



Powertrain Compartment Acoustical Insulation Materials

1 Scope

This specification describes the requirements for an engine compartment sound absorber (ECSA) used for noise control in the engine compartment.

1.1 Material Description. Materials shall be identified by Types to identify material construction and properties.

1.2 Symbols. Not applicable.

1.3 Applicability. Where materials are required to control noise on the powertrain.

2 References

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

2.1 External Standards/Specifications.

ASTM C423	ASTM D3801	ISO 354	ISO 3386-1
ASTM D1117	ASTM D5034	ISO 845	SAE J1351
ASTM D3574	ASTM E1050	ISO 1798	UL 94
ASTM D3776			

2.2 GM Standards/Specifications.

GM9200P	GMW3259	GMW14334	GMW16750
GMW3059	GMW14124	GMW14729	GMW16955
GMW3232	GMW14194	GMW16522	

3 Requirements

3.1 Type A – Fiberglass ECSA. The fiberglass construction shall consist of:

3.1.1 Fiberglass insulation core (per GMW14194 Type 2).

3.1.1.1 Surface density. As low as possible to meet acoustic targets.

- Nominal: $810 \text{ g/m}^2 \pm 10\%$.
- Range: 610 g/m^2 to 1200 g/m^2 .
- Design value: As specified on engineering drawing.

3.1.1.2 Color. Black (or dark gray, as approved).

3.1.1.3 Thickness. As thick as possible within packaging constraints. See part drawing for specific geometry.

3.1.2 Facings (as Required for Appearance or Dust Irritant Control).

3.1.2.1 Material. Nonwoven polyester or polyester/rayon blend (per GMW16522).

3.1.2.2 Color. Black (or dark gray, as approved).

3.1.2.3 Surface Density. As low as possible to meet acoustic targets.

- Range: 36 g/m^2 to 68 g/m^2 as specified on engineering drawing.

3.1.3 Edge Treatments (as Required for Dust Irritant Control).

3.1.3.1 Compressed Edges. Compressed to a maximum thickness of 3 mm, unless specified otherwise.

3.1.3.2 Edge Trimming.

- Pinched edges, preferred when possible.
- Water-jet trimming, as required by geometric shape.

3.2 Type B – Polyester ECSA. This construction shall consist of 100% polyester fibers, in a cut to shape, sheet configuration having the properties:

3.2.1 Color. Black (or dark gray, as approved).

3.2.2 Surface Density (per ASTM D3776). As low as possible to meet acoustic targets.

- a. Nominal: $370 \text{ g/m}^2 \pm 10\%$.
- b. Range: 320 g/m^2 to 420 g/m^2 .
- c. Design value: As specified on drawing.

3.2.3 Thickness. Dependent on acoustical targets and packaging constraints.

3.2.4 Tensile Strength = 70 N minimum (machine and across machine direction) when tested per ASTM D5034 grab method, 305 mm/minute jaw speed.

3.2.5 Tear Strength = 125 N minimum (machine and across machine direction) when tested per ASTM D1117, trapezoid method.

3.3 Type C – Polyester-Moldable ECSA. This construction consists of a blend of several types of 100% thermoplastic polyester fibers having melt point differences which permit compression molding into parts with the properties:

3.3.1 Surface Density. As low as possible to meet acoustic targets.

- a. Nominal: $800 \text{ g/m}^2 \pm 10\%$.
- b. Range: 600 g/m^2 to 1000 g/m^2 .
- c. Design value: As specified on drawing.

3.3.2 Color. Black (or dark gray, as approved).

3.3.3 Thickness. As thick as possible within packaging constraints. See part drawing for specific geometry.

3.4 Type D – Shoddy ECSA. This construction consists of synthetic resin bonded textile fiber fleece, compression molded core with an upper and lower facing having the general properties:

3.4.1 Surface Density. As low as possible to meet acoustic targets.

- a. Nominal: $1250 \text{ g/m}^2 \pm 10\%$.
- b. Range: 1150 g/m^2 to 1350 g/m^2 .
- c. Design value: As specified on drawing.

3.4.2 Facings. As required for appearance or dust irritant control.

- a. Nonwoven polyamide 66, polyester or cellulose.

3.4.3 Color. Black on appearance side.

3.4.4 Edge Treatments. Trim edges heat sealed.

3.4.5 Thickness. As thick as possible within packaging constraints. See part drawing for specific geometry.

3.5 Type E – Blended Synthetic Fiber Insulator ECSA. This construction shall consist of a homogeneous mixture of synthetic fibers entangled or needled together into a random orientation. A sufficient percentage of thermoplastic fiber or thermo set resin is included in the blend to enable molding by a thermoforming process. A decorative facing may be required per the part drawing.

3.5.1 Surface Density. As low as possible to meet acoustic targets.

- a. Nominal: $1000 \text{ g/m}^2 \pm 10\%$.
- b. Range: 800 g/m^2 to 1200 g/m^2 .
- c. Design value: As specified on the part drawing.

3.5.2 Color. Black (or dark gray, as approved).

3.5.3 Thickness. As thick as possible within packaging constraints. See part drawing for specific geometry.

3.6 Type F – Sheet Polyurethane Foam for ECSA. This construction shall consist of polyurethane foam laminated on one or both surfaces with either an aluminum foil, scrim facing, or both.

3.6.1 Polyurethane Foam Tested per ASTM D3574.

- a. Density: As specified on part drawing, per acoustical noise requirements.

3.6.2 Facings.

- a. Material: Non-woven polyester or polyester/rayon blend (per GMW16522).
- b. Color: Black (or dark gray, as approved).

3.6.3 Aluminum Foil. Foil thickness to be called out on part drawing.

3.7 Type G – Cast Polyurethane Foam for ECSA. This construction shall consist of polyurethane foam that is cast (molded) into the desired geometry. Cast foam should be skinned on entire surface.

Cast polyurethane foam tested per GMW16750, Type 1.

3.7.1 Density. Cast foam with density $120 \text{ kg/m}^3 \pm 16 \text{ kg/m}^3$ or as low as possible to meet acoustical targets.

3.7.2 Mechanical Properties per ASTM D3574-E.

- a. Tensile strength at break: 150 kPa minimum.
- b. Tensile strength at break after heat aging for 1000 h at 120 °C: 80 kPa minimum.
- c. Elongation: 60% minimum.
- d. Tear Strength: 500 N/m minimum.

3.8 Type I – Melamine Foam for ECSA. This construction shall consist of melamine foam that is thermoformable into a desired geometry.

3.8.1 Density. Formable foam with a density of $10 \text{ kg/m}^3 \pm 3 \text{ kg/m}^3$ per ISO 845, or as low as possible to meet acoustical targets.

3.8.2 Mechanical Properties.

- a. Compressive Strength: Minimum 4 kPa per ISO 3386-1.
- b. Tensile Strength: Minimum 55 kPa per ISO 1798.
- c. Elongation at break: Minimum 10% per ISO 1798.

3.9 Acoustical Performance. The acoustic performance of the ECSA shall comply with Table 1 and Table 2. Sound absorption may be determined by either, ASTM E1050 Normal Incidence, or ASTM C423/ISO 354 Random Incidence as defined by part bulk area and packaging limited area thicknesses. (The intent of the "packaging limited" properties is to allow for local compression where necessary, due to packaging constraints, with limit on reduced acoustic.)

See Appendix A, Figure A1 for sound absorption curves.