



LABEL PERFORMANCE, NO ADHESIVE	WSS-M99P41-A10
LABEL PERFORMANCE, SEWN IN	WSS-M99P41-A11
LABEL PERFORMANCE, REMOVABLE	WSS-M99P41-A20
LABEL PERFORMANCE, PSA, INTERIOR	WSS-M99P41-A31
LABEL PERFORMANCE, PSA, EXTERIOR	WSS-M99P41-A32
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LABEL PERFORMANCE, HEAT APPLIED, VERY HIGH ABRASION	WSS-M99P41-A56
LABEL PERFORMANCE, IN MOLD, POST MOLD, INTERIOR	WSS-M99P41-A61
LABEL PERFORMANCE, IN MOLD, POST MOLD, EXTERIOR	WSS-M99P41-A62
LABEL PERFORMANCE, IN MOLD, POST MOLD, UNDERHOOD	WSS-M99P41-A63
LABEL PERFORMANCE, PSA LABELS AND TAPES, PRODUCTION PART IDENTIFICATION, TRACKING AND ASSEMBLY	WSS-M99P41-A72

1. SCOPE

These specifications define the performance requirements for all Ford Motor Company vehicle labels. The base materials and adhesive types that make up the particular label are selected by the supplier to meet the intended application. The information is documented in Supplement A, of this specification.

2. APPLICATION

These specifications were released originally for labeling requirements of various automotive components. Applications include (but are not limited to) warning labels, bar code labels, instructional labels, and "patches" having no printing.

Date	Action	Revisions	Rev. 05
2018 02 26	Revised	See Summary of Revisions	L. Rice / A. Wedepohl, FNA
2014 11 25	Revised	See Summary of Revisions	G. Eaton, FNA
2006 11 30	Released	L. Hess, FNA	



## 2.1 DEFINITIONS OF LABEL APPLICATION TYPES

**No Adhesive:** Informational or instructional labels, located interior, exterior, or underhood, which are hung on the vehicle. The label must remain legible until the vehicle reaches the consumer.

**Sewn In:** Informational or instructional labels, interior only, and sewn into a vehicle component such as a seat, seatbelt webbing, or head rest. These labels must remain intact for the life of the vehicle.

**Removable:** Informational or instructional labels or protective films located interior, exterior or underhood. Removable labels are not intended to remain intact for the life of the vehicle. Removable labels are considered to be temporary for convenience inventory or process management. Protective films containing no printed information are considered removable labels. Removable labels are intended to be easily removed by hand and leave the substrate they are applied to unaltered. The labels are hand applied at room temperature and must remain legible and in place until they are removed by the consumer or manufacturing facility.

**Pressure Sensitive Adhesive (PSA):** Informational or instructional labels located interior, exterior or underhood. PSA labels are intended to remain legible and in position for the life of the vehicle. PSA labels are NOT approved for seatbelt webbing. Maximum bond strength is reached after 72 hours, but within 20 minutes initial strength makes them difficult to remove. The labels are hand applied in the assembly plant or at the Tier One supplier facility.

**PSA High Abrasion:** Same as PSA but for labels located in a high abrasion environment such as the seat, carpet, or unprotected exterior.

**PSA Label Security Feature:** PSA labels described above but with unique characteristics designed to show evidence that a part on a vehicle or its information has been tampered with, altered and/or counterfeit. The label security feature(s) could include, but are not limited to, UV foot print, self-destruction upon attempted removal, infra red traceable ink or adhesive or anti-counterfeit printing. The intent of the security feature is to allow field investigators the ability to authenticate genuine security labels.

**Heat Applied:** Informational or instructional labels that are located anywhere in the vehicle. They are intended to remain legible for the life of the vehicle. There are two types of heat applied labels:

1. Heat transfer which is an ink base with a protective coating and adhesive.
2. Heat seal which is a multi-layer film consisting of a heat-activated adhesive.

The labels are applied at the Tier One supplier facility per the label supplier process instructions.

**Heat Applied High Abrasion:** Same as heat applied but with a different construction that resists abrasion and is applied to the carpet, seat or unprotected exterior locations.

**Heat Applied Very High Abrasion:** Heat applied labels to seatbelt webbing.

**In Mold/Post Mold:** Instructional or informational labels that are applied at the Tier One supplier facility. For in mold, the label is placed into the injection molding tool prior to molding the part. In Post mold or pad print, silkscreen paint is applied to the part. They are intended to remain legible for the life of the vehicle.

**PSA Labels and Tapes, Production Part Identification Tracking and Assembly:** Printable PSA labels or roll tape for identification labeling of parts. The labels or tape are required to remain intact prior to and during assembly. They have no requirement to be legible for the life of the vehicle or to be removed. They have no requirement to remain intact, except for frame labels applied prior to E-coat which must remain in place for corrosion resistance.



2.2 APPLICATION TESTING

Label test requirements depend on their type, location, and unique properties. Table 1 outlines the test requirements necessary for approval.

Note: All labels located in a protected exterior location do not require exterior weathering outlined in paragraph 3.16.2. All other exterior test requirements apply.

**TABLE 1  
TEST REQUIREMENTS FOR SPECIFIC LABEL TYPES**

LABEL TYPE	Property	Location	Suffix	Tests Required
No Adhesive		All	A10	3.1 - 3.10.2, 3.12.2.1, 3.12.4, 3.12.5.1, 3.13, 3.14, 3.16.1, 3.17.1
Sewn In		Interior	A11	3.1 - 3.10.2, 3.12.2.1, 3.12.4, 3.12.5.1, 3.13 - 3.15, 3.16.1, 3.17.1, 3.19 - 3.26
Removable		All	A20	3.1 - 3.10.2, 3.11.1, 3.12.2.1, 3.12.4, 3.12.5.1, 3.12.5.2, 3.13 - 3.15 (Interior.), 3.16.1, 3.16.2, 3.17.1
PSA	General	Interior	A31	3.1 - 3.10.2, 3.11.2, 3.12.2.2, 3.12.3.1, 3.12.4, 3.12.5.1, 3.13-3.15, 3.16.1, 3.17.1, 3.18-3.23, 3.25
		Exterior	A32	3.1 - 3.10.2, 3.11.2, 3.12.2.3, 3.12.3.1, 3.12.4, 3.12.5.2, 3.16.2, 3.17.1, 3.26 - 3.28, 3.30, 3.31
		Underhood	A33	3.1 - 3.10.2, 3.11.2, 3.12.2.3, 3.12.3.2, 3.12.4, 3.12.5.3, 3.15, 3.17.1, 3.26, 3.27, 3.29 - 3.33
	High Abrasion	Interior	A34	3.1 - 3.10.2, 3.11.2, 3.12.2.2, 3.12.3.1, 3.12.4, 3.12.5.1, 3.13-3.15, 3.16.1, 3.17.2, 3.18-3.23, 3.25
		Exterior	A35	3.1 - 3.10.2, 3.11.2, 3.12.2.3, 3.12.3.1, 3.12.4, 3.12.5.2, 3.16.2, 3.17.2, 3.26 - 3.28, 3.30, 3.31
PSA	Security Feature	Interior	A41	3.1 - 3.10.2, 3.11.3, 3.12.2.2, 3.12.3.1, 3.12.4, 3.12.5.1, 3.13-3.15, 3.16.1, 3.17.1, 3.18-3.23, 3.25
		Exterior	A42	3.1 - 3.10.2, 3.11.3, 3.12.2.3, 3.12.3.1, 3.12.4, 3.12.5.2, 3.16.2, 3.17.1, 3.26 - 3.28, 3.30, 3.31
		Underhood	A43	3.1 - 3.10.2, 3.11.3, 3.12.2.3, 3.12.3.2, 3.12.4, 3.12.5.3, 3.15, 3.17.1, 3.26, 3.27, 3.29 - 3.33
Heat Applied	General	Interior	A51	3.1 - 3.10.2, 3.11.5, 3.12.2.2, 3.12.3.1, 3.12.4, 3.12.5.1, 3.13 - 3.15, 3.16.1, 3.17.1, 3.18 - 3.23, 3.25
		Exterior	A52	3.1 - 3.10.2, 3.11.5, 3.12.2.3, 3.12.3.1, 3.12.4, 3.12.5.2, 3.16.2, 3.17.1, 3.26 - 3.28, 3.30, 3.31
		Underhood	A53	3.1 - 3.10.2, 3.11.5, 3.12.2.3, 3.12.3.2, 3.12.4, 3.12.5.3, 3.15, 3.17.1, 3.26, 3.27, 3.29 - 3.33
	High Abrasion	Interior	A54	3.1 - 3.10.2, 3.11.5, 3.12.2.2, 3.12.3.1, 3.12.4, 3.12.5.1, 3.13 - 3.15, 3.16.1, 3.17.2, 3.18 - 3.23, 3.25
		Exterior	A55	3.1 - 3.10.2, 3.11.5, 3.12.2.3, 3.12.3.1, 3.12.4, 3.12.5.2, 3.16.2, 3.17.2, 3.26 - 3.28, 3.30, 3.31
	Very High Abrasion	Interior Seatbelt	A56	3.1 - 3.10.2, 3.11.5, 3.12.2.2, 3.12.3.1, 3.12.4, 3.12.5.1, 3.13 - 3.15, 3.16.1, 3.17.3, 3.18 - 3.25
In Mold/Post Mold		Interior	A61	3.1 - 3.10.2, 3.12.2.2, 3.12.3.1, 3.12.4, 3.12.5.1, 3.13 - 3.15, 3.16.1, 3.17.1, 3.18, 3.19, 3.21
		Exterior	A62	3.1 - 3.10.2, 3.12.2.3, 3.12.3.1, 3.12.4, 3.12.5.2, 3.16.2, 3.17.1, 3.18, 3.19, 3.21, 3.26 - 3.28, 3.30, 3.31
		Underhood	A63	3.1 - 3.10.2, 3.12.2.3, 3.12.3.2, 3.12.4, 3.12.5.3, 3.15, 3.17.1, 3.26, 3.27, 3.29 - 3.33
PSA Labels and Tapes	Only for Production Tracking and Assembly	ALL	A72	3.1 - 3.10.2, 3.11.4, 3.12.2.1, 3.12.4, 3.12.5.2, 3.16.3, 3.17.1, 3.27



**3. REQUIREMENTS**

**3.1 APPROVED SOURCES**

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

**3.2 LABEL SUBSTRATE COMPATIBILITY MANAGEMENT**

All labels meeting performance specifications A10-A63 must have Supplement A completely filled out and signed by Ford Materials Engineering, the label supplier, and the Tier One supplier. Compatibility of the label adhesive with substrate material is the responsibility of the Tier One supplier. The Tier One shall have the label tested on any additional substrates against the applicable performance specification requirements. If the requirements are met, a new Supplement A shall be signed and documented with the addition/change in substrate material.

Completed Supplement A's are stored on the Ford Materials Engineering shared drive under the specification number.

**3.3 CONDITIONING AND TEST CONDITIONS**

Unless otherwise noted, the test specimen consists of a label affixed to the production substrate material. The labels must be applied to the production representative substrate using a production representative process. The substrate material may be taken from the actual part or may be a production-representative plaque (having grain if appropriate.)

**3.4 REPORTING REQUIREMENTS ON SUPPLEMENT A – All Labels**

Requirements apply for all specifications.

**3.4.1 Thickness**

Report (if applicable) label cover stock, face stock, adhesive, and release liner thickness on Supplement A.

**3.4.2 Material Type**

Report basic material type for each layer of the label on Supplement A. if applicable.

**3.4.3 Label Print Color and Print Method**

Report ink color(s) used on the label and print method on Supplement A.

**3.4.4 Application Substrate**

Report the material the label was affixed to for testing. Unless prior authorization is obtained from Materials Engineering, the label must be tested on the substrate(s) it will be adhered to in production. The substrate (Ford Material Specification or Industry Standard and Grade or Supplier Name and Product Code) and substrate color(s) must be recorded on Supplement A. Management of substrate changes is the responsibility of the Tier One supplier, per para 3.2.



## 3.4.5 Application Process

Any label application parameters that must be set during production must be documented on Supplement A. (e.g. heat applied labels must have a record of process temperature, time, recommendations, etc.)

## 3.4.6 Safety Labels, Scanned Labels and Security Feature Labels

Report on Supplement A. See para 3.10

## 3.4.7 Retain Supplement A Requirement Information

Supplement A is maintained by Materials Engineering and is required at PPAP. Contact the Materials Engineering Department for information.

## 3.4.8 Functional Requirements

Report on Supplement A any functional requirements and/or any limitations for the label.

## 3.5 RELEASE LINER

For labels with release liners, the label must be easily removed from the liner and must not tear, distort, or otherwise become illegible rendering the label unsuitable for intended application.

## 3.6 PRINT ADHESION

Place a strip of 24 mm wide 3M #898 or current equivalent tape (with a peel adhesion of 0.6 N/mm width) on the printed side of the label. Apply the tape with moderate thumb pressure to the label and substrate. Remove the tape by pulling one end at a 90° angle with a quick snap. There shall be no effect on legibility and no graphic delamination from the substrate.

## 3.7 SETTING TIME FOR NORMAL HANDLING, STORAGE STABILITY

The label shall set sufficiently to permit normal handling immediately after application and shall be free of streaks, blisters, wrinkles, ragged edges, and any other surface imperfections after storage for up to 30 days at temperatures up to 40 °C

## 3.8 LABEL STRENGTH

The label must not break, tear, or deface when removed from the release backing or tape roll.

## 3.9 GENERAL ACCEPTANCE CRITERIA

### Initial

The labels or tapes shall be free of streaks, blisters, wrinkles, ragged edges, and any other surface imperfections that will make them unsuitable for the intended usage. The design, color, and gloss shall be as specified on the engineering drawing.

### After Exposure

After each of the exposure conditions described for all label types the film or label must not show visual evidence of peeling, loss of printing or legibility, loss of adhesion, curling of edges, staining, blistering, checking, cracking, excessive shrinkage, or any other effect which would detract from its proper function or appearance. If the label is tamper-evident (A41-A43), the label features must retain the same quality after each exposure. Labels containing barcodes must remain scannable after each exposure.



## 3.10 SAFETY LABELS, SCANNED LABELS, AND SECURITY FEATURE LABELS

These labels must be detailed on engineering drawings:

3.10.1 Safety Labels- Child seats, airbag warning, etc. must be noted on the engineering drawing. This label classification may convey safety information or governmentally mandated information that is considered permanent. Where applicable, the C/FMVSS regulation shall be noted on the engineering drawing.

3.10.2 Scanned Labels – (Only applicable to labels that are intended to be scanned with a barcode reader.) The scannability performance level must be documented on the Engineering drawing and Supplement A. The barcode pattern must be scannable by the type of scanner that will be used in production.

### Original

The barcode pattern must be scannable by the type of scanner that will be used in production.

### After Conditioning

If the label must be scannable for the life of the vehicle and/or service, scan the label after conditioning per the correct label type. The barcode pattern must be scannable after the conditioning periods.

3.10.3 Security Feature: Labels shall exhibit the required label security feature (Tamper-Evident and/or Alteration Resistant and/or Counterfeit Resistant) after being subjected to ALL test conditions. **VIN and antitheft labels must be constructed to meet all three security features listed below in para 3.10.3.1 - 3.10.3.3.** The label security feature shall be in compliance with the applicable regional governmental requirements (ex. NHSTA Part 541). The critical feature(s) shall be noted on the engineering drawing. **The specific method used to achieve the required label security property shall be documented in Supplement A.**

3.10.3.1 Tamper-Evident - Where required, the designed destruct mechanism, (for example, tell-tale evidence, UV Footprint, frangible window, or other Label Manufacturer method) that shows tamper evidence, even after Ford has added any variable data, the label must be evaluated by general visual examination after each test condition.

3.10.3.2 Alteration Resistant - Where required, the label manufacturer shall provide evidence to Ford Motor Company that sufficient effort has been made to produce a label and information that is resistant to alteration, even after Ford has added any variable data. (For example: Alteration of the number on the label must leave traces of the original number or otherwise visibly alter the appearance of the label material.)

3.10.3.3 Counterfeit Resistant – Where required, the label manufacturer shall provide evidence to Ford Motor Company that sufficient effort has been made to produce a label and information that is resistant to counterfeiting, even after Ford has added any variable data. The label manufacturer shall provide the method designed to make the label counterfeit resistant. (For example: print pattern; infrared analysis of cover material, ink or adhesive; embedded fibers; etc.)



**3.11 INITIAL LABEL ADHESION AND STRENGTH**

(3.11.1, 3.11.2 and 3.11.4: ASTM D1000, adhesion tests use 180° peel, conditioned per para 3.3, but condition a minimum of 24 hours at room temperature)

3.11.1 Removable (easily peeled by hand) 5 N/m min

For removable labels, there must not be any adverse affect on the substrate upon removal. (e.g. evidence of staining, discoloration, gloss change, transfer of adhesive residue on the substrate)

3.11.2 PSA (pressure sensitive adhesive) 450 N/m min

3.11.3 Security Feature Labels

Method: **At 23°C:** Apply label to substrate as in production and condition for 72 h at room temperature. Beginning at one edge, attempt to remove the label using a scraper or finger nail to lift the end of the label and initiate the peel.

**At 80°C:** Apply label to substrate as in production and condition for 72 h at 80°C. Without letting the label cool, attempt to remove the label using a scraper to lift the end of the label and initiate the peel.

Requirement: **At 23°C:** Label shall destroy or be damaged upon attempted removal from the substrate to the extent that it is rendered non-transferable.

**At 80°C:** Report results of hot peel.

3.11.4 PSA Labels and Tapes used only for Production Part Tracking and Assembly

3.11.4.1 Label and Tape Adhesion 340 N/m min

3.11.4.2 Tape Breaking Strength 5000 N/m min

3.11.4.3 Tape Elongation 1.5% min

3.11.4.4 Tape Unwind Force 100 N/m max

3.11.5 Heat Applied Labels

3.11.5.1 Corner Pick Test

Method: Using a scraper or finger nail, pick at the corner 5 times trying to separate the label from the substrate. Carefully grip lifted portion of the label and pull up slowly.

Requirement: If label piece breaks off it is a PASS. If the label can be separated in tact it is a FAIL.

3.11.5.2 Corner Tape Test

Method: Using Scotch 898 tape (25mm width), place diagonally across the corner of the test label with 30 mm of tape on the label surface and 100 mm on the substrate. Bend over the remaining tape to make a tail to grasp during the peel. Rub applied tape to remove bubbles and allow the tape to sit for 30 seconds. While holding down the substrate, pull the tape at 90° at a speed that removes the label in 1 second.





Requirement: If the label remains attached, it is a PASS. If the corner cleanly lifts from substrate, it is a FAIL.

3.11.5.3 Cross hatch Test

Method: Place cutter assembly on the test specimen so that it rests on the nylon protector and the rear (narrow end) of the handle. Grasp the handle and rotate it upward with respect to the line of contact of the nylon guide with the test surface. During this motion, the tips of the cutter first contact the test surface when the top of the handle is about 7 degrees with respect to the test surface. Continue this motion until the top surface of the handle is elevated to about 15 degrees.

With enough pressure on the handle to ensure that all of the cutter tip penetrates to the test specimen supporting base, pull the assembly along the test surface through 0.75 to 1.00 inch. Repeat for a second cut intersecting the first pattern at 90° (± 5°) then brush the surface lightly. Place 3" of Scotch 898 tape over the pattern and smooth down removing bubbles. After 60 seconds, remove the tape by pulling the free end, in a rapid smooth motion, at a 180° angle.

Requirement: If less than 5% of the label is removed it is considered a PASS.

**3.12 ADHESION AND APPEARANCE AFTER ENVIRONMENTAL CONDITIONING TEST REQUIREMENTS**

3.12.1 Acceptance criteria for paragraphs 3.12.2 - 3.12.5

3.12.1.1 Appearance – All Label Types

Must meet para 3.9 general acceptance criteria after exposure and a Rating 4 minimum per AATCC Evaluation Procedure 1. For removable labels, there must not be any adverse affect on the substrate upon removal (e.g. evidence of staining, discoloration, gloss change, transfer of adhesive residue on the substrate).

3.12.1.2 Adhesion (Removable, and PSA only)

Perform 180° peel adhesion per para 3.11, 1 - 4 hours after removal from each condition listed in para 3.12.2- 3.12.5. The result must be equal or greater to the label adhesion listed in para 3.11.

Test Method for 3.12.2 - 3.12.5:

Apply a 25 mm width strip of the label material to be tested to the substrate and allow the finished sample to dwell for a minimum of 24 hours.

3.12.2 Heat Age Must meet 3.12.1

3.12.2.1 No adhesive, Sewn In, Removable, and PSA Labels and Tapes for Production Part Tracking and Assembly (A10, A11, A20, A72)

Place the test specimen in an oven for 168 h at 80 +/-2 °C





3.12.2.2 Interior  
(AATCC Evaluation Procedure 1)

Place the test specimen in an oven as follows:

- At or Above Beltline: 168 hours, 100 +/- 2 °C
- Below Beltline: 168 hours, 90 +/- 2 °C
- Scuff Plate / Floor Area: 168 hours, 80 +/- 2 °C
- Special Area: 168 hours, (Review with Materials Engineering.)

The standard requirement will be assumed to be "At or Above Beltline" unless otherwise noted on Supplement A, and the Engineering Drawing.

If the label will be affixed to various color substrates in production, repeat this test using one substrate color from each of the following color categories: light pigmented and dark pigmented.

3.12.2.3 Exterior and Underhood Labels

- Exterior: 336 hours, 80 +/- 2 °C
- Underhood (non-engine): 336 hours, 110 +/- 2 °C

- Must meet 3.12.1.1 only:
- Underhood (directly on engine): 1000 hours, 125 +/- 2°C

3.12.3 Heat Resistance Must meet 3.12.1

3.12.3.1 Interior and Exterior Labels

Place the test specimen in an oven for 1 h at 121 +/- 2 °C

3.12.3.2 Underhood Labels

Place the test specimen in an oven for 72 h at 121 +/- 2 °C

3.12.4 Humidity Must meet 3.12.1  
(AATCC Evaluation Procedure 1)

Test specimens placed in a humidity chamber for 168 hours at 38 +/- 2 °C, 95-100% R.H.

3.12.5 Environmental Cycle Must meet 3.12.1

3.12.5.1 Interior Labels  
(AATCC Evaluation Procedure 1)

The following general conditioning is a standardized label requirement. Conditioning requirements may be altered to be consistent with the part requirement. Prior approval must be obtained from Materials Engineering.

Condition the test specimen as follows:



10 cycles, each cycle shall consist of the following:

- 4 h at 100 +/- 2 °C
- 4 h at 38 +/- 2 °C and 95 - 100% R.H.
- 16 h at -40 +/- 2 °C

3.12.5.2 Exterior labels

Condition the test specimen as follows:

10 cycles, each cycle shall consist of the following:

- 4 h at 80 +/- 2 °C
- 4 h at 38 +/- 2 °C and 95 - 100% R.H.
- 16 h at -40 +/- 2 °C

3.12.5.3 Underhood Labels

Condition the panel for 1 h at -40 +/- 2 °C and then expose to heat for 1 h at 121 +/- 2 °C. Repeat for 4 cycles.

**3.13 ODOR**

(FLTM BO 131-03, label folded in half, adhesive to adhesive)

Rating 3 max

Note: Test will be run on a single label and will be run on the label alone, not affixed to the substrate.

**3.14 FOGGING**

(SAE J1756, 3 h at 100 °C heating, 21 °C cooling plate, post test conditioning 16 h, label folded in half, adhesive to adhesive)

Fog Number

70 min

Formation of clear film, droplets or crystals is cause for rejection.

Note: Test to be run on the label alone, not affixed to the substrate. Formation of clear film, droplets or crystals is cause for rejection unless it can be determined by FTIR analysis and concurred upon by Ford Materials Engineering that the deposits do not contribute to windshield fog (e.g. water droplets.)

**3.15 FLAMMABILITY**

(ISO 3795, SAE J369)

Burn Rate

100 mm/minute max

Test shall be conducted with the label 100% bonded to the substrate to form a material composite.



3.16 WEATHERING RESISTANCE

3.16.1 Interior  
(FLTM BO 116-01, ISO 105-A02/AATCC, Evaluation Procedure 1)

<i>Vehicle Sunlight Exposure Level</i>	<i>FLTM BO 116-01 Test Exposure</i>	<i>AATCC Rating After Exposure, min</i>
Severe Exposure i.e. Instrument Panel top and defroster grille	3609.6 kJ/m <sup>2</sup>	Rating 4
Heavy Exposure i.e. Airbag, steering wheel	2406.4 kJ/m <sup>2</sup>	Rating 4
Medium Exposure i.e. Door trim, seats, sun visor, seat belt webbing	977.6 kJ/m <sup>2</sup>	Rating 4
Mild Exposure i.e. Floor console, lower floor molding	601.6 kJ/m <sup>2</sup>	Rating 4
Low Exposure i.e. Lower trim panels, carpets, removable labels, labels with no adhesive	225.6 kJ/m <sup>2</sup>	Rating 4

3.16.2 Exterior  
(ASTM D7869 or SAE J2527 modified, ISO 105-A02/AATCC Evaluation Procedure 1)

ASTM D7869 (preferred)	SAE J2527 Boro/Boro	Requirements
2250 h	3000 h	Fade Resistance: Rating 4 min  There shall be no cracking, chalking, wrinkling, crazing, iridescence, bloom, milkiness, separation, or loss of adhesion (coating).

3.16.3 PSA Labels and Tapes used only for Production Part Tracking and Assembly  
(ASTM D7869 or SAE J2527 modified, ISO 105-A02/AATCC Evaluation Procedure 1)

Most labels (A72) will not require weathering. In the case where parts are stored outside or transported uncovered and exposed to sunlight, resistance to sun load is required. Labels on full frames, for example, may be transported by open railcar and stored outside up to 6 months and therefore have the following requirement:

ASTM D7869 (preferred)	SAE J2527 Boro/Boro	Requirements
375 h	500 h	Fade Resistance: Rating 4 min  There shall be no cracking, chalking, wrinkling, crazing, iridescence, bloom, milkiness, separation, or loss of adhesion (coating).

This is a standardized label requirement. The exposure level may be increased or decreased to be consistent with the part requirement. Prior approval must be obtained from Materials Engineering. Exposure level other than the levels described above must be recorded on Supplement A and the Engineering Drawing.



**3.17 ABRASION RESISTANCE**  
(FLTM BN 108-02, CS-10 wheel, 500 g load)

The following general conditioning is a standardized label requirement. Conditioning requirements may be altered to be consistent with the part requirement. Prior approval must be obtained from Materials Engineering.

- 3.17.1 Abrasion (all labels except A10, A20, and A72), 100 cycles                      Must meet 3.9  
Note: Labels meeting A10, A20, or A72, 50 cycles.
- 3.17.2 High Abrasion Area, 600 cycles:                                                              Must meet 3.9
- 3.17.3 Very High Abrasion – Seat Belt Applications ONLY (A 56)                      Must meet 3.9  
Hex Bar Test on Seatbelt Labels ONLY  
(FMVSS571.209, S5.1 (d), except no breaking strength)

**3.18 RESISTANCE TO SCUFFING**                                                              Must meet 3.9  
(SAE J365, 100 cycles)

This is a standardized label requirement. Requirements may be altered to be consistent with the part requirement. Prior approval must be obtained from Materials Engineering.

**3.19 CROCKING, WET, DRY, AND CLEANERS**                                                              Rating 4 min  
(FLTM BN 107-01, ISO 105-A02/  
AATCC Evaluation Procedure 2)

In addition to wet and dry crocking per the test method, evaluate the following Motorcraft or a commercially available fluid cleaner, using the procedure for wet crocking:

- Glass Cleaner                                                                                                      Motorcraft ZC-23
- Leather and Vinyl Cleaner                                                                                      Motorcraft ZC-56
- Carpet and Upholstery Cleaner                                                                                      Motorcraft ZC-54
- IPA                                                                                                                              50% v/v IPA and deionized water

**3.20 MIGRATION STAINING**                                                                                      Rating 5 min  
(FLTM BN 103-01, I-SO 105-A02/  
AATCC Evaluation Procedure 1 and 2)

There shall be no evidence of injurious exudation, adhesion (tackiness), separation or color transfer when placed face to face with itself and the standard vinyl test material. The specimens and the accessory test materials must not show any surface deterioration, change in color tone (hue), or any other defects.

**3.21 SOILING AND CLEANABILITY**  
(FLTM BN 112-08, ISO 105-A02/  
AATCC Evaluation Procedure 1)

After Cleaning                                                                                                              Rating 4 min

**3.22 LOW TEMPERATURE RESISTANCE**

Test panels prepared per paragraph 3.3 should be conditioned for 4 h at -30 +/- 2 °C.

- 3.22.1 Cold Flexibility  
(FLTM BN 102-01, Flexible substrates only)



Original (as received)	-30 +/- 1 °C
After 168 hours at 80 +/- 2 °C	-30 +/- 1 °C

In addition to the general requirements, the label shall remain flexible and exhibit no cracking when bent around a 6.4 mm mandrel (label side up) immediately after exposure.

**3.23 BALLY FLEX**  
(FLTM BN 162-01)

ONLY for labels affixed to flexible materials which may experience flexing with the part, e.g. luggage shade, seat, cargo net. This excludes labels affixed to fabric-covered visors and seatbelt labels.

3.23.1	Original, 45,000 cycles	Must meet 3.9
3.23.2	After aging 225 kJ/m <sup>2</sup> (FLTM BO 116-01), 10,000 cycles	Must meet 3.9
3.23.3	After aging 168 hours at 100 +/- 2 °C, 30,000 cycles	Must meet 3.9

**3.24 RESISTANCE TO FLEX FOLD**  
(FLTM BN 102-04 Method A) Must meet 3.9

ONLY for labels affixed to flexible materials which may experience flexing with the part, e.g. luggage shade, seat, cargo net. This excludes labels affixed to fabric-covered visors and seatbelt labels.

3.24.1	Original Flex Fold, 100,000 cycles	Must meet 3.9
3.24.2	Aged 168 hours at 100 +/- 2 °C, 50,000 cycles mechanical convection oven, plus flex fold	Must meet 3.9

Note: The label must be centered on the 250 x 300 mm material substrate.

**3.25 RESISTANCE TO LAUNDERING, 30 cycles** Must meet 3.9  
(ASTM D2724-11)

ONLY applicable for labels applied to interior trim pieces which are designed to be removed and laundered, such as child seat fabric or removable tote bags.

**3.26 WATER IMMERSION** Must meet 3.9  
(24 h at 32 +/- 2 °C)

Test panels prepared per para. 3.3 are completely immersed in a water bath.

**3.27 CORROSION,** Must meet 3.9  
(FSMS Test Method 00.00-L-467)

Consult Materials Engineering for total exposure time. Typically not applicable for PSA labels and tapes used for production part tracking and assembly. It does apply to frame labels applied prior to E-coat.

**3.28 CHEMICAL RESISTANCE FOR EXTERIOR**  
(FLTM BO 101-05)

Acceptance criteria: Printed text must remain legible when wiped with cloth after exposure. There shall be no significant adhesion loss based on visual examination.



Test Fluids: Current production factory fill materials, or commercially available products.

- Isopropyl Alcohol 1: 1 with Water Must meet 3.9
- Glass cleaner
- ASTM Fuel C w/15% ethanol
- Engine Oil which meets latest API-ILSAC standards
- Windshield Solution – methyl alcohol based
- Coolant Solution (50% Deionized water)

**3.29 CHEMICAL RESISTANCE FOR UNDERHOOD**  
(FLTM BO 101-05, Except Test Temperature 100 °C)

Acceptance Criteria: There shall be no blistering and only slight softening or dulling. Printed text must remain legible when wiped with cloth after exposure. There shall be no significant adhesion loss based on visual examination.

Test Fluids: Current production factory fill materials, or commercially available products. Fuel composition per, FLTM AZ 105-01, 23 °C +/- 2 °C, one hour.

- Reference Fuel C w/ 10% ethanol, Must meet 3.9
- Reference Fuel E85 Must meet 3.9
- Reference Fuel F (diesel Fuel) Must meet 3.9
- Brake fluid Must meet 3.9
- Motor Oil Must meet 3.9
- Coolant Solution (50% Deionized water) Must meet 3.9
- Automatic Transmission Fluid Must meet 3.9

**3.30 STEAM RESISTANCE** 80% Retention min  
(FLTM BO 160-04, no scribe, 2 MPa, 6.1 lpm flow)

Using a 50 x 100 mm sample, direct a steam jet to the 50 mm edge at a distance of approximately 200 mm for one minute at a right angle to the surface and then for 1 minute at a 10° angle to the surface. Failure occurs if more than 20% of the sample is lifted off.

**3.31 AIR PRESSURE RESISTANCE** 80% Retention min

Using a 50 x 100 mm sample, direct a stream of air at a pressure of 414 to 522 kPa using a 2.4 mm diameter orifice to the 50 mm edge at a distance of approximately 75 mm for three minutes at a right angle to the surface and then for 3 minutes at a 10° angle to the surface. Failure occurs if more than 20% of the sample is lifted off.

**3.32 BATTERY ACID RESISTANCE** Must meet 3.9

ONLY for labels affixed on battery trays and battery shields for lead acid batteries

Apply label onto appropriate substrate and allow to cure for 24 hours at 23 °C before starting test. Evenly distribute ten drops (approximately every 40 mm) of 10%, by weight, of sulfuric acid (specific gravity 1.260 +/- 0.005) around the outside edge of the label with half of each drop on the label, the other half on the substrate. Five isolated drops are to be placed on the printed area of the label away from the cut edges. One drop is equal to 0.06 ml. The test conditions are as follows:

- 3.32.1 Place the acid prepared label/panel into an air circulating oven in a horizontal plane at 80 +/- 2 °C for 16 hours.
- 3.32.2 Place a separate set of prepared test label/panels on a flat surface at ambient laboratory temperature for four weeks.



The label must display no lack of adhesion due to acid attack. The pressure sensitive adhesive must have good acid resistance. Acid discoloration at the die cut edges must not exceed more than 1.5 mm (1/16 inch) from the edge into the label area.

### 3.33 THERMAL SHEAR ADHESION

(For labels on vertical surface only.)

Test Method: Cut a 51 mm x 75 mm specimen from the label sample. Apply the specimen to the test panel so 25 mm of the 75 mm side is hanging over the edge. Adhere a piece of tape to the part of the label which is hanging over the edge to reinforce it. Attach a 100 g weight to this edge and suspend the test panel in a vertical position in an oven set at 121 °C for 24 hours. Failure occurs if printing is distorted and if the label slips more than 5 mm.

### 3.34 LOT CERTIFICATION

Lot certification requirements shall be included in supplier's process control plan and defined in the Ford Purchasing Agreement and engineering drawing.

## 4. GENERAL INFORMATION

The information given below is provided for clarification and assistance in meeting the requirements of this specification. Contact [gms@ford.com](mailto:gms@ford.com) for questions concerning Engineering Material Specifications.

Appendix A is provided as a graphical summary of the test requirements for these specifications.

## 5. SUMMARY OF REVISIONS

2018 02 26

- Expanded A72.
- Specified A20 to having interior and exterior conditions.
- Clarified descriptions and corrected grammar throughout the document
- 3.1 Changed wording to state this spec does not have approved sources
- 3.4.1 Included additional requirements for reporting
- 3.6 Changed strip width and clarified peel adhesion
- 3.11.4 Included labels and clarified the relevant subsections
- 3.11.5 Added section to cover heat applied labels.
- 3.12.2 Increased application of Heat Aging and updated color categories
- 3.13 Updated note to specify testing to be done on a single label
- Added section 3.16.3
- 3.22 Changes required temperature
- 3.23 Changed test to bally flex
- 3.24 Added specification for meeting general acceptance criteria
- 3.30 Added flow rate based on nozzle specifications in FLTM BO 160-04
- Updated Supplement A
- Updated Appendix A

2014 11 25

- 3.16.2 Added optional exterior weathering test method ASTM D7869.

2014 01 22

- 3.12.2.3: Modified heat age temperature before peel adhesion requirement.

4/5/2013

- Changed naming of Table 2.2 to Table 1





- Reconciled Table 1 with Appendix A
- Corrected typos and general formatting throughout document
- Removed reference to JLR throughout document
- Changed heat age duration and temperature of underhood labels in 3.12.2.3.
- Moved heat age requirement for labels directly on the engine to 3.12.2.3.
- Moved Exterior Weathering to the same section as Interior Weathering
- Expanded exposure levels for Interior Weathering based on label location
- Updated Corrosion requirement to the corporate standard
- Removed 12 months Florida weathering requirement
- Moved Chemical Resistance for Underhood next to Chemical Resistance for Exterior
- Updated Supplement A
- Added 80 °C to Security Feature Labels

01/27/09

- Table 2.2 Updated removable labels to exclude environmental testing, odor and fogging
- Table 2.2 Changed tests required for PSA tapes to be the same as removable label requirements
- Para 3.10.3 Added VIN and antitheft label requirements to include all 3 label security features.
- Para 3.11.4 New limits for breaking strength, elongation and unwind force
- Para 3.30 Steam Resistance test replaced with FLTM BO 160-04 modified (as written)



ENGINEERING MATERIAL SPECIFICATION

WSS-M99P41-A10/A72

SUPPLEMENT A

Specification No: WSS-M99P41-\_\_\_\_\_

Matrix No. (Ford Use Only)\_\_\_\_\_

Supplier Name \_\_\_\_\_

Contact person (name/title)\_\_\_\_\_

(phone/e-mail):\_\_\_\_\_

Final Product ID Code/Trade name (if applicable): \_\_\_\_\_

Adhesive Product Code, Chemistry and Supplier (if applicable)\_\_\_\_\_

Face Stock Product Code, Chemistry, and Supplier (if applicable)\_\_\_\_\_

Cover Stock Product Code, Chemistry and Supplier (if applicable)\_\_\_\_\_

Adhesive Thickness:\_\_\_\_\_ Face Stock Thickness\_\_\_\_\_ Cover Stock Thickness\_\_\_\_\_

Release Liner Type & Thickness: \_\_\_\_\_

Security feature/scanned/safety label description:\_\_\_\_\_

Print Method (including ribbon type): \_\_\_\_\_

Label Print Color(s):\_\_\_\_\_

Substrate(s) and substrate color(s) to which this label has been affixed for testing (including paint system): \_\_\_\_\_

Application Process Parameters for Production)\_\_\_\_\_

Functional Requirements and/or Limitations for this application (Heat, Fade, Abrasion):\_\_\_\_\_

Non Standard Conditions for Heat Age and Weathering:\_\_\_\_\_

Signed & Dated:

\_\_\_\_\_  
LABEL SUPPLIER

\_\_\_\_\_  
TIER ONE SUPPLIER

\_\_\_\_\_  
METS ENGINEER



**APPENDIX A**  
Test Method Allocation

Test method: Sample Size required for DV and PV L = 1 minimum, R = 5 minimum		Label category/suffix																				
		A10	A11	A20	A31	A32	A33	A34	A35	A41	A42	A43	A51	A52	A53	A54	A55	A56	A61	A62	A63	A72
'R' = Test required on adhesive roll stock, 'L' = Tests required on Actual labels (appearance evaluations must be completed on actual labels), 'P' = Test required on molded part																						
3.11.1	Removable Label Adhesion			R																		
3.11.2	PSA Label Adhesion				R	R	R	R	R													
3.11.3	Security Feature Label Adhesion									L	L	L										
3.11.4	Instructional Tapes Adhesion																					R
3.12.2.1	Removable/No Adhesive Heat Age	L	L	L																		L
3.12.2.2	Interior Heat Age				L R			L R		L R			L			L		L	P			
3.12.2.3	Exterior and Underhood Heat Age					L R	L R		L R		L R	L R		L	L		L			P	P	
3.12.3.1	Heat resistance of interior and exterior labels				L R	L R		L R	L R	L R	L R		L	L		L	L	L	P	P		
3.12.3.2	Heat resistance of underhood labels						L R				L R				L						P	
3.12.4	Humidity Resistance	L	L	L	L R	L R	L R	L R	L R	L R	L R	L	L	L	L	L	L	L	P	P	P	L
3.12.5 Environmental cycling	3.12.5.1 Interior	L	L	L	L R			L R	L R			L			L		L	P				
	3.12.5.2 Exterior					L R		L R		L R			L			L			P			L
	3.12.5.3 Underhood						L R				L R				L						P	
3.13	Odor	L	L	L	L			L		L			L			L		L	P			
3.14	Fogging	L	L	L	L			L		L			L			L		L	P			
3.15	Flammability		L	L	L		L	L		L		L	L		L	L		L	P		P	
3.16.1	Interior Weathering Resistance	L	L	L	L			L		L			L			L		L	P			
3.16.2	Exterior Weathering Resistance	L		L		L		L		L			L			L				P		



APPENDIX A (Cont.)  
Test Method Allocation

'R' = Test required on adhesive roll stock, 'L' = Tests required on Actual labels				Label category/suffix																			
				A10	A11	A20	A31	A32	A33	A34	A35	A41	A42	A43	A51	A52	A53	A54	A55	A56	A61	A62	A63
Test method: Sample Size required for DV and PV L = 1 minimum, R = 5 minimum																							
<b>3.16.3 Exterior Weathering Resistance</b>																							L
3.17	Abrasion Resistance (FLTM BN 108-02 CS-10 wheel, 500 G load)	3.17.1	Abrasion all labels 100 cycles		L		L	L	L			L	L	L					P	P	P		
			50 cycles	L		L																	L
		3.17.2	High abrasion area, 600 cycles						L	L						L	L						
		3.17.3	Very high abrasion seat belt applications only (A 56)														L						
3.18	Resistance to Scuffing						L			L			L			L		L	P	P			
3.19	Croaking, Wet, Dry & Cleaners				L		L			L			L			L		L	P	P			
3.20	Migration Staining				L		L			L			L			L		L					
3.21	Soiling and Cleanability				L		L			L			L			L		L	P	P			
3.22	Low Temperature Resistance				L		L			L			L			L		L					
3.23	Bally Flex				L		L			L			L			L		L					
3.24	Resistance to Flex Fold				L		L			L			L			L		L					
3.25	Resistance to Laundering				L		L			L			L			L		L					
3.26	Water Immersion				L			L	L		L		L	L			L			P	P		
3.27	Corrosion							L	L		L	L		L	L		L			P	P	L	
3.28	Chemical Resistance for Exterior							L			L			L			L						
3.29	Chemical Resistance for Underhood							L	L			L		L					P		P		
3.30	Steam Resistance							L	L		L	L		L	L		L			P	P		
3.31	Air Pressure Resistance							L	L		L	L		L	L		L			P	P		
3.32	Battery Acid Resistance							L				L			L						P		
3.33	Thermal Shear Adhesion (For labels on vertical surface only)							L				L			L						P		