HOSE, EPDM RUBBER, PARA-ARAMID FIBERS REINFORCED, ENGINE COOLANT AND ELECTRO-CHEMICAL DEGRADATION RESISTANT, HIGH ELONGATION, LOW MODULUS — **WSE-M96D34-A1**

NOT TO BE USED FOR NEW DESIGN

HOSE, EPDM RUBBER, META-ARAMID FIBERS REINFORCED, ENGINE COOLANT AND ELECTRO-CHEMICAL DEGRADATION RESISTANT, HIGH ELONGATION, LOW MODULUS — **WSE-M96D34-A2**

HOSE, EPDM RUBBER, RAYON OR PET FIBER REINFORCED, ENGINE COOLANT AND ELECTROCHEMICAL DEGRADATION RESISTANT, HIGH ELONGATION, LOW MODULUS, OR A COPOLYMER PARA-ARAMID — **WSE-M96D34-A3**

HOSE, EPDM RUBBER, MODIFIED PARA-ARAMID FIBERS REINFORCED, ENGINE COOLANT AND ELECTRO-CHEMICAL DEGRADATION RESISTANT, HIGH ELONGATION, LOW MODULUS — **WSE-M96D34-A4**

HOSE, EPDM RUBBER, META-ARAMID OR MODIFIED PARA-ARAMID FIBERS REINFORCED, ENGINE COOLANT AND ELECTRO-CHEMICAL DEGRADATION RESISTANT, HIGH ELONGATION, LOW MODULUS, HIGH PRESSURE RESISTANCE — **WSS-M96D34-A5**

1. SCOPE

These specifications define long life, high pressure EPDM rubber coolant hoses internally reinforced with a variety of synthetic fibers. All these hoses are resistant to electrochemical (striations) degradation.

2. APPLICATION

These specifications address electrochemical degradation which is the root cause of coolant hose cracks and striations and the sealing requirements of the hoses at high and low temperatures. They characterize hoses which are resistant to electrochemical damage, air, coolant, and ozone up to 120 °C continuous with short term exposures up to 140 °C. When used with the proper fittings and constant tension clamps, they also have excellent sealability down to -40 °C. These materials may be used in branched hose applications. This document does not address special design considerations such as excessive pressures, impulse cycles, or bend radii, See coolant hose design guide for design considerations.

"A1" hoses have para-aramid (Kevlar) fiber reinforcement which is sufficient for all applications that do not have excessive impulse and/or flex conditions. This specification is used mostly for upper and lower radiator hoses. This specification is not recommended for new applications.

Date	Action	Revisions	Rev. 8
2017 09 13	Editorial	See Summary of revisions	C.Obermaier, NA
2017 03 13	Revised	See Summary of revisions	C.Obermaier, NA
2016 02 09	Revised	Editorial correction to 3.14	A. Reaume, NA

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"A2" hoses have meta-aramid (Nomex) fiber reinforcement which should be specified only where excessive impulse and/or flex resistance are required. This specification is used for heater and bypass hoses.

"A3" hoses have rayon or polyethylene terephthalate fiber reinforcement and should be used only in applications where the temperature does not exceed 120 °C. This hose is made primarily for lower radiator hose applications. The compound properties of "A3" hoses are equivalent to "A1" and "A2" hoses. This specification is not recommended for new applications in North America.

"A4" hoses have a modified para-aramid (K 119), Twaron T2100 (or a copolymer para-aramid (Technora) fiber reinforcement which should be specified where excessive impulse and/or flex resistance are required such as heater and bypass hoses.

"A5" hoses have either a meta-aramid (see A2) or a modified para-aramid (see A4) fiber reinforcement with a construction that will withstand higher system pressures. This specification should be used on applications where an even greater resistance to pressure is required.

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 COMPOSITION

Compounds formulated to these specifications shall not contain thiuram and no more than 0.04 wt % thiocarbamates in the inner layer (tube) of the construction.

3.4 DYNAMIC MECHANICAL ANALYSIS
(ASTM D 4065)

Ford Motor Company, at its option, may establish a shear modulus/damping vs. temperature curves plotted for -40 to +135 °C temperature range for material/parts supplied to this specification. The shear modulus and damping curves established for initial approval shall constitute the reference standard and shall be kept on file at the designated material laboratory. All samples shall produce shear modulus and damping curves that correspond to the reference standard when tested under the same conditions.

3.5 HOSE CONSTRUCTION

The hose shall consist of an EPDM rubber tube and cover internally reinforced with para-aramid (Kelvar) fibers (WSE-M96D34-A1) or meta-aramid (Nomex) fibers (WSE-M96D34-A2), rayon or polyethylene terephthalate fibers (WSE-M96D34-A3) or modified para-aramid (K-119) or copolymer para-aramid (Technora) fibers (WSE-M96D34-A4).

The following tests where possible, shall be performed on finished hoses and/or test specimens cut from them in accordance with ASTM D 3183 (cutting knife procedure preferred). Greater

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variation in test values can be anticipated when evaluating materials that are thinner then recommended by an applicable Industry Standard/Test Method.

3.6 ORIGINAL PROPERTIES

		Tube	Cover
3.6.1	Hardness, Durometer A (ISO 868/ASTM D 2240, instantaneous, plied-up specimen)	58 - 70	60 - 72
3.6.2	Tensile Strength (ISO 37/ASTM D 412, Die C)	10.0 MPa min	9.0 MPa min
3.6.3	Elongation (ISO 37/ASTM D 412, Die C)		
	. Sulfur Cured	420 % min	350 % min
	. Peroxide Cured	250 % min	250 % min
3.6.4	Modulus at 100% Elongation, MPa, min (ISO 37/ASTM D 412, Die C)	2.0 - 4.0 %	2.0 - 4.0 %
3.6.5	Ozone Resistance, Cover (FLTM BP 101-01, Procedure A or B)	---	Rating 0 max

3.7 HEAT AGED

(ISO 188/ASTM D 573, 168 h)	135 °C	150 °C
Hardness Change	+14 max	+17 max
Tensile Strength Change	-18 % max	-32 % max
Elongation Change		
. Sulfur Cured	-65 % max	-75 % max
. Peroxide Cured	-20 % max	-25 % max

Visual Evaluation

No surface tackiness or cracks when folded flat against itself.

3.8 HEAT AGED

(ISO 188/ASTM D 573, 1000 h)	120 °C	135 °C
Hardness Change (Actual Hardness not to exceed 90)	+18 max	+22 max
Tensile Strength Change	-25 % max	-38 % max

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