



Low Wear Non-woven Carpet for Accessory Floor Mat Applications

1 Scope

1.1 Material Description. The material is low-wear and is generally used on entry level vehicles only for accessory floor mats.

1.1.1 Material Identification. The material shall be constructed using synthetic fibers, dyed and finished with an approved backing to become acceptable in color, pattern and physical properties as outlined in this specification.

1.2 Symbols. The construction code defines the material construction and will be assigned by the responsible Commodity Materials Engineer.

1.3 Applicability. Suitable for molded accessory floor mat applications only.

Note: For requirements for vehicles without solar absorbing glass, contact the appropriate Materials Engineer. All interior materials are developed to be used in vehicles with solar glass; therefore, performance may be compromised if used in non-solar glass vehicles.

1.4 Remarks. None.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ISO 105-A01	ISO 105-A03	ISO 5084	ISO/IEC 17025
ISO 105-A02	ISO 105-B06	ISO 13937-2	SAE J1530

2.2 GM Standards/Specifications.

GMW3010	GMW3235	GMW14102	GMW14444
GMW3059	GMW3259	GMW14108	GMW14892
GMW3182	GMW3387	GMW14125	GMW15634
GMW3205	GMW3402	GMW14128	GMW15635
GMW3208	GMW3417	GMW14141	GMW16853
GMW3221	GMW4217	GMW14162	
GMW3232	GMW6992	GMW14270	

2.3 Additional References. None.

3 Requirements

3.1 General Requirements.

3.1.1 Standard Conditions (GMW3221, Code A). All test specimens shall be conditioned to GMW3221, Code A for a minimum of 24 h, unless the test method indicates that standard conditioning is not required or that other conditions apply.

3.1.2 Sampling and Test Specimen Preparation. When multiple test specimens are required, they shall be taken diagonally across the sample so that no two (2) test specimens overlap in the same row of yarns. Avoid taking specimens from damaged, contaminated, or defective areas caused by improper handling or manufacturing. Specimens should not be cut within 50 mm of any edge of the specimen.

3.1.3 Visual Evaluation of Automotive Trim (GMW6992). The color, pattern, aesthetics and other related qualities shall be approved by the appropriate engineering department as an acceptable match to the standard when viewed under conditions set forth in GMW6992. See the appropriate Non-Woven Carpet Construction Specification Form (Appendix A, Data Sheet A1) for Pattern and Finish information.

3.1.4 Material Construction Specification. All required information shall be reported on the Non-Woven Carpet Construction Specification Form, and the Carpet Construction Certification Data Forms, see Appendix A, Data Sheet A1, and Appendix B, Data Sheets B1, B2, and B3. The form shall be submitted along with each carpet material submitted for engineering approval. Established values for a construction will be reported on and controlled within the limits established on the Carpet Construction Certification Data Forms.

3.1.5 Data Reporting. If all individual readings of a specific test meet or exceed the specified requirements, report the average. Unless otherwise stated, any individual reading outside the specified limit does not meet the requirement. Report all individual test results that do not meet the requirements. All required information shall be reported on the appropriate test data reporting forms, see Appendix B, Data Sheet B1, B2, and B3.

3.1.6 Laboratory Accreditation. Laboratory testing is to be performed by a laboratory that conforms (meets requirements but may not be formally recognized by a third party) to ISO/IEC 17025 and is acceptable to the responsible GM department. Test reports must conform to ISO/IEC 17025. Supplier shall submit a letter of compliance.

3.1.7 Deviations from Defined Test Methods. Deviations from the conditions of any test method shall have been agreed upon between supplier and vehicle manufacturer. All deviations shall be specified on the component drawings, material specifications, etc. and shall be indicated on test certificates, reports, etc.

3.1.8 Documentation. Specimens of components or materials released to this specification shall be tested for conformity with the requirements of this specification and approved by the responsible GM Department prior to the start of delivery of production level components or materials. Any change to the component or material, e.g., design, function, properties, manufacturing process, and/or location of manufacture requires a new release of the product. It is the sole responsibility of the supplier to provide the customer, unsolicited, with documentation of any change of modification to the product/process, and to apply for a new release. If not otherwise agreed to the entire verification test shall be repeated and documented by the supplier prior to start of delivery of the modified or changed product. In some cases, a shorter test can be agreed to between the responsible GM Department and the supplier.

3.2 Rolled Good Carpet Construction Requirements.

3.2.1 Weight (GMW3182). Test three (3) specimens. Report the results in grams per square meter (g/m²). Refer to the Non-Woven Carpet Construction Specification Form (Appendix A, Data Sheet A1) for weight specification requirements.

3.2.2 Pile Height. Refer to the Non-Woven Carpet Construction Specification Form (Appendix A, Data Sheet A1) for pile height specifications.

3.2.3 Thickness (ISO 5084). Refer to the Non-Woven Carpet Construction Specification Form (Appendix A, Data Sheet A1). Report the average for three (3) specimens in millimeters to the nearest 0.01 mm. Use a 4.0 N load and a 200 mm ± 0.8 mm diameter presser foot to achieve a pressure of 0.127 kPa. All readings should be taken after the presser foot has been in contact with the material for at least 5 s. The specimens shall be 100 mm × 100 mm size.

3.2.4 Breaking Load (GMW3010, Code A). Test six (6) specimens; three (3) specimens from the Machine Direction (MD) and another three (3) from the Cross-Machine Direction (CMD).

- Floor: 310 N minimum

3.2.5 Trouser Tear Strength (ISO 13937-2). Test six (6) specimens; three (3) specimens from the MD and another three (3) from the CMD. Electronic method of calculation shall be used.

- Floor: 50 N minimum

3.2.6 Resistance to Cracking from Bending at Cold Temperature (GMW14108). Cut four (4) specimens approximately 250 mm × 250 mm. Oven age two (2) specimens for 336 h at 93 °C ± 2 °C. Expose specimens face side down during the entire oven exposure. For “as-received” testing and after aging, condition specimens for a minimum of 24 h to the requirements of GMW3221, Code A before cold temperature exposure. Condition all four (4) specimens at -30 °C for a minimum of 4 h. One as-received specimen shall be wrapped around a

75 mm diameter mandrel so that the face side is in contact with the mandrel, then the backside. Follow the same procedure for both oven aged specimens.

3.2.6.1 There shall be no cracking or other deterioration of specimen on the backside.

3.2.7 Abrasion Resistance (GMW3208). Non-woven, low-weight carpet for accessory floor mats must be tested to GMW3208. Taber abrasion test using H18 wheel, 1000 g load for 500 cycles. Three (3) specimens per type shall be tested according to GMW3208.

Note: A rating ≥ 6 is required for floor mats.

3.2.8 Linear Abrasion (GMW14125, Coding BX2). Non-woven carpets must meet Coding BX2 Cycle with a rating ≥ 4 .

3.2.9 Mildew (GMW3259). Required only if natural fibers are present in the construction. There shall be no visible growth or odor of mildew. See Appendix A, Data Sheet A1 to determine if this is a requirement.

3.2.10 Flammability (GMW3232).

3.2.10.1 After Conditioning. Immediately prior to tests, all test specimens shall be conditioned for a minimum of 24 h according to GMW3221, Code A.

3.2.10.2 After Aging. The test cycle shall commence with 48 h $\pm$ 1 h at 40 °C $\pm$ 3 °C and 95% $\pm$ 5% relative humidity (RH), followed by 168 h $\pm$ 1 h at 90 °C $\pm$ 3 °C and completed without interruption. Repeat the conditioning before testing flammability.

3.2.11 Dimensional Stability (GMW4217). Test to the dry and wet method. For both the MD and CMD, a maximum of 1.5% is allowed.

3.2.12 Sound Transparency (GMW14128). If a carpet is intended to be used as a speaker covering, it must meet this requirement.

3.2.13 Interior Emissions (GMW16853). Applicable for GMW14444, Code E parts only. For required tests, procedure and limits see Table titled **Overview of Test Procedures required for the Individual Materials and Part Approvals** and Table titled **Emission Requirements for Interior Material/Parts/Assembly List** according to GMW16853.

3.2.13.1 Resistance to Odor (GMW3205, Coding A2 and B2). Report results for wet and dry conditions. Use a ratio of specimen size to container volume of 1:50. A rating of ≥ 6 is required.

3.2.13.2 Fogging (GMW3235, Method B). The bath temperature shall be Coding T2 specified in GMW3235 (T2 = 100 °C) except for Code 1 parts (see GMW14444 for reference). The condensable constituents, or the fogging value **G**, shall be ≤ 2 mg. No droplets, or crystals are acceptable upon visual examination.

3.2.13.3 Volatile Organic Compound/Semi-volatile Organic Compound (VOC/SVOC) (GMW15634). Record total amounts of VOCs and SVOCs in milligram/kilogram and attach a report listing all chemicals detected. Values of total amounts shall be ≤ 300 μ g/g for VOCs, and ≤ 300 μ g/g for SVOCs.

3.2.13.4 Carbonyls (GMW15635). Record the amounts of each chemical listed along with the sum of C2 to C6 Carbonyls. Values shall be Formaldehyde: ≤ 8 mg/kg, Acetaldehyde: ≤ 8 mg/kg, Acrolein: ≤ 8 mg/kg, Acetone: report value, Sum C2 to C6 Carbonyls: ≤ 20 mg/kg.

3.3 Color Requirements.

3.3.1 A rating of ≥ 4 is required using the gray scale (ISO 105-A02) for color change. A noticeable value (lightness) and/or chroma (saturation) change with minimum hue change is acceptable. Evaluate specimens as specified in GMW6992. Reference polystyrene or blue wool is to be used to certify the xenon arc apparatus.

3.3.1.1 Colorfastness to Artificial Light Xenon Arc Method. Any of the Xenon Arc methods noted in Tables 1, 2 and 3 may be used.

Note: Xenon testing shall be performed and reported for limited approval status while Nature Weathering testing is ongoing. Natural weathering is the requirement for full approval.

Table 1: Xenon Arc Method (GMW14162, Cycle A)

Application	Requirement	For Information
Carpet (Floor)	320 kJ/m ²	640 kJ/m ²

Table 2: Xenon Arc Method (GMW14162, Cycle B)

Application	Requirement	For Information
Carpet (Floor)	14 MJ/m ²	28 MJ/m ²

Table 3: Xenon Arc Method (ISO 105-B06, Condition 5)

Application	Requirement	For Information
Carpet (Floor-Low Ultraviolet)	112 kJ/m ²	Not applicable
Carpet (Floor- High Ultraviolet)	451 kJ/m ²	Not applicable

3.3.2 Natural Weathering Exposure (GMW3417). Natural weathering is the requirement for Colorfastness to Light approval. The Natural Weathering testing conditions are listed in Table 4. GM is responsible for conducting the natural weathering testing. Suppliers shall submit one (1) A4 or letter size specimen of the color-approved material to the responsible engineer at the developing region. This specimen must be from the same lot of material that is visually approved by GM. The specimen shall be labeled "For Natural Weathering Test" and include the supplier's name, piece number, date and GM Finish Symbol and color number. GM will advise the supplier of compliance or lack of compliance to the requirement. A rating of ≥ 4 per ISO 105-A02 grey scale for color change, with no greater than a noticeable value (lightness) and or chroma (saturation) change with minimum hue change is acceptable. Evaluate specimens as specified in GMW6992. See Table 4 for exposure requirements.

Note: Non-solar glass vehicles revert to regional requirement.

Table 4: Natural Weathering Exposure Requirement (Solar Glass)

Application	Temperature (°C)	Requirement (TNR kL)	Information Only
Carpet (Floor-Low Ultraviolet (UV))	85	15	-
Carpet (Floor-High UV)	102	105	-

Note: kL = kiloliters, TNR = Temperature Normalized Radiation.

3.3.3 Fiber Degradation (GMW3387). Perform fiber degradation before and after Xenon testing and natural weathering. A rating ≥ 8 is required.

3.3.4 Dye Migration (GMW14141). A rating ≥ 4 is required using the gray scale (ISO 105-A03) for staining.

3.3.5 Color Crock (ISO 105-A01). A rating ≥ 4 is required using the gray scale (ISO 105-A03) for staining. Use the "Round Finger" and ten (10) strokes (to and fro).

3.3.6 Water Spotting/Colorfastness to Water (GMW14102). Specimen size shall be 400 mm $\times$ 400 mm. Amount of water used shall be 50 ml. No penetration through the carpet when applying the water. No staining, ringing, haptic change or shrinkage allowed.

3.3.7 Cleanability and Soil Resistance (GMW3402). Perform soiling and cleaning of all soiling agents listed in GMW3402, Table 1 with the exception of Codes E and L. A rating ≥ 4 is required for each soil and cleaner. For the evaluations, use the gray scale ISO 105-A02 and/or ISO 105-A03.