

**Section 601.2(a) Pipes.** Revise by adding the following:

**6.g Group VII.** 3.5 m (12-foot) maximum fill—0.6 m (2.5 to 2.0-foot) minimum cover

**6.g.1 Polyethylene.**

- AASHTO M 294, Type S, cell class 435400C, 450 mm (18-inch), 525 mm (21-inch), 600 mm (24-inch), 750 mm (30-inch), 900 mm (36-inch), 1050 mm (42-inch), 1200 mm (48-inch), and 1500 mm (60-inch) diameters; PENNDOT Design Manual Part 4M, and 2004 AASHTO LRFD Bridge Design Specifications Chapter 12. Comply with the requirements of Table 1 for initial product approval testing. Comply with the requirements of Table 2 for production quality control sampling and testing in addition to the requirements of AASHTO M 294. Provide watertight joints according to AASHTO M 294, except joints must meet a 35 kPa (5 psi) laboratory test per [ASTM D 3212](#) using a bell and spigot design.

TABLE 1			
Stress Crack Resistance of Pipes			
Pipe Location	Test Method	Test Conditions	Test Requirements
Pipe Liner	FM 5-572, Procedure A	10% Igepal solution at 50° C (122 F) and 4137 kPa (600 psi) applied stress; 5 replicates	Average failure time of the pipe liner ≥ 18 hours, no single value < 13 hours.
Pipe Corrugation <sup>1</sup> , (molded plaque)	ASTM F 2136	10% Igepal solution at 50° C (122 F) and 4137 kPa (600 psi) applied stress; 5 replicates	Average failure time ≥ 24 hours, no single value < 17 hours.
Junction	FM 5-572, Procedure B and FM 5-573	<p>Full Test<sup>2</sup>:</p> <p>Test temperature 80° C (176 F) and applied stresses of 4482 kPa (650 psi) and 3103 kPa (450 psi).</p> <p>Also, test temperature 70° C (158 F) and applied stress of 4482 kPa (650 psi); 5 replicates at each of three test conditions.</p>	<p>Determine failure time at 3447 kPa (500 psi) at 23° C (73.4 F) ≥ 100 years (95% lower confidence) using 15 failure time values<sup>3</sup>. The tests for each condition can be terminated at duration equal to or greater than the following criteria:</p> <p>110 hours at 80° C (176 F) 4482 kPa (650 psi)                      430 hours at 80° C (176 F) 3103 kPa (450 psi)                      500 hours at 70° C (158 F) 4482 kPa (650 psi)</p>
		<p>Single Test<sup>4</sup>:</p> <p>Test temperature 80° C (176 F) and applied stress of 4482 kPa (650 psi); 5 replicates</p>	<p>The average failure time ≥ 110 hours</p>

Longitudinal Profiles <sup>5</sup>	FM 5-572, Procedure C and FM 5-573	<p>Full Test<sup>2</sup>:</p> <p>Test temperature 80° C (176 F) and applied stresses of 4482 kPa (650 psi) and 3103 kPa (450 psi).</p> <p>Also, test temperature 70° C (158 F) and applied stress of 4482 kPa (650 psi); 5 replicates at each of three test conditions.</p>	<p>Determine failure time at 3447 kPa (500 psi) at 23° C (73.4 F) ≥ 100 years (95% lower confidence) using 15 failure time values<sup>3</sup>. The tests for each condition can be terminated at duration equal to or greater than the following criteria:  110 hours at 80° C (176 F) 4482 kPa (650 psi)  430 hours at 80° C (176 F) 3103 kPa (450 psi)  500 hours at 70° C (158 F) 4482 kPa (650 psi)</p>
		<p>Single Test<sup>4</sup>:</p> <p>Test temperature 80° C (176 F) and applied stress of 4482 kPa (650 psi); 5 replicates</p>	<p>The average failure time ≥ 110 hours</p>

Oxidation Resistance of Pipes

Pipe Location	Test Method	Test Conditions	Requirement
Liner and/or Crown <sup>6</sup>	OIT Test (ASTM D 3895)	2 replicates (to determine initial OIT value) on the as manufactured (not incubated) pipe	25 minutes, minimum
Liner and/or Crown <sup>6</sup>	Incubation test FM 5-574 and OIT test (ASTM D 3895)	Three samples for incubation of 265 days at 80° C <sup>7</sup> (176 F) and applied stress of 1724 kPa (250 psi). One OIT test per each sample.	Average of 3 minutes <sup>8, 9</sup> (no values < 2 minutes)
Liner and/or Crown <sup>6</sup>	MI test (ASTM D 1238 at 190° C/2.16 kg (374 F /4.762 lb))	2 replicates on the as manufactured (not incubated) pipe.	< 0.4 g/10 minutes
Liner and/or Crown <sup>6</sup>	Incubation test FM 5-574 and MI test (ASTM D 1238 at 190° C/2.16 kg (374 F /4.762 lb))	2 replicates (total) on the three aged samples after incubation of 265 days at 80° C <sup>7</sup> (176 F) and applied stress of 1724 kPa (250 psi)	MI Retained Value <sup>9,10, 11</sup> > 80% and < 120%

Note: FM = Florida Method of Test.

1. Required only when the resin used in the corrugation is different than that of the liner.
2. Perform full test on alternative pipe diameter of pipe based on wall profile design, raw material cell classification, and manufacturing process. Full test must be performed on maximum and minimum pipe diameters within a manufacturing process.
3. Computer program to predict the 100 year stress crack resistance with a 95% lower confidence can be obtained from PENNDOT.
4. Single test for the junction and longitudinal profile may be used on alternate pipe sizes within a manufacturing process. Single point tests may not be used on maximum and minimum pipe sizes within a manufacturing process except by approval of MTD, Engineer of Tests. Single point tests may be used for quality assurance testing purposes.
5. Longitudinal profiles include vent hole(s) and molded lines.
6. OIT and MI tests on the crown are also required when resin used in the corrugation is different than that of the liner.
7. The incubation duration and temperature can also be 195 days at 85° C (185 F).
8. Within each replicate set of tests, the discrepancy range shall be within 6%. If an out-of range discrepancy occurs, repeat the three OIT tests.

9. Perform the tests for incubated and “as-manufactured” pipe samples by the same lab, same operator, the same testing device, and in the same day.
10. Within each replicate set of tests, the discrepancy range shall be within 9%. If an out-of-range discrepancy occurs, repeat the two MI tests on the same pipe sample. If insufficient material is available, a repeat of one test is acceptable.
11. The MI retained value is determined using the average MI value of incubated sample divided by the average MI value of as-manufactured pipe sample.

- Florida Department of Transportation (FDOT) Method of Test: [FM 5-572](#), Determining Stress Crack Resistance of HDPE Corrugated Pipes; [FM 5-573](#), Predicting the Crack Free Service Life of HDPE Corrugated Pipes; [FM 5-574](#), Predicting the Oxidation Resistance of HDPE Corrugated Pipes; [FM 5-575](#), Determining Tensile Creep Properties of Corrugated Pipe Liner Tensile Specimens; [FM 5-576](#), Predicting Long-Term Tensile Strength of HDPE Corrugated Pipes; [FM 5-577](#), Predicting Long-Term Modulus of HDPE Corrugated Pipes. The laboratory performing these tests must be certified by the [Geosynthetic Accreditation Institute \(GAI\)](#).
- Provisional approval status is based on testing included in Table 1 to predict long-term design service (100 years) for Thermoplastic Pipe, Group VII. Full protocol testing as outlined in the FDOT Research Report, “[Protocol for Estimating the Service Life of Corrugated High Density Polyethylene Pipe](#),” including FM 5-575, FM 5-576, and FM 5-577 must also have been initiated or scheduled before obtaining provisional approval status.
- Manufacturers must submit to BOCM, information pertaining to materials identity, antioxidant variation, carbon black variation, and quality control/quality assurance plans for review and approval before use. Any change in resin or anti-oxidant raw materials from the initial product approval must be resubmitted to the Department for reevaluation and approval.

Test Description	Test Method	Test Requirements	Minimum Test Frequency
Pipe Liner	FM 5-572, Procedure A	Greater than or equal to the value of the initial approval test (within the statistical precision and bias of the test method).	Monthly <sup>2</sup>
Liner and/or Crown <sup>1</sup>	OIT Test (ASTM D 3895)	25 minutes, minimum	Quarterly <sup>2</sup>
1. OIT test on the crown is required when resin used in the corrugation is different than that of the liner. 2. The test is applicable for each pipe diameter manufactured within the stated time period.			

**Section 601.2(b) Other Material.** Revise by adding the following:

- Watertight Joint Gasket. [ASTM F 477](#)