

VIRGINIA DEPARTMENT OF TRANSPORTATION

# LOCATION AND DESIGN DIVISION

## INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: Selection of Pipe Type	NUMBER: IIM-LD-254.2
SPECIFIC SUBJECT: Pipe Type Options for Culverts and Storm Sewer to be Determined by Engineer	DATE: October 5, 2016
	SUPERSEDES: IIM-LD-254.1
APPROVAL:	B. A. Thrasher, P.E. State Location and Design Engineer Approved October 5, 2016

Changes are shaded.

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### CURRENT REVISION

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- The pipe joint type definition was revised for Special Design to add “Environmental Contamination”.
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### EFFECTIVE DATE

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- This memorandum is effective upon receipt unless identified otherwise within this IIM.
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### PURPOSE / NEED / SCOPE / REQUIREMENTS

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- This memorandum explains the pipe selection process to be used on all VDOT construction and maintenance projects.
  - Selection of allowed pipe type options (concrete, metal, or plastic, and in some cases other materials) for culverts and storm sewer will be made by the Engineer based on information contained in Chapters 3 and 8 in the VDOT Drainage Manual and Standard PC-1 in the VDOT Road and Bridge Standards. The Engineer will also select the allowed joint types to be used.

- Localities that own and maintain the drainage system within a project will have the authority to determine the pipe and joint type from the allowable options as described in the PC-1 standard. The Locality Engineer will be responsible for making this determination and no justification need be given by the Locality Engineer. The Locality Engineer may defer this decision to the VDOT Engineer if they choose.
- The VDOT Resident Engineer/Administrator or designee shall be afforded the opportunity to select / scope the pipe type selection based on local conditions and business need.  
  
The justification for any pipe type selection shall be documented to the project file using [Form LD-457](#). The justification may be technical, operational, financial, based on field constraints, or other relevant criteria. Pipe selection should be verified by the Engineer.
- Large Culverts that will become part of the Department's structure inventory as defined in the current IIM-S&B-27 shall be designed in accordance with the requirements of Part 2 of the Manual of the Structure and Bridge Division by an Engineer, registered in the Commonwealth of Virginia. Regardless of functional class of road, Large Culverts require preliminary, final and as-built plans.
- The Engineer shall consider all available pipe type(s) that are found to be technically qualified for any given project or application, and competition between two or more material types is encouraged unless engineering or economic justifications dictate otherwise. Justification of pipe selection shall be documented in the Final Drainage Report.

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## PROCEDURES

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- The Engineer will use the PC-1 Standard to determine the allowable pipe type(s) to meet the project design requirements by assessing the following:
  - functional classification of road (Higher Functional Class (HFC) roads require 75-year service life and Lower Functional Class (LFC) roads require 50-year service life);
  - cover required over the pipe;
  - allowed usage of metal pipe, based on restricted locations in Table B of PC-1, or according to the pH of the soil and water on site (use lower of the two);
  - soil resistivity, and flow velocity through the pipe, if abrasive conditions are judged to be present (based on FHWA abrasion levels) based on Table C of PC-1;
  - an evaluation of the bedload abrasion requirements as noted in Table D in the PC-1 Standard;
  - required gauge thickness for service life based on Table D in the PC-1 Standards (VDOT-modified use of the ANSI service life chart);
- The Engineer will specify joints (and connections in the case of storm sewers) to meet the project design requirements in accordance with AASHTO PP-63. Allowable joints are found on the [Department's Approved List No. 14](#).

Following are pipe joint type definitions per AASHTO Designation: PP 63-09 (2014) Standard Practice for Pipe Joint Selection for Highway Culvert and Storm Drains:

Joint Type	Definitions	Applications
<b>Soil-Tight</b>	A joint that is resistant to infiltration of particles larger than those retained on the No. 200 sieve. Soil-tight joints provide protection against infiltration of backfill material containing a high percentage of coarse grain soils, and are influenced by the size of the opening (maximum dimension normal to the direction that the soil may infiltrate) and the length of the channel (length of the path along which the soil may infiltrate).	Non-vehicular applications, Low-volume trails, Temporary Drainage [Shall not be considered for roadway applications]
<b>Silt-Tight</b>	A joint that is resistant to infiltration of particles that are smaller than particles passing the No. 200 sieve. Silt-tight joints provide protection against infiltration of backfill material containing a high percentage of fines, and typically utilize some type of filtering or sealing component, such as an elastomeric rubber seal or geotextile.	Private/Commercial Entrances, Shared-Use Paths, Culverts, Closed Drainage applications
<b>Leak-Resistant</b>	A joint that limits water leakage at a maximum rate of 200 gallons/inch-diameter/mile/day for the pipeline system for the project specified head or pressure.	Same as Silt-Tight (where there are seasonably high ground water conditions, riverine, tidal or otherwise historical conditions of a normal pool), Stormwater Management (SWM) Facility Outfalls*  * All outfall pipes exiting a SWM basin or facility shall contain Leak-Resistant Joints.
<b>Special Design</b>	Special design joints are joints requiring special strength in bending or shear, pull-apart capabilities, or unusual features such as restrained joints placed on severe slopes, welded joints, flanged and bolted joints for high pressures, high heads, or velocities. These joints are typically described within the special provisions of the project specifications. Water-Tight joints that provide zero leakage for a specified head or pressure application are included in this category.	Structural applications, Water-Tight, <b>Environmental Contamination</b>

- The Engineer will verify and document that the Locality Engineer has made a determination of final pipe and joint type from the allowable options.
- The Engineer will document that the VDOT Resident Engineer/Administrator (or their designated Responsible Charge Engineer) has had the opportunity to concur with the final pipe type selection based on local conditions.
- The Engineer will specify pipe in accordance with Chapter 3 of the VDOT Drainage Manual. The Engineer will also utilize the PC-1 in such documents, denoting all the available pipe types for the project, based on local conditions.
- The Joint Type shall be included in the Drainage Descriptions.
- The following Allowable Pipe Type cells are available in the drainage cel library and should be placed on the drainage description sheet. The Engineer is responsible for filling out the charts for each project.
  - APTCLV – Allowable Pipe Types Culvert
  - APTSS – Allowable Pipe Types Storm Sewer

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## REFERENCES

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- The following references apply to this IIM:
  - VDOT Road and Bridge PC-1 Standard
  - AASHTO Designation: PP 63-09 (2014) Standard Practice for Pipe Joint Selection for Highway Culvert and Storm Drains
  - VDOT Approved List No. 14
  - VDOT Drainage Manual