PERFORMANCE, ACOUSTICAL WHEEL ARCH/WELL LINERS	**WSS-M99P32-E2**
PERFORMANCE, ACOUSTICAL HEAVY DUTY WHEEL ARCH/WELL LINERS	**WSS-M99P32-E3**
PERFORMANCE, ACOUSTICAL UNDERBODY/ENGINE SHIELDS	**WSS-M99P32-E4**
PERFORMANCE, ACOUSTICAL HEAVY DUTY UNDERBODY/ENGINE SHIELDS	**WSS-M99P32-E5**

1. SCOPE

This specification defines the minimum durability requirements of composite acoustical underbody and under-engine shields, including wheel arch/well liners, where various materials may be combined to provide acoustical (sound absorption/barrier/insulation) features. Examples include PET nonwoven fabric, Glass/PP fiber nonwoven fabric, Glass/PP wet laid nonwoven composite. Materials are also called Light Weight Reinforced Thermoplastic (LWRT).

2. APPLICATION

This specification is released for materials used to make functional parts such as under-engine shields, underbody aero/NVH shields, and wheel arch/well liners.

There are four subsets of the standard (E2, E3, E4 & E5) dependent on the end use and design application. Typical composite mass per square area levels are:

WSS-M99P32-E2 → 700 to 1200 g/m^2
WSS-M99P32-E3 → 1200 to 1600 g/m^2
WSS-M99P32-E4 → 800 to 1400 g/m^2
WSS-M99P32-E5 → 1200 to1800 g/m^2

The best value g/m^2 should be developed for each application based on the specific needs.

The following components are NOT in the scope for this performance specification:

- Interior/luggage compartment insulators. Use WSS-M99P32-D1 (latest).
- Engine/Hood/Tunnel Insulators/NVH Pads. Use WSS-M99P32-D6 (latest).

3. REQUIREMENTS

The materials described in this specification are designed for use in applications where the component will not exceed temperatures of 150°C. When positioned in areas near exhaust or other high temperature (exceeding 150°C) components, additional shielding may be required.

Maximum temperature:

- Components not directly bolted to engine (as agreed by engineering): 120 °C
- Components exposed to engine fluids or bolted to the engine: 150 °C (note that this is a very unusual condition)

3.1 APPROVED SOURCES

This specification is performance based and does not have approved sources.

Date	Action	Revisions	Rev 00
2017 03 15	Released		K. Mueller, NA

Copyright Ford Motor Company
Provided by IHS Markit under license with FORD
No reproduction or networking permitted without license from IHS
Full document details: FORD WSS-M99P32-E5 2017
Copyright © 2017, Ford Global Technologies, LLC
Licensee=/, User=,
Not for Resale,
Documents
Document Sharing Hub

3.2 APPEARANCE
(FLTM BI 109-01)

All appearance properties of exposed materials shall meet the requirements of the relevant Engineering Department.

3.3 CONSTRUCTION AND FINISHED PART REQUIREMENTS

Detailed part construction must be submitted along with test data for all tests according to Table 1. Design Verification testing (DV) is done on the prepared blanks (cut from production parts or processed in production method) and Production Validation testing (PV) is done on finished parts. DV/PV and sample sizes are defined in Table 1. Data must be submitted via the Ford Materials Database (FMD) template.

In addition to the following minimum requirements, production assemblies must withstand normal handling during shipping, installation, use, and service, without tearing, breaking, or permanently deforming. Specific sampling areas may be required when highlighted on the Engineering Drawing.

Unless otherwise directed by Ford Design and Release Engineering Activity:

- All DV testing shall be run on NVH prepared blanks at 2mm, 4mm, and 6mm thicknesses, with design intent production process.
- All PV testing shall be run on finished parts.

3.3.1 Thickness (SAE J882) — Report, mm

3.3.2 Area Weight (FLTM BN 106-01) — Report, g/m^2

3.3.3 Construction — Report

Detailed composite construction must be submitted along with test data (unless proprietary):

Tier 1 Name,
Tier 2, Material Supplier, Trade Name,
Type of part, Made in-house or purchased,
Manufacturing process,
Number of Layers (including scrims), Min, Max. & Avg. Denier,
GSM of each layer,
Main material(s) of each layer (Composition for each layer),
% Recycled Content, % Regrind Content

3.3.3.1 All construction details must be included on Engineering Drawing.

3.3.3.2 Color shall be dark grey or black for all Wheel Arch / Wheel Well Liners (E2/E3) visible surfaces.

Documents
Document Sharing Hub

Copyright Ford Motor Company
Provided by IHS Markit under license with FORD
No reproduction or networking permitted without license from IHS
Full document details: FORD WSS-M99P32-E5 2017

Copyright © 2017, Ford Global Technologies, LLC
Licensee=/, User=,
Not for Resale,

3.3.4 Resistance to Mildew

The material shall exhibit no visible evidence of mildew growth and/or objectionable odor after 7 days exposure in a humidity cabinet maintained at 98 +/- 2% relative humidity and 38 +/- 2 °C.

3.3.5 Moisture Absorption 30% max

Cut a 200 x 200 +/-10mm specimen from the part to be tested. Weigh the specimen nearest to 0.1 g.

Condition part/section in suspended position at 38 +/- 2 °C and 95 +/- 2% R.H. for 24 hours. After 1 h at 23 +/- 2 °C and 50 +/- 2% RH weigh the part/section to the nearest 0.1 g and determine increase of weight in percent based on the original weight.

3.3.6 Gravelometer Report
(Mid-rocker Underbody Shields and
Front Wheel Arch/Well Liners Only)
(SAE J400 / ISO 20567-1, 5 cycles of 700g (473ml),
at 23 +/- 2 °C and -30 +/- 2 °C, test specimens size
100 x 305 mm (4 x 12 in), impingement angle at
45 degrees with edge-supported backer plate)

There shall be no holes, separation, or other changes that impact the function or reduce the perceived quality of the vehicle.

3.3.7 Water and Splash Resistance 25 g max
(ISO 9073-17, after 4 consecutive cycles of
500ml water spray)

3.3.8 Fluid Resistance

3.3.8.1 Resistance of Insulators to Various Test Reagents
(ASTM D896)

The test sample shall not dissolve, exhibit tackiness or delaminate when immersed in each of the following test reagents for a 4 hour period. Use a separate specimen for each test reagent. Record condition after each test interval. Proper safety precautions must be followed when handling hot and/or flammable fluids.

Test Reagents (per FLTM BI 168-01 For Underhood Use).

3.3.8.2 Fluid Spotting Resistance
(FLTM BI 168-01, For Underhood Parts, Method B)

The test sample shall not dissolve, exhibit tackiness, delaminate, crack, or craze when exposed to the test fluid. Record condition after each test interval. Proper safety precautions must be followed when handling hot and/or flammable fluids.

3.3.9 Corrosiveness to Steel Rating 4 min
(SAE J1389)

The following material requirements must be tested in both the mold direction and cross mold direction. The requirements are independent of direction (report both directions).

Documents
Document Sharing Hub

Copyright Ford Motor Company
Provided by IHS Markit under license with FORD
No reproduction or networking permitted without license from IHS
Copyright © 2017, Ford Global Technologies, LLC
Licensee=/, User=,
Not for Resale,
Full document details: FORD WSS-M99P32-E5 2017

3.3.10 Breaking Force
Preferred:
(ISO 527-4 Type 2, Sample size 25 x 250 mm; Testing speed: 100 mm/min, samples at maximum And minimum thicknesses) — Report N, min

OR

(ASTM D5034, 100 mm between clamps, speed 25mm/min, sample size 25mm x 150mm, at maximum and minimum thicknesses) — Report N, min

Report Method, MD/CMD, thickness of samples

3.3.10.1 Change After Humidity Aging (48 h at 38 +/- 2 °C and 95 +/- 2% R.H.; 1 h at room temperature) — -30% max

3.3.10.2 Change After Long Term Heat Exposure 7 days for: — -30% max
Components exposed to engine fluids or bolted to the engine: 150 °C
Components not bolted to engine (as agreed by engineering): 120 °C
(Test after exposure)

3.3.10.3 Change After Immersion In Water (48 h in distilled water at room temperature) (Test after exposure) — -30% max

3.3.11 Flexural Modulus
(ISO 178, Method A, 12.7mm/min compression rate) — Report MPa, min
Include specimen sizes

Report Method, MD/CMD, thickness of samples

3.3.11.1 Change After Humidity Ageing (48 h at 38 +/- 2 °C and 95 +/- 2% R.H.; 1 h at room temperature) — -30% max

3.3.11.2 Change After Long Term Heat Exposure 7 days for: — -30% max
Components exposed to engine fluids or bolted to the engine: 150 °C
Components not bolted to engine (as agreed by engineering): 120 °C
(Test after exposure)

3.3.11.3 Change After Immersion In Water (48 h in distilled water at room temperature) (Test after exposure) — -30% max

3.3.12 Peel Strength
(Laminates only w/ bonded, non-needled attachment) (FLTM BN 151-05, 250 mm length sample, 30 min. immersion). — 20 N/50mm, min
or
Adhesion of the covering material must exceed cohesive strength of the substrate.

Documents
Document Sharing Hub

Copyright Ford Motor Company
Provided by IHS Markit under license with FORD
No reproduction or networking permitted without license from IHS
Full document details: FORD WSS-M99P32-E5 2017

Copyright © 2017, Ford Global Technologies, LLC
Licensee=/, User=,
Not for Resale,