

ORIGINATION FORM

THE INFORMATION BELOW IS TO BE PROVIDED BY THE ORIGINATOR (The person who receives or originates the issue and needs to forward the issue for action.)

Specification: 948-2 and 948-4

Subject: 948-2 Corrugated Polyethylene Tubing and Pipe
948-4 Pipe Liner

Origination date: 10/20/2009

Originator: Mario Paredes
Office/Phone: 352-955-6690

Problem statement: 948-2

1. Restricts class II HDPE pipe to type S only which is the only one we have tested for 100 year service life.
2. AASHTO M-294 applies to various different kinds of HDPE pipe. Specification doesn't indicate which of those HDPE pipes the extended service life and additional requirements applies to, so clarification is needed.
3. Specification as written does not restrict the use of regrind material, so clarification is needed.

948-4

1. Review of test methods referred in specification was needed including polymer resin cell classifications.

Proposed solution: Changes provide a more specific description of products that would provide the service life needed for FDOT's infrastructure.

Information source: 3 pipe and liner manufacturers were contacted to find out if specific ASTM cell classifications were manufactured in Florida. Bruce Larson from Snap-Tite, Jon Sickles from ADS, and Doug Bower from Contech.

Recommended Usage Note:

Estimated fiscal impact, if implemented: None

Implementation of these changes, if and when approved, will begin with the July 2010 letting.



Florida Department of Transportation

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GOVERNOR

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STEPHANIE KOPELOUSOS
SECRETARY

MEMORANDUM

DATE: January 5, 2010
TO: Specification Review Distribution List
FROM: Rudy Powell, Jr., P.E., State Specifications Engineer
SUBJECT: Proposed Specification: 9480203 Miscellaneous Types of Pipe

In accordance with Specification Development Procedures, we are sending you a copy of a proposed specification change.

This change was proposed by Tom Malerk to clarify the testing requirements for Type S polyethylene pipe including the junction and longitudinal profile test conditions, to specify the use of only Class II ground pipe for use in reworked plastics, to allow the acceptance of test reports conducted by a laboratory qualified by the Geosynthetic Accreditation Institute – Laboratory Accreditation Program (GAI-LAP), and update ASTM and AASHTO requirements.

Please share this proposal with others within your responsibility. Review comments are due within four weeks and should be sent to Mail Station 75 or to my attention via e-mail at ST986RP or rudy.powell@dot.state.fl.us. Comments received after **February 2, 2010** may not be considered. Your input is encouraged.

RP/ft
Attachment

MISCELLANEOUS TYPES OF PIPE.

(REV 12/21/09)

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

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

948-2.3.1 General: Class I 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.

Provide certification of the actual mean diameter of pipe shipped to the project. Include in the certification the minimum and maximum diameters used to certify the actual mean diameter. The certification shall be attested to by a person having legal authority to bind the manufacturing company.

Ensure that the pipe joints have been tested at the plant hydrostatically at the specified pressure using test methods in ASTM D-3212 and witnessed by the Engineer.

Ensure that each shipment of products to the job site includes a list of products and each product has an affixed legible stamp mark of the plant, indicating its compliance with the requirements of the plant’s Department approved Quality Control Plan and Contract Documents.

948-2.3.2 Additional Requirements for Class II (100 Year), Type S Polyethylene Pipe ~~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 hours, no single value shall be less than 13 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 hours, no single value shall be less than 17 hours.

Table 1			
Junction	FM 5-572, Procedure B and FM 5-573	Full Test ^{2,3} : Test <i>at 3 temperature/stress combinations:</i> 176°F and applied stresses of at 650 psi 176°F at 450 and 450 psi. Test temperature 158°F at 650 psi and applied stress of 650 psi; 5 replicates at each test condition	Determine failure time at 500 psi at 73.4°F ≥ 100 years (95% lower confidence) using 15 failure time values ⁴ . The tests for each condition can be terminated at duration equal to or greater than the following criteria: 110 hr at 176°F 650psi 430 hr at 176°F 450 psi 500 hr at 158°F 650 psi
		Single Test ⁵ : Test temperature 176°F and applied stress of 650 psi.; 5 replicates	The average failure time must be equal to or greater than 110 hr
Longitudinal Profiles ⁶	FM 5-572, Procedure C, and FM 5-573	Full Test ^{2,3} : Test <i>at 3 temperature/stress combinations:</i> 176°F and applied stresses of 650 and 450 psi. Test temperature 158°F at applied stress of 650 psi; 5 replicates at each test condition 176°F and applied stresses of 650 and 450 psi. Test temperature 158°F at applied stress of 650 psi; 5 replicates at each test condition	Determine failure time at 500 psi at 73.4°F ≥ 100 years (95% lower confidence) using 15 failure time values ⁴ . The tests for each condition can be terminated at duration equal to or greater than the following criteria: 110 hr at 176°F 650psi 430 hr at 176°F 450 psi 500 hr at 158°F 650 psi
		Single Test ⁵ : Test temperature 176°F and applied stress of 650 psi.; 5 replicates	The average failure time must be equal to or greater than 110 hr
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 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 minutes ^{9, 10} (no values shall be less than 2 minutes)

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 pipe for reworked plastic, but not class I.

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)* ~~deemed to be appropriately qualified by the Plastics Pipe Institute and acceptable to the State Materials Engineer.~~ Submit this information to the Director, 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 D-3350~~ or 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, ~~and shall have a minimum cell classification of 12456b.~~

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 D-3550~~ or ASTM F-714 *or AASHTO M-326* and shall have a minimum of cell classification of ~~334542064c.~~

(2) High Density Polyethylene Profile Wall: Discrete high density polyethylene pipe liner shall meet the requirements of ~~ASTM F-894~~ *AASHTO M-294* and shall have a minimum cell classification of ~~335424354000c.~~

(3) Polyvinyl Chloride: Discrete polyvinyl chloride pipe liner shall meet the requirements of ~~ASTM F-789~~, ASTM F-794, ~~or ASTM F-949~~, *or AASHTO M-304* and shall have a minimum cell classification of ~~12456b4.~~

(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-~~16173598~~ and shall have a minimum cell classification of 12454b.

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 ~~1332454.~~

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-~~1698~~ *735* and shall have a minimum cell classification of 12454b.

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.