans by dumping in final position as nearly as practicable. Prior to dumping, the ditch must be shaped and/or notched to receive the riprap and allow for proper embedment.

Where concrete-lined ditches or flumes are to be constructed, the cross-section, grade, and alignment shall be as shown on the Plans as approved by the City Engineer. Placement, finishing, curing, and testing shall comply to the same requirements as for Portland Cement Concrete Pavements.

16.09 PLUGGING/REMOVAL OF EXISTING PIPE AND STRUCTURES

The plugging/removal of existing pipe and structures shall be done in accordance with the Contract drawings and as directed by the Engineer. Payment will be as outlined in the contract documents.