TUBE, POLYAMIDE 12 (PA12) COVER, ETFE TUBE, LOW PRESSURE, FUEL/ALCOHOL RESISTANT, NON-CONDUCTIVE, LOW PERMEATING **WSS-M98D33-A5**

1. SCOPE

This specification defines a Multilayered Tubing with a non-conductive inner layer. The construction has low permeation rates and good resistance to fuel/alcohol blends.

2. APPLICATIONS

This specification was released originally for flexible fuel vapor lines requiring low permeation. The maximum working pressure should not exceed 104 kPa. Long term continuous operating temperature should not exceed 90 °C and maximum intermittent temperature should not exceed 115 °C. These lines will meet the requirements of the US market for both reformulated and flexible fuels.

2.1 LIMITATIONS

The requirements listed in this specification represent values based on vehicle operating conditions that do not exceed 0.6 MPa fuel pressure. If the fuel system is expected to exceed this pressure the construction is not appropriate for the application.

3. REQUIREMENTS

3.1 APPROVED SOURCES

This specification requires the use of approved sources. Only the sources identified on the Ford Approved Source List (ASL) can be used when this specification is listed on the drawing, CAD file, or other documents. The list of approved sources is located within Ford at www.mats.ford.com or available externally through a Ford Materials Engineer.

3.2 CONDITIONING AND TEST CONDITIONS

All test values are based on material conditioned for not less than 24 h prior to testing in a controlled environment of 23 +/- 2 °C and 50 +/- 5% relative humidity. Testing of the material should occur in the conditioning environment or soon after removal.

3.3 INFRARED SPECTROPHOTOMETRY AND/OR THERMAL ANALYSIS

IR spectra and thermograms from initial material approval shall constitute the reference standard and shall be kept on file at the designated material laboratory. The material supplier shall ensure that all future material supplied to the specification shall produce IR spectra and thermograms that correspond to the reference standard when tested under the same conditions.

3.4 INITIAL QUALIFICATION

Suppliers seeking approval to this specification must meet the initial qualification processes that include evaluating materials and constructions according to the applicable Fuel System Design Specification (SDS) and individual Design Verification Methods (DVM).

Date	Action	Revisions	Rev. 3
2016 01 26	Revised	See summary of revisions	A. Reaume/G. Kowalski, NA
2006 10 31	Revised	Inserted 3.0; Deleted 3.1,3.2,3.3,3.5, & 4	
1997 08 27	Activated		J. Spencer

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3.5 ADDITIONAL REQUIREMENTS

Requirements beyond those explicitly stated in this document and the material specification may be specified on the Engineering drawing, Engineering specification (ES), performance specification, System Design Specification (SDS) and/or Attribute Requirement List (ARL).

3.6 PERFORMANCE CRITERIA

Materials approved to this specification must also be approved to the fuel system polymeric materials performance standard: WSS-M98P14-A1

3.6.1 Burst Pressure (SAE J2260, Room Temperature Burst, High Temperature Burst)	
3.6.1.1 Room temperature burst (As received)	832 kPa min
3.6.1.2 High temperature burst (Burst at 90°C)	312 kPa min
3.6.2 Kink Resistance (SAE J2260, Ovality Requirement)	Ball must pass freely
3.6.3 Dimensional Stability, length change (Expose 300 mm of tubing in an air circulating oven (ASTM D 573/ISO 188) for 168 h at 120 +/- 2 °C., measure at room temperature)	4 % max
3.6.4 Flammability Resistance, Cover Stock Only (ISO 3795)	Self- extinguishing within 60 seconds

4. GENERAL INFORMATION

The information given below is provided for clarification and assistance in meeting the requirements of this specification. Contact gmfs@ford.com for questions concerning Engineering Material Specifications.

4.1 RECYCLING CODES >PA12, ETFE<

4.2 APPROVAL OF MATERIALS

Suppliers desiring approval of their materials shall first obtain an expression of interest from Purchasing, Design or Product Development, and Materials Engineering. The supplier shall submit a completed copy of their laboratory test reports, signed by a qualified and authorized representative of the test facility, demonstrating full compliance with all the requirements of the Material Specification. Tested material samples must be available for review upon request and kept for a minimum of one year. Upon request, the supplier will review the associated quality control documents (Process Failure Mode and Effects Analysis, Control Plans, Certification testing) with Ford.

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