

948 MISCELLANEOUS TYPES OF PIPE.
(REV 5/19/10) (FA 6-9-10) (1-11)

SUBARTICLE 948-1.7 (Page 901) is deleted and the following substituted

948-1.7 Polyvinyl Chloride (PVC) Pipe (12 to 36 Inches): Polyvinyl Chloride (PVC) Pipe for side drain, cross drain, storm drain and other specified applications shall conform to AASHTO M-278 for smooth wall PVC pipe or ASTM F-949 for PVC ribbed pipe. Mitered end sections are not to be constructed of polyvinyl chloride. Use only concrete or metal mitered end sections as indicated in the Design Standards.

All pipe produced and shipped to the job site shall meet the requirements of 105-3.2.

SUBARTICLE 948-2.3 (Pages 901 – 904) is deleted and the following substituted:

948-2.3 Corrugated High Density Polyethylene Pipe (12 to 60 inches):

948-2.3.1 General: Class I (50 year) corrugated Polyethylene Pipe used for side drain, storm and cross drain or french drain shall meet the requirements of AASHTO M-294. Class II Corrugated Pipe shall meet the requirements of AASHTO M-294 and the additional requirements as specified herein. Corrugations may only be annular. Ensure that pipe resin conforms to ASTM D-3350 minimum cell classification 435400C except that cell class 435400E may be used if the combination of color and UV stabilizer provides the same or better UV protection than that of resin cell class 435400C. Mitered end sections are not to be constructed of polyethylene. Use only concrete or metal mitered end sections as indicated in the Design Standards.

All pipe produced and shipped to the job site shall meet the requirements of 105-3.2.

948-2.3.2 Additional Requirements for Class II (100 Year), Type S Polyethylene Pipe Meet the following requirements:

Table 1			
Stress Crack Resistance of Pipes			
Pipe Location	Test Method	Test Conditions	Requirement
Pipe Liner	FM 5-572, Procedure A	10% Igepal solution at 122°F and 600 psi applied stress, 5 replicates	Average failure time of the pipe liner shall be ≥ 18.0 hours, no single value shall be less than 13.0 hours.
Pipe Corrugation ¹ , (molded plaque)	ASTM F-2136	10% Igepal solution at 122°F and 600 psi applied stress, 5 replicates	Average failure time shall be ≥ 24.0 hours, no single value shall be less than 17.0 hours.

Table 1

Junction	FM 5-572, Procedure B and FM 5-573	<p>Full Test^{2,3}: Test at 3 temperature/stress combinations: 176°F at 650 psi 176 °F at 450 psi 158°F at 650 psi; 5 replicates at each test condition</p>	<p>Determine failure time at 500 psi at 73.4°F ≥ 100 years (95% lower confidence) using 15 failure time values⁴. The tests for each condition can be terminated at duration equal to or greater than the following criteria: 110.0 hr at 176°F 650psi 430.0 hr at 176°F 450 psi 500.0 hr at 158°F 650 psi</p>
		<p>Single Test⁵: Test temperature 176°F and applied stress of 650 psi.; 5 replicates</p>	<p>The average failure time must be equal to or greater than 110.0 hr</p>
Longitudinal Profiles ⁶	FM 5-572, Procedure C, and FM 5-573	<p>Full Test^{2,3}: Test at 3 temperature/stress combinations: 176°F at 650 psi 176 °F at 450 psi 158 °F at 650 psi; 5 replicates at each test condition</p>	<p>Determine failure time at 500 psi at 73.4°F ≥ 100 years (95% lower confidence) using 15 failure time values⁴. The tests for each condition can be terminated at duration equal to or greater than the following criteria: 110.0 hr at 176°F 650psi 430.0 hr at 176°F 450 psi 500.0 hr at 158°F 650 psi</p>
		<p>Single Test⁵: Test temperature 176°F and applied stress of 650 psi.; 5 replicates</p>	<p>The average failure time must be equal to or greater than 110.0 hr</p>
Oxidation Resistance of Pipes			
Pipe Location	Test Method	Test Conditions	Requirement
Liner and/or Crown ⁷	OIT Test (ASTM D-3895)	2 replicates (to determine initial OIT value) on the as manufactured (not incubated) pipe.	25.0 minutes, minimum
Liner and/or Crown ⁷	Incubation test FM 5-574 and OIT test (ASTM D-3895)	Three samples for incubation of 195 days at 176°F ⁸ and applied stress of 250 psi. One OIT test per each sample	Average of 3.0 minutes ^{9, 10} (no values shall be less than 2.0 minutes)

Table 1			
Liner and/or Crown ⁷	MI test (ASTM D-1238 at 190°C/2.16 Kg)	2 replicates on the as manufactured (not incubated) pipe.	< 0.4 g/10 minutes
Liner and/or Crown ⁷	Incubation test FM 5-574 and MI test (ASTM D-1238 at 190°C/2.16 Kg)	2 replicates on the three aged sampled after incubation of 195 days at 176°F ⁸ and applied stress of 250 psi	MI Retained Value ^{10, 11, 12} shall be greater than 80% and less than 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 A higher test temperature (194° F) may be used if supporting test data acceptable to the State Materials Engineer is submitted and approved in writing.
3 Full test shall be performed 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.
4 Computer program to predict the 100 year SCR with 95% lower confidence can be obtained from FDOT.
5 Single test for the junction and longitudinal profile may be used on alternating 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 the Engineer. Single point tests may be used for quality assurance testing purposes.
6 Longitudinal profiles include vent holes and molded lines.
7 OIT and MI tests on the crown are required when resin used in the corrugation is different than that of the liner.
8 The incubation temperature and duration can also be 136 days at 185°F.
9 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.
10 The tests for incubated and “as-manufactured” pipe samples shall be performed by the same lab, same operator, the same testing device, and in the same day.
11 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.
12 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.

Manufacturer may use ground class II, but not class I, pipe for reworked plastic.

948-2.3.3 Certification: Furnish to the Engineer certification from the manufacturer for each pipe diameter manufacturers LOT to be incorporated into the project that the pipe meets the requirements of these Specifications.

Manufacturers seeking evaluation of a product in accordance with Departmental procedures must submit test reports conducted by a laboratory qualified by the Geosynthetic Accreditation Institute-Laboratory Accreditation Program (GAI-LAP) or qualified by ISO 17025 accreditation agency using personnel with actual experience running the test methods for class II HDPE pipe. Submit the test reports to the State Materials Office.

948-2.3.4 Verification Samples: Furnish verification samples as directed by the Engineer.

ARTICLE 948-4 (Pages 905 – 906) is deleted and the following substituted:

948-4 Pipe Liner.

948-4.1 Cured-In-Place Pipe Liner: Cured-in-place pipe liner shall be continuous, resin impregnated, flexible tubing that meets the requirements of ASTM D-5813 and ASTM F-1216.

948-4.2 Deformed Pipe Liner: Deformed pipe liner shall be manufactured in an out of round state, usually collapsed circumferentially and folded on the long axis. After installation in

a host pipe, the liner is rounded by means of heat and pressure to fit the host pipe. Deformed pipe liner, when installed, shall extend from one structure to the next in one continuous length with no intermediate joints.

(1) Polyethylene: Deformed polyethylene pipe liner shall meet the requirements of ASTM F-714 with a minimum cell classification of 335420c.

(2) Polyvinyl Chloride: Deformed polyvinyl chloride pipe liner shall meet the requirements of ASTM F-1504.

948-4.3 Discrete Pipe Liner: Discrete pipe liner shall be round, flexible or semi-rigid liner, manufactured in lengths that may be joined in a manhole or access pit before insertion in a host pipe.

(1) High Density Polyethylene Solid Wall: Discrete high density polyethylene pipe liner shall meet the requirements of ASTM F-714 or AASHTO M-326 and shall have a minimum of cell classification of 345464c.

(2) High Density Polyethylene Profile Wall: Discrete high density polyethylene pipe liner shall meet the requirements of AASHTO M-294 and shall have a minimum cell classification of 435400c.

(3) Polyvinyl Chloride: Discrete polyvinyl chloride pipe liner shall meet the requirements of ASTM F-794, ASTM F-949, or AASHTO M-304 and shall have a minimum cell classification of 12454.

(4) Fiberglass: Discrete fiberglass pipe liner shall meet the requirements of ASTM D-3262.

948-4.4 Spiral Wound Pipe Liner: Spiral wound pipe liner shall consist of coils of profile strips that are wound into a host pipe helically, after which a cementitious grout is injected into the annular space between the liner and the host pipe, forming a rigid composite structure.

(1) Polyvinyl Chloride: Polyvinyl chloride spiral wound pipe liner shall meet the requirements of ASTM F-1697 or ASTM F-1735 and shall have a minimum cell classification of 12454.

948-4.4.1 Machine Spiral Wound Pipe Liner: Machine spiral wound pipe liner shall consist of a continuous one piece profile strip wound directly into the deteriorated pipelines. The liner can be installed in close fit to the host pipe, or alternatively installed at a fixed diameter. Where the liner is installed at a fixed diameter, the annular space between the spiral wound liner pipe and the existing pipe is grouted.

(1) Polyvinyl Chloride: Polyvinyl chloride machine spiral wound pipe liner shall meet the requirements of ASTM F-1697 and shall have a minimum cell classification of 12454.

948-4.5 Paneled Pipe Liner: Paneled pipe liner consists of custom-cut flat or curved panels that are formed to the inside circumference of a host pipe.

(1) Polyvinyl Chloride: Polyvinyl chloride paneled pipe liner shall meet the requirements of ASTM F-1735 and shall have a minimum cell classification of 12454.

948-4.6 Point Pipe Liner: Point pipe liner may consist of any materials covered by this specification when used to repair and rehabilitate an isolated portion of an existing storm drain pipe. Materials which are restricted (as primary components) to point repair are; steel, which shall meet the requirements of AASHTO M-167M, ASTM A-167, or ASTM A-240; aluminum, which shall meet the requirements of AASHTO M-196, and rubber; which shall meet the requirements of ASTM C-923.

948-4.7 Coated Pipe Liner: Coated pipe liner consists of liquid, slurry, foam or gel that is spread or sprayed over the interior surface of an existing pipe to rehabilitate it. Materials that may be used for coating are hydrophilic urethane gel, epoxy resin, polyester resin, gunite, shotcrete, low density cellular concrete, and cementitious grout.