

4.6 ConnDOT Culvert Material Requirements

4.6.1 Introduction

Conduits used to pass drainage under the highway or through the highway embankment shall be of the type which provides the necessary capacity at the lowest overall cost.

4.6.2 Reinforced Concrete Pipe (RCP)

Reinforced concrete pipe (RCP) should be considered for use in all locations except those subject to salt water and unstable foundations. This material has been used with great success on all highways since the inception of the Department. RCP, like all conduit materials, is limited to height of overfill and live loads, especially during construction. RCP shall meet the load-strength criteria as shown in the AASHTO LRFD Bridge Design Specifications, Section 12.10. Strength computations should be performed if the cover is over 15 feet or under 2 feet. It may be desirable to consider other than standard bedding in order to arrive at the most economical installation. If other bedding classes are used, details will have to be included in the plans. A unit weight of 2000 kg/m³ (125 lbs/cf) shall be used to determine the loading if the actual earth load is not known. When RCP is to be jacked through an embankment a special pipe is required and is usually Class V.

4.6.3 Corrugated Metal Pipe (CMP)

There are three types of metal pipe which are normally considered, they are aluminum, coated galvanized steel and aluminum coated steel. CMP shall meet the load strength criteria as shown in AASHTO LRFD Bridge design specifications, section 12.7. Strength computations should be performed for CMP at any cover.

- Aluminum pipes are predominantly used in salt water environments.
- Aluminum coated steel pipe has shown great success in durability compared to other types of coated galvanized steel pipe.
- Coated galvanized steel will normally be coated with a polymeric coating unless asphalt coating is specified. If asphalt coating is used it will be produced with a 40% paved invert in accordance with our specifications. Corrugated metal pipe will normally be specified for conduits installed essentially parallel to cut or fill slopes with cross slopes of 1:4 or greater. This pipe will normally be used where the foundation conditions are unstable. In such instances the culverts are installed with a camber, as specified by the Soils and Foundation unit or responsible consulting engineer, in anticipation of foundation settlement.
- A new type of corrugation (spiral rib) is available in both steel and aluminum. This corrugation provides a lower Mannings "n" value.

4.6.4 Corrugated Structural Plate Pipe (CSPP)

Structural plate pipes are manufactured from corrugated steel plates with 150mm X 50 mm (6 in X 2 in) corrugations or corrugated aluminum plates with 228mm X 64mm (9 X 2 ½ inches) corrugations which are bolted together at the site. These pipes are available starting at a diameter of 1500mm (60 in) and are able to tolerate higher heights of fill and also provide satisfactory results at locations of unstable foundations. Steel structural plates are to be coated with asphalt in accordance with the specifications.

4.6.5 Corrugated Polyethylene Pipe (CPP)

Corrugated polyethylene pipe is a product which has been used in the past as underdrain pipe in the smaller sizes. However, larger sizes of high density polyethylene pipe (HDPE) are available for storm drainage systems and culverts. This material can be considered for use in a salt water environment. Guidelines for the use of this product are found in Appendix C.

4.6.6 Polyvinyl Chloride (PVC)

Polyvinyl chloride plastic pipe (PVC) is a product for storm drainage systems and culverts which can also be considered for use in a salt water environment. The height of fill requirements for this product shall conform to the same requirements as for the use of HDPE.

4.6.7 Special Connections

Specially designed concrete junction boxes may be needed to connect larger pipes which will not fit into standard catch basins or manholes. If pipes are large enough, they can accommodate riser structures with "tees" for access or inlets. Elbows, tees and wyes may be considered for unusual situations but access must be available for debris removal.

4.6.8 Railroad Crossings

Conduits placed under railroad road-beds shall be designed to conform to the pertinent provisions of the current American Railway Engineering Association (AREA) Specifications and shall also conform to any applicable pipeline occupancy specifications for the type of conduit designed.

4.6.9 Airports

Materials to be considered for airport drainage shall comply with the current "Standards for Specifying Construction of Airports."