



South Carolina
Department of Transportation

955 Park Street
Post Office Box 191
Columbia, South Carolina 29202-0191

Office of the Director
(803) 737-1302 ♦ Fax (803) 737-2038

Deputy Director of Engineering
(803) 737-1314 ♦ Fax (803) 737-2038

Deputy Director of Finance and Administration
(803) 737-1240 ♦ Fax (803) 737-1719

Deputy Director of Mass Transit
(803) 737-1280 ♦ Fax (803) 737-1862

October 10, 1995

INSTRUCTIONAL BULLETIN NO. 95-15

SUBJECT: Selection of Drainage Pipe for Use in South Carolina Highways

EFFECTIVE DATE: September 8, 1995

SUPERSEDES: Pipe Requirements on bottom of pg. 9-30 (Memorandum dated March 6, 1992 from Road Design Engineer) and Engineering Directive Memorandum PC-26, C-20, M-28 Effective January 3, 1995

RE: Revised Engineering Directive Memorandum PC-26, C-20, M-28 Effective September 8, 1995

Use this Engineering Directive Memorandum for selecting drainage pipe.

APPROVED:

E. S. Eagle
Road Design Engineer

Attachment

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

ENGINEERING DIRECTIVE MEMORANDUM

Number: PC - 26
C - 20
M - 28

Subject: SELECTION OF DRAINAGE PIPE FOR USE IN SOUTH CAROLINA
HIGHWAYS

Supersedes: ENGINEERING DIRECTIVE MEMORANDUM PC-26, C-20, M-28
EFFECTIVE JANUARY 3, 1995

Introduction

Except in underdrain applications, the Department has primarily used reinforced concrete (R.C.) pipe meeting AASHTO M 170 in its construction and maintenance program for many years. Other pipe materials have slowly gained the respect of Department engineers as viable alternatives to R.C. pipe. These procedures are for the selection of all drainage pipes except underdrain and slope drain applications for use in the maintenance and construction of roads in the state highway system.

General

Construction of all pipe should be in accordance with the "Standard Specifications for Highway Construction," addendums, special provisions, and this Engineering Directive Memorandum. All pipe with diameters of 900 millimeters (36 inches) and above are required to have riprap placed at each end. The Engineer may place riprap at any pipe end whenever deemed necessary. Any installation of pipe can require beveling the ends to match the adjacent slope. If a project specifies the beveling of any or all lines of pipe, and if that project has alternate pipe, then all alternate pipe types shall be beveled. Beveled pipe ends should be noted during the PS&E field review. Backfill around all pipe should achieve 95% standard proctor compaction. Minimum cover for all pipe should be no less than one foot unless otherwise recommended by the manufacturer or shown herein.

SELECTION OF DRAINAGE PIPE FOR USE IN HIGHWAYS

September 1, 1995

Page 2

Reinforced Concrete Pipe

Reinforced Concrete Pipe (R.C.) may be used in all drainage applications. It must meet the requirements of AASHTO M 170M (M 170). An approved preformed flexible plastic gasket meeting AASHTO M 198 should be used in most installations. Generally, Class III pipe may be used under fills up to 4.5 meters (15 feet) on interstate routes and up to 6.0 meters (20 feet) on other roads. Class IV pipe should be specified under higher embankments. Class V pipe should be used under all railroad tracks when R.C. pipe is specified.

Corrugated Steel Pipe

Corrugated steel pipe in the past has been one of the other types of pipe materials used. Due to the high acidity of the South Carolina soils which corrodes the wall of the galvanized corrugated steel pipe, corrugated galvanized steel pipe is not permitted in future permanent installations on South Carolina highways. Corrugated galvanized steel pipe may be used, however, in temporary drainage applications.

Corrugated Aluminum Alloy Pipe

Corrugated aluminum alloy (CAA) pipe meeting AASHTO M 196 M (M 196) can be used in lieu of concrete pipe in most cases. CAA pipe comes in sizes up to 3000 millimeters (120 inches) in diameter. Only a fully corrugated coupling band is specified to join the pipe together. Rerolled ends are not permitted. A gasket is required on all joints. CAA pipe can be requested on a P.S. & E. field review as the sole pipe to be used or as an alternate to R.C. pipe. Maintenance may use CAA pipe in most applications as needed. CAA pipe can be used in storm sewer, crossline and driveway applications. Diameters of CAA pipe will be one standard pipe size larger than R.C. pipe in most crossline and driveway applications. Minimum cover during construction is required and varies according to size. These figures are included in a fill height table on Standard Drawing No. 714-2.

SELECTION OF DRAINAGE PIPE FOR USE IN HIGHWAYS

September 1, 1995

Page 3

Corrugated High Density Polyethylene Pipe

Corrugated High Density Polyethylene (HDPE) pipe (Type S) meeting AASHTO M 294 may be selected for use on a construction project only as an alternate to R.C. pipe on secondary low volume roads in all applications. The pipe sizes range from 305 mm to 915 mm (12" to 36") diameter. Smooth interior wall (Type S) is the only HDPE pipe approved for permanent applications by the Department. Type C (single wall) may be used in temporary applications. Backfill material should be as specified in AASHTO M 294. During construction, crossline HDPE pipe should be protected from heavy machinery by placing a minimum of four feet of earth over the pipe until the threat of displacement or other damage due to heavy equipment is eliminated. In most cases, a gasket is required in the coupling band that joins the pipe. Couplers must be provided by the same manufacturer who supplies the pipe. When attaching one manufactures pipe to another, a "compromise coupling system" will be required. The "compromise coupling system" is available from at least two of the primary manufactures of HDPE pipe. Maintenance use will primarily be residential driveways, outfall ditches and limited crosslines. HDPE pipe may be used in storm sewer applications where the hydraulic design is approved by the Hydraulics Engineer. Selection criteria for the application of HDPE pipe in permanent drainage installations are:

Secondary roads only where:

- (1) Low volume - less than 1000 ADT
- (2) "C" Projects only
- (3) Pipe sizes are between 305 mm and 915 mm (12" and 36") inclusive
- (4) P. E. Pipe must be Type S

HDPE pipe may be used under embankments up to 6.0 meters (20 feet) high. A special review of the HDPE pipe application should be done if fill heights are greater than 6.0 meters (20 feet).

Polyvinyl Chloride Pipe

Polyvinyl Chloride (PVC) pipe, AASHTO M 304, has been reviewed and presently will not be used in South Carolina highway construction. Experimental use, in locations as specified for HDPE pipe above, may be tried by Maintenance to gain experience with it. When PVC pipe (large diameters) is used, each joint should be gasketed. The cost of PVC pipe is believed to keep it from competing as a viable alternate pipe. Maximum fill heights should be limited to each PVC pipe manufacturer's recommendations.

SELECTION OF DRAINAGE PIPE FOR USE IN HIGHWAYS

September 1, 1995

Page 4

Selection of Pipe Alternates

Selection of pipe alternates for secondary 'c' projects depends on each road in that contract meeting the criteria to use the same alternate pipe material. If one road in a group of roads does not meet the selection criteria then that contract cannot be chosen for that pipe alternate. Selection of roads capable of using pipe alternates should be discussed on a PS&E field review. The District Engineering Administrator, Project Engineer, or Road Design Engineer may select projects to incorporate alternate pipe in order to gain more experience with other pipe materials and to determine any cost savings associated with various pipe. An alternate pipe should be selected for inclusion in construction projects in all areas of the state when possible.

Major federal aid projects will continue to use three alternate pipes for driveways. The alternates will be R.C. pipe, CAA pipe and HDPE pipe.

Approved: W. M. DuBoise III
Director of Preconstruction

Approved: D. H. Freeman
Director of Construction

Approved: A. K. Kelly
Director of Maintenance

Effective Date: September 8, 1995