

HEADLININGS, SUNSHADE AND PILLAR MATERIALS

GM2746M

1 SCOPE. This specification describes aesthetic fabrics suitable for trimming headlinings, sunshades, pillars, speaker grilles and other miscellaneous applications. The materials are made from synthetic fibrous textile materials and are either knit or nonwoven in construction. When laminated to foam, the foam should meet GM6083M.

NOTE: Some fabrics are designed for H/L application only and should not be used on the pillars. See NAO Color & Trim Engineer to define materials suitable for each application.

2 REFERENCED STANDARDS.

GM502M	GM9505P	ASTM D3884
GM1000M	GM9538P	ASTM D5034
GM6083M	GM9652P	ASTM D5587
GM9070P	GM9900P	ISO 25
GM9126P	AATCC 8	SAE J361
GM9133P	AATCC 107	SAE J1351
GM9200P	ASTM D751	SAE J1756
GM9231P	ASTM D1777	SAE J1767
GM9318P	ASTM D3774	SAE J1885
GM9452P	ASTM D3775	

3 REQUIREMENTS. Unless otherwise specified, the material shall be conditioned and tested under standard conditions of $21 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ RH. Condition materials until moisture equilibrium is reached. When 3 specimens are to be tested one shall be cut from one side of the sample, one from the center, and one from the opposite side.

3.1 COLOR AND PATTERN. The color and pattern shall be approved by the engineering department as an acceptable match to the engineering approval sample when viewed under conditions set forth in SAE J361.

3.2 DESIGN AND MANUFACTURE FOR THE ENVIRONMENT.

3.2.1 Restricted and Reportable Chemicals (GM1000M). All materials supplied to this specification must comply with the requirements listed in GM1000M, **Restricted and Reportable Chemicals**.

3.2.2 Recycling Guidelines (GM502M). Materials developed to this specification shall be optimized to provide maximum end-of-life cycle value utilizing the Recyclability Checklist and GM Recycling Design Guidelines. Recycled content shall be reported to the approving and procuring Materials Engineering departments utilizing the Recycled Content Report Form.

3.2.3 Lab Accreditation. Testing is to be performed by an accredited laboratory certified by GM or certified by an accrediting agency recognized by GM to ISO 25 or GM GP-10.

4 MATERIAL CONSTRUCTION. The following properties shall be specified by and conform to the appropriate Textile Engineering Construction specification issued by NAO Color & Trim Engineering.

4.1 COMPOSITION. Fiber content, back coating, dye type, substrate material (foam, knits, nonwoven), etc.

4.2 PRODUCTION. Machine type, machine setup, yarn construction, dye method, etc.

4.3 YARN COUNT (ASTM D3775). If applicable, the construction shall conform to the appropriate Textile Engineering Construction Specification with a wale and course count tolerance of $\pm 5\%$.

4.4 WEIGHT. Test 3 specimens, each 294 cm^2 . Weigh to the nearest 0.1 g. Multiply the weight by 33.9 and report the average in g/m^2 . Reference the Textile Engineering Construction Specification for appropriate weight and tolerance for each construction.

4.5 THICKNESS (ASTM D1777). Use a 25.4 mm or larger diameter pressure foot, 0.60 kPa (1.4 oz/inch²) load, reading taken after 5 s. Use a 200 mm (± 4 mm) foot diameter for foam laminates with 4 N preload. Define the overall finished product thickness. Take 3 measurements and report average and 3 sigma variations. Reference the Textile Engineering Construction Specification for appropriate thickness for each construction.

4.6 FOAM (GM6083M). The laminate shall be composed of an engineering approved foam per GM6083M. Foam thickness shall be specified on the Textile Engineering Construction Specification and detailed part drawings.

4.7 WIDTH (ASTM D3774). Refer to purchase order. A Textile Engineering Construction Specification must be submitted to NAO Color & Trim Engineering for all widths supplied.

5 PROPERTIES REQUIRED FOR PHYSICAL EVALUATION.

5.1 TENSILE STRENGTH AND ELONGATION (ASTM D5034, GRAB METHOD, CONDITIONED TESTING, CRE, 300 mm/minute). Test 3 specimens in the machine (wale) direction and 3 in the across machine (course) direction. Report individual test results. No individual test result shall be less than the minimum value required.

5.1.1 Tensile Strength. The tensile strength shall be 133 N minimum for knits and 310 N minimum for nonwovens. After the tensile values have been established for a specific fabric construction, they shall be specified on and conform to the Textile Engineering Construction Specification.

5.1.2 Elongation. The elongation shall be taken during the tensile test at a 25 N, 50 N, 100 N load and at break. Test in the warp/machine direction, course/across machine direction and both bias (45° angle to the warp/machine) directions. For

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foam laminated knits, the warp (wale) elongation, at a 50 N load, shall have a 16% minimum and the course a 30% minimum. For nonwoven constructions the machine direction elongation, at a 50 N load, shall have 8% minimum and the across machine a 12% minimum. Bias elongations and elongations at a 25 N and 50 N load and break will be reported for information only. Elongation values shall be specified on and conform to the Textile Engineering Construction Specification.

5.2 TEAR STRENGTH. Test 3 samples in the machine (wale) direction and 3 in the across machine (course) direction, as received only. Report the individual test results. No individual test result shall be less than the minimum value required.

NOTE: Some fabrics are designed for H/L application only and should not be used on the pillars. See NAO Color & Trim Engineer to define materials for each application.

5.2.1 Trapezoid Method (ASTM D5587, Condition 1, Option 1, CRE). The tear strength as received shall be 29 N minimum for knit headlining material, 36 N minimum for knit pillars material and 135 N minimum for nonwoven materials. After the trapezoid tear strength has been established for a specific fabric construction, it shall be specified on and conform to the Textile Engineering Construction Specification.

5.2.1.1 Tear Strength after Xenon Exposure. After exposure per 6.1 the tear strength shall be 9 N minimum for all material constructions and applications.

5.3 BOND STRENGTH (ASTM D751, 300 mm/minute).

5.3.1 Bilaminate (Nonwoven Backing). The bond strength shall be greater than the internal strength of the nonwoven. If a separation occurs in the nonwoven, the minimum internal strength shall be 30 N/25 mm width in both directions.

5.3.2 Bilaminate (Foam Backing). Bond strength shall be taken between fabric and foam after the following conditions. The bond strength shall meet the following requirements or there shall be a failure of the foam.

5.3.2.1 The foam used in a laminate construction must meet the requirements of GM6083M.

Condition	Fabric mm
As Received	3.0 N/25
Cycled Aged per GM9200P	3.0 N/25
Hydrolytic Stability per GM9231P	2.2 N/25
Xenon Exposure per 6.1	1.0 N/25

NOTE: Test 3 samples (side-center-side) in each direction. Record the average value. No individual test result shall be less than the minimum value required.

5.4 RESISTANCE TO WEAR - Taber Abrasion (ASTM D3884, H-38, 500 g weights, 300 cycles). A minimum of 3 specimens are to be tested. A rating based on the following scale of a 3 or greater is considered to meet this requirement.

A 5X or 10X lighted magnifying device should be used for evaluation. If material is used as a composite only, test as a composite that represents production intent; sun visor applications must be tested as material only.

5.4.1 Test Method Modification. Start with Section 6 in ASTM D3884.

5.4.1.1 Prior to cutting the specimens, apply a piece of double coated tape (3M #400) of a #36 mounting card to the back side of the material.

5.4.1.2 Using a circular die or scissors, cut the specimens 108 mm in diameter. A 7 mm hole must be cut in the exact center of the specimens. Do not fold the sample to cut the hole.

5.4.1.3 Mount the specimen as directed in Section 11 of ASTM D3884 with the exception of 11.3. The following shall be substituted: Place the test specimen face up on top of the rubber mat on the flat specimen holder. Secure the clamp plate and the knurled nut in place to hole the center of the specimen. Using scissors, cut around the edge of the specimen to remove any material that might extend over the edge. Place the outer clamp over the specimen, apply slight downward pressure and tighten. Under no circumstance is any of the material to extend over the edge and be held in place by the outer clamp.

5.4.2 Rating Scale.

- 5 – No change. No abrasion noticed.
- 4 – Slight change. Fluffy surface, slight fiber disturbance.
- 3 – Moderate change. Disturbance of surface yarns and fibers (bearding), slight nap distortion.
- 2 – Noticeable change. Abrasion of surface yarns and fibers, permanent distortion or reduction of napped surface.
- 1 – Severe change. Destructive abrasion of surface yarns and fibers or yarn breakage.

NOTE: Exclude 2 mm from the edges when rating the abrasion.

5.5 RESISTANCE TO ODOR (SAE J1351). This test is required for manufacturers whenever a new fiber, finishing agent, resin, backcoating, or combination thereof is introduced. Tested fabric shall have no offensive or objectionable odors with a maximum rating of a 3.

5.5.1 Evaluation. Replace 5.4 with: Remove the cans from the oven and allow to cool to room temperature for a minimum of 15 minutes. Raise the lid partially but do not remove it. With a cupped hand, draw the air from the can to the nose and slowly inhale. Immediately repeat the procedure for the first test specimen (dry) and record the appropriate rating listed in Section 6. Lids should not be raised longer than 5 s. Tests must be conducted in an environment free from drafts and contaminant odors.

5.6 DIMENSIONAL STABILITY (GM9452P). (WITH CONDITIONS OF GM9505P CYCLE M). For information only. Test after each condition measuring before and after ambient for 1 cycle only. Test high temperature @ 85°C.

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5.7 FLAMMABILITY (GM9070P). The material shall not burn or transmit a flame front across its surface at a rate greater than that specified in Table 1 of GM9070P, after the following conditions: as received, after accelerated aging (GM9200P). If a specimen has a designated burn rate of DNI, SE, or SE/NBR the resultant burn rate for use in Table 1 shall be 0. Test the required number of samples in both the warp (wale) and the filling (course) direction.

NOTE: If the material is a composite (as defined in the test procedure) or is to be used in a composite, the composite must meet this requirement.

5.8 CLEANABILITY (GM9126P, PROCEDURE A).
A minimum rating of satisfactory is required. Composite constructions shall retain their integrity and performance.

5.9 HYDROLYTIC STABILITY (GM9231P). Foam laminates *ONLY*. The sample shall show no signs of degradation.

5.10 FOGGING (SAE J1756). Photometric procedure: bath temperature of 85°C; cooling temperature of 38°C; 6 h test time; 16 h post conditioning time. The amount of fog when measured with a 60° glossmeter shall have a rating of 60 units or more. Samples that result in a residue that forms a transparent film, discernible droplets or any visual signs of crystallinity, shall be judged to have not passed this requirement. Evaluate the presence of crystallinity using 200X magnification and report the results, for information only. Test 9 samples for approval if initial test is less than 90 units.

5.11 ACOUSTICAL PERFORMANCE SOUND TRANSPARENCY. If applicable, fabric materials intended for use as a covering for an audio speaker must exhibit satisfactory audio test results as determined by a Delco Electronics Engineer per GM9318P. Any broad band deviation greater than 2/3 of an octave in band width, should not exceed 1.5 dB. Narrow band deviation, 2/3 of an octave or less in band width, should not exceed 3.0 dB.

5.12 RESISTANCE TO PILLING (GM9652P). A rating of 2 or greater for fabrics used in the 1998 model year and future.

5.13 RESISTANCE TO WICKING. For information only. Cut a 76 x 152 mm (3" x 6") sample in both the warp/machine direction and the course/cross machine direction. Mark a line 25 mm (1") from the edge, perpendicular to the long dimension, with an indelible marker. Dip the sample in distilled water up to the 25 mm line and leave in for 10 s. Lay the sample flat on the counter or table to dry. After the sample dries (approx. 1 h), measure how far the water wicked past the 25 mm line. If wicking has occurred, look for a stain at the top edge of the water line. Record the distance the sample wicked and the presents of a stain at the edge of the water line.

6 PROPERTIES REQUIRED FOR COLOR EVALUATION.

6.1 COLORFASTNESS TO LIGHT (SAE J1885).
Xenon arc apparatus.

6.1.1 Blue Wool and/or Polystyrene Reference Plastic are to be used to certify the running of the Xenon arc apparatus.

6.1.2 A noticeable on-tone fade as defined in the test method is acceptable after the following exposures. An AATCC Gray Scale rating of 3 may be used for guidance. The sample shall show no stiffness due to the coating/foam used (front and/or back).

Headlining and Sunshades 150.4 kJ/m²
Pillars 225.6 kJ/m²

NOTE: Some fabrics are designed for H/L application only and should not be used on the pillars. See NAO Color & Trim Engineer to define materials for each application.

6.1.3 Test all samples to both 150.4 kJ/m² and 225.6 kJ/m² exposure levels. For materials designed for H/L applications only, the 225.6 kJ/m² exposure will be for information.

6.1.4 Spectrophotometer Readings (SAE J1767). For information only. Measure and record the color change on a 0/45 or sphere (specular included) Spectrophotometer with a D65 light source and a 10° observer. Use the following difference values as guides:

ΔE..... less than or equal to 3 CIELAB units
ΔL..... less than or equal to 3 CIELAB units
ΔC less than or equal to 1 CIELAB unit
ΔH less than or equal to 0.5 CIELAB unit

6.1.5 At the discretion of the GM engineer, new constructions, colors or applications may be sent to Florida and/or Arizona and exposed to the Weathering Exposure Test for Interior Trims (GM9538P). Expose for the duration as specified by the GM Engineer.

6.2 COLOR CROCK (AATCC 8). When subjected to 10 strokes on the crockmeter, the material shall show a minimum rating of 3 when compared to the AATCC Chromatic Transference Scale.

6.3 DYE STABILITY (AATCC 107, 2 h @ 50°C).
The material shall have a minimum rating of 3 on the AATCC Chromatic Transference Scale using AATCC multifiber test fabric, Style 10 (edges cold cut only). If material does not pick up the specified regain, soak for 20 ± 5 minutes. Drying operation is optional (air or force dried).

6.4 RESISTANCE TO WATER SPOTTING AND FINISH DISTURBANCES (GM9133P). There shall be no change in the color or finish when subjected to 10 drops of distilled water.

6.5 CLEANING RESISTANCE OF CONSUMER PRODUCTS (GM9900P). Procedure A with a satisfaction rating of 3 or better on the AATCC Chromatic Transfer Scale.

6.6 MATERIAL CONSTRUCTION AND PHYSICAL EVALUATION PROPERTIES RETESTED FOR EACH COLOR. Reference the paragraph in the previous sections for information on testing for the following requirements.

6.6.1 Flammability. (5.7).

6.6.2 Cleanability. (5.8).

6.6.3 Resistance to Wicking. (5.13).