POLYCARBONATE (PC), OPTICAL GRADE, HIGH MELT FLOW, EXTERIOR **WSS-M4D1052-B1**

POLYCARBONATE (PC), OPTICAL GRADE, LOW MELT FLOW, EXTERIOR **WSS-M4D1052-B2**

POLYCARBONATE (PC), OPTICAL GRADE, LOW MELT FLOW, INTERIOR **WSS-M4D1052-B3**

1. SCOPE

The material defined by this specification is a thermoplastic injected molded compound based on polycarbonate. These are non UV-stable materials.

2. APPLICATION

WSS-M4D1052-B1 & B2: These specifications were released originally for materials used for exterior lighting components that require optical performance and that are coated with a UV stable material.

WSS-M4D1052-B3: These specifications were released originally for materials used for interior lighting components that require optical performance in low UV exposure vehicle regions.

2.1 LIMITATIONS

- This material is not UV stable; therefore it requires a UV stable coating for exterior applications. Long term exposure to direct sunlight will cause yellowing.
- This material should be evaluated for potential incompatibility with other materials that they may come in contact with. Refer to the appropriate performance specification.
- HALS (Hindered Amine Light Stabilizers) IS PROHIBITED IN PC AND PC/ABS RESINS. HALS UV stabilizer degrades the polymer in the presence of moisture causing cracking/crazing of the resin.

WSS-M4D1052-B1 only: These materials should not be considered for parts with snap-in features or features that are notch-sensitive, as they tend to break in these types of applications.

3. REQUIREMENTS

3.1 APPROVED SOURCES

This specification is part of the Ford Co-Managed Buy (CMB) agreement. Tier 1 molders who are participating under the CMB agreement must use one the following approved sources (deviations require approval from Raw Materials Purchasing and Materials Engineering).

Molders not on the CMB program or regions without CMB are required to use materials listed on the Ford Approved Source List (ASL), and are encouraged to use the CMB sources. Only the sources identified on the Approved Source List 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.

Date	Action	Revisions	Rev. 0
2018 03 06	Released		C. Wilson - NA

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Approval of new sources requires the completion of the latest version of the FMD template. Data should be submitted at the time as the specification data package. Only one FMD package is required per trade name approved, FMD is not required for each manufacturing site. FMD is required for new site approvals that do not have an existing FMD record.

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 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

3.4.1 Many 4D resin specifications prior to 2011, identified certain requirements with the symbol (s), which indicated that the mean and +/- 3 sigma values were to be reported. The specification minimum, maximum or range was established using 3 sigma data. For 2011 and beyond, refer to Table 1 for number of samples required for each test.

3.4.2 This specification is based on virgin material and does not allow the addition of recycled content (PIR/PCR).

3.4.3 The use of regrind is permitted, for economic / environmental reasons. Part manufacturers using this specification must complete DV and PV testing with the maximum allowable amount of regrind and the maximum allowable regrind content must be specified on the engineering drawing. Any changes to what is specified on the drawing (no specific amount implies zero regrind) must be approved by Materials and PD Engineering through the formal Ford Motor Company process (SREA) or Engineering Notice.

3.4.4 Performance Criteria:
WSS-M4D1052-B1 & B2: Parts using this specification shall meet the appropriate performance specifications, WSK-M98P10-A/Latest (Exterior Lamp Assembly).
WSS-M4D1052-B3: Parts using this specification shall meet the appropriate performance specification, WSS-M15P4-G/Latest.

3.4.5 Ford Materials Engineering may request a Control Plan and Certificate of Analysis (C of A) containing lot testing requirements which must include, but are not limited to:

Melt Flow Rate
Density

3.5 SAMPLE PREPARATION

All tests shall be carried out on production materials manufactured from the production process unless correlation to a non-production process has been reviewed and approved by Ford Materials Engineering.

Unless otherwise specified all tests shall be carried out on injection molded, one-end gated test specimens. The test specimens A and D shall be molded using molding conditions defined in ISO 7391-2. No additional annealing is allowed. See Tables 1 and 2 for the number of samples required.

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Specimens shall be as follows:

Specimen A	150 minimum x 10 x 4.0 +/- 0.2 mm (ISO 527-2, Specimen Type 1A)
Specimen B	355 x 100 x 1.0 +/- 0.1 mm (ISO 3795)
Specimen C	145 x 60 x 3.2 +/- 0.2 mm
Specimen D	Center of Specimen A, 80 x 10 x 4.0 +/- 0.2 mm
Specimen E	100 mm diameter x 3.2 mm
Specimen F	80 mm diameter x 3.2 mm
Specimen G	90 mm x 200 mm
Specimen H	50 +/- 1 mm diameter x 3.2 +/- 0.2 mm
Specimen I	100 mm x 150 mm, min

3.6 APPEARANCE

3.6.1 Weathering Resistance (*WSS-M4D1052-B3 only*) — Rating 4 min
(FLTM BO 116-01, 601.6 kJ/m^2 exposure
Specimen C, ungrained, non-polished mold,
ISO 105-A02 / AATCC Evaluation Procedure 1)

After exposure the material shall show no fading or color change in excess of the specified AATCC rating. In addition, there shall be no cracking, crazing or other deterioration.

Use regional choice for initial approval and report the color house used. See Table 2 for additional color durability submission requirements.

3.7 MATERIAL PROPERTIES

		B1	B2/B3
3.7.1	Melt Flow Rate, g/10 minutes (ISO 1133 300 °C, 1.2 kg)	15 - 25	10 - 15

The material shall be dried for 4hr minimum at 125 °C in a mechanical convection oven immediately preceding the test.

3.7.2	Density (ISO 1183, Method A)	1.16-1.26 g/cm^3
3.7.3	Tensile Strength at Yield (ISO 527-1 & ISO 527-2, Specimen A, 50mm/minute test speed)	55 MPa min
3.7.4	Elongation at Yield (ISO 527-1 & 527-2, Specimen A, 50mm/minute test speed)	5% min
3.7.5	Tensile Modulus (ISO 527-1 & ISO 527-2, Specimen A 1mm/min test speed)	2.0 GPa min
3.7.6	Flexural Modulus (ISO 178, Specimen D, 64mm support span, 2mm/min test speed)	2.1 GPa min

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