

**THERMOPLASTIC POLYOLEFIN ELASTOMER (TEO), UNFILLED
MOLDING COMPOUND, UV STABILIZED, MOLD-IN-COLOR,
PARTIALLY PAINTED, EXTERIOR****WSS-M4D952-A2****1. SCOPE**

The material defined by this specification is an unfilled, weatherable and paintable thermoplastic molding compound based on thermoplastic polyolefin elastomer.

2. APPLICATION

This specification was released originally for material used for exterior bumper applications that are mold-in-color and partially painted. Any color additives need to be reviewed and approved by the raw material supplier and Ford Materials Engineering. The UV/heat stabilizers must be in the base resin from the material supplier, not in the color concentrate, for mold-in-color applications at the press.

3. REQUIREMENTS

Material specification requirements are to be used for initial qualification of materials.

3.1 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Standard Requirements For Production Materials (WSS-M99P1111-A).

3.1.1 All requirements of this specification, identified by symbol (s), shall be met with data representing 3 sigma values using latest ISO test methods.

3.1.2 This specification was developed using virgin material properties. The use of regrind is permitted, for economic/environmental reasons, with compliance as indicated in WSS-M99P1111-A.

3.2 MOLDING COMPOUND

(s)	3.2.1	Melt Flow Rate (ISO 1133, 230 °C, 2.16 kg)	Reference Approved Source List g/10 minutes
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3.3 MOLDED TEST SPECIMEN

3.3.1 Preparation of Test Specimens

Unless otherwise specified all tests shall be carried out on injection molded one-end gated test specimens.

Date	Action	Revisions
2006 07 28	Revised	Title, 2., 3.1.2, 3.3.6.1, 3.3.8, 3.3.8.1, 3.3.8.2, Figure 1, 3.6, .3.7; Added 3.3.8.1.1, 3.3.8.1.2, 3.3.8.2.1, 4.4, 4.5, 4.5.1, 4.5.2 & 4.5.3 K. Mueller, M. Massera
2005 11 04	Activated	K. Mueller, M. Massera



The following dimensions are required:

- A. 150 minimum x 10 x 4.0 +/- 0.2 mm (ISO 527-2, specimen type 1A)
- B. 60 x 60 x 2.0 +/- 0.1 mm (ISO/DIS 294-3)
- C. 355 x 100 x 1.0 +/- 0.1 mm (ISO 3795)

Test specimen A shall be molded using molding conditions defined in ISO 1873-2. Specimens with shorter dimensions shall be cut from the center of the specimen A. No annealing allowed.

3.3.2	Density (ISO 1183, Method A)	0.89 – 0.91 g/cm ³
3.3.3	Hardness, Durometer D (ISO 868, 15 s dwell)	53 – 57
(s) 3.3.4	Tensile Strength at Yield, min (ISO 527-1 & ISO 527-2, 150 minimum x 10 x 4.0 +/- 0.2 mm specimen A, test speed: 50 mm/minute)	14 MPa
3.3.4.1	Elongation at Yield, min (Test Method according to para 3.3.4)	5%
3.3.5	Tensile Stress/Strain Curves (ISO 527-1, 527-2, ISO 11403-1; 150 x 10 x 4 mm specimen A). Test speed shall be 50 mm/minute. Provide a curve of tensile stress versus strain using one specimen per lot at each of the following temperatures: -40 °C, 23 °C and 85 °C (Page 8). For ductile materials, the curve shall cover strain through yield point.	
(s) 3.3.6	Impact Strength, Izod, notched, min (ISO 180/1A, 80 x 10 x 4.0 +/- 0.2 mm specimen [use center section of specimen A], 10 specimens for each test)	
3.3.6.1	At 23 +/- 2 °C	32 kJ/m ² , 100% Partial Break
3.3.6.2	At 10 +/- 2 °C	100% Partial Break
3.3.6.3	At 0 +/- 2 °C	13 kJ/m ²
3.3.6.4	At -40 +/- 2 °C	3 kJ/m ²

The test specimens must be conditioned for a minimum of 6 h at the above specified temperature prior to impact test. Low temperature testing shall be done within the cold chamber, if not possible, test may be conducted outside, but within 5 seconds.



(s) 3.3.7 Flexural Modulus, min 800 MPa
(ISO 178, 80 x 10 x 4.0 +/- 0.2 mm specimen, [use center section of specimen A], 2 mm/min test speed, 64 mm support span)

3.3.8 Impact Strength, Multiaxial, Painted and Unpainted Specimens
(ASTM D 3763, 100 x 100 x 3.2 +/- 0.2 mm thick smooth surface injection molded specimen, test a minimum of 10 specimens from 3 individual lots at each condition; 2.2 m/s impact velocity; to be tested using production paint systems. For North America: painted primer ESB-M6J142-A PPG MPP6000; Basecoat/Clearcoat ESB-M2J218-A1/2 1K/1K PPG Oxford White CBCF6466, PPG Clearcoat CUCC1000XA)

Test specimens must be conditioned for minimum of 6 h at test temperature prior to impact testing. Low temperature conditioning and testing shall be conducted within the same environmental chamber as the clamp mechanism of the impact device.

Painted test specimens must be oriented with paint in tension (paint side down).

Summarize testing at each condition by providing the following information as well as the information in Figure 1.

- Detailed description of specimen preparation
- Molding conditions: melt and mold surface temperatures, and average injection velocity
- Number of samples tested per lot per temperature
- Numbers of lots tested
- Number of samples with ductile failure per each test condition
- Representative force vs. deflection curve for each impact event

Test results shall be submitted with an initial qualification of the material with curves (data on CD as well as paper copies) and test samples.

A ductile failure is defined as a crack that does not radiate more than 10 mm from the center of the impact point.

3.3.8.1 Painted Specimens
(Test Method per para 3.3.8)

3.3.8.1.1 Energy at Maximum Load, min 13.0 J
(At 0 +/- 2 °C)

% Ductile, min 90%
(At 0 +/- 2 °C)

3.3.8.1.2 Energy at Maximum Load, min 11.0 J
(At -10 +/- 2 °C)

% Ductile, min 40%
(At -10 +/- 2 °C)

3.3.8.2 Unpainted Specimens
(Test Method per para 3.3.8)

3.3.8.2.1 % Ductile, min 100%
(At -40 +/- 2 °C)