



POLYCARBONATE (PC), GENERAL PURPOSE, EXTERIOR  
POLYCARBONATE (PC), GENERAL PURPOSE, INTERIOR

WSS-M4D1051-A1  
WSS-M4D1051-A2

## 1. SCOPE

The material defined by this specification is a thermoplastic injection molded compound based on polycarbonate. This is a non UV-stable material.

## 2. APPLICATION

WSS-M4D1051-A1: This specification was released originally for materials used for headlamp lenses and rear lamp housings and protected by UV resistant coatings.

WSS-M4D1051-A2: This specification was released originally for materials used for general purpose applications not requiring optical clarity, such as instrument cluster light filters. This material may be color pigmented when optical transparency is not required.

### 2.1 LIMITATIONS

This material does not contain UV stabilizers, long term exposure to direct sunlight will cause chalking and loss of gloss.

## 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](http://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 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.

| Date       | Action    | Revisions                | Rev. 4         |
|------------|-----------|--------------------------|----------------|
| 2017 05 12 | Revision  | See Summary of Revisions | T. Nover, EU   |
| 2014 12 16 | Editorial | See Summary of Revisions | L. Sorcide, NA |
| 2012 06 22 | Activated |                          | G. Eaton, NA   |



- 3.4.2 The use of regrind is permitted, for economic / environmental reasons, with compliance as indicated in Ford Engineering CAD and Drafting Standard E-4.
- 3.4.3 *WSS-M4D1051-A2*: Materials used in interior applications must meet the requirements outlined in WSS-M99P2222-C1/Latest, Performance, Vehicle Interior Environment Quality Material/Component Requirements. Data must be included in material submission.
- 3.4.4 Performance Criteria:  
*WSS-M4D1051-A1*: Parts using this specification shall meet the appropriate performance specifications, WSS-M98P13-C/Latest (MIC Exterior) or WSK-M98P10-A/Latest (Exterior Lamp Assembly).  
  
*WSS-M4D1051-A2*: Parts using this specification shall meet the appropriate performance specification, WSS-M15P4-F/Latest.

### 3.5 SAMPLE PREPARATION

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. See Tables 1 and 2 for the number of samples required.

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 thick                                  |
| 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-M4D1051-A2 only) Rating 4 min  
(FLTM BO 116-01, 601.6 kJ/m<sup>2</sup> exposure  
Specimen C from smooth 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

- 3.7.1 Density 1.17 – 1.23 g/cm<sup>3</sup>  
(ISO 1183, Method A)
- 3.7.2 Tensile Strength at Yield 59 MPa min  
(ISO 527-1 & ISO 527-2, Specimen A,



50 mm/minute test speed)

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|---------|----------------------------------------------------------------------------------------|-----------------------------------------------|
| 3.7.3   | Elongation at Yield<br>(ISO 527-1 & ISO 527-2, Specimen A,<br>50 mm/minute test speed) | 2 % min                                       |
| 3.7.4   | Tensile Modulus<br>(ISO 527-1 & ISO 527-2, Specimen A<br>1 mm/min test speed)          | 2.0 GPa min                                   |
| 3.7.5   | Flexural Modulus<br>(ISO 178, Specimen D,<br>64 mm support span, 2 mm/min test speed)  | 2.1 GPa min                                   |
| 3.7.6   | Impact Strength, Notched Charpy<br>(ISO 179-1/1eA, Specimen D)                         |                                               |
| 3.7.6.1 | At 23 +/- 2 °C                                                                         | 10 kJ/m <sup>2</sup> min<br>Report Break Type |
| 3.7.6.2 | At - 40 +/- 2 °C                                                                       | 4 kJ/m <sup>2</sup> min<br>Report Break Type  |

The test specimen must be conditioned for minimum of 6 hours 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.

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|-------|------------------------------------------------------------------------------------------------------------------------|------------|
| 3.7.7 | Heat Deflection Temperature<br>(ISO 75-1 & ISO 75-2, Specimen D,<br>flatwise, 0.34 +/- 0.1 mm deflection. At 1.80 MPa) | 118 °C min |
|-------|------------------------------------------------------------------------------------------------------------------------|------------|

All specimens dry as molded. If not tested immediately after molding, specimens must be stored in a sealed, moisture-proof container filled with silica gel.

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|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 3.7.8 | Vicat Softening Temperature<br>(ISO 306, Specimen D. Bath - silicone oil,<br>temperature raise 50 +/- 5 °C/h.<br>Dial gage reset to 'O' after addition<br>of 5 kg weight, at 50 N load) | 136 °C min |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|

All specimens dry as molded. If not tested immediately after molding, specimens must be stored in a sealed, moisture-proof container filled with silica gel.

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|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 3.7.9 | Heat Aging Performance<br>(ISO 188, except 150 +/- 50 air<br>changes/h, 1000 h at 90 +/- 2 °C.<br>After heat aging test specimens are<br>to be conditioned in a desiccator for<br>3 - 5 h at 23 +/- 2 °C. Unaged property<br>values shall be determined at the time<br>of the aged properties determination) |  |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

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|---------|-------------------------------------------------------------------|-------------|
| 3.7.9.1 | Tensile Strength at Yield, Change<br>(Test method per para 3.7.2) | +/- 25% max |
|---------|-------------------------------------------------------------------|-------------|