



Specification for Acoustic Treatments Subsystem

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This standard establishes the common technical requirements and scope for the Acoustic Treatments subsystem for a General Motors vehicle. The common functions, performance, design constraints, reliability, and validation required of the subsystem are defined in this document. This specification becomes Statement of Requirements (SOR) Appendix C1 and Appendix B2 to a Statement of Requirements for an Acoustic Treatments Subsystem.

1.1.1 Program-specific requirements, and most importantly the Acoustic Treatments performance requirements, are now to be captured in a separate Statement of Requirements (SOR) Appendix C2 derived from a template titled Program Specific Acoustic Treatment Requirements.

1.2 Applicability. Acoustic components located at the passenger compartment, rear compartment, engine compartment and underbody.

2 References

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

2.1 External Standards/Specifications.

ASTM D5229	ISO 11469	SAE J1344
GB CNCA-C11-09 2014	ISO/TS 16949	

2.2 GM Standards/Specifications.

GMW3059	GMW14196	GMW15063	GMW16522
GMW3116	GMW14234	GMW15067	GMW16617
GMW3232	GMW14264	GMW15174	GMW16653
GMW3259	GMW14444	GMW15272	GMW16853
GMW3600	GMW14453	GMW15410	GMW16856
GMW8518	GMW14456	GMW15443	GMW17000
GMW14124	GMW14517	GMW15981	GMW17162
GMW14171	GMW14700	GMW16155	
GMW14194	GMW15010	GMW16331	

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2.3 Additional References.

- Acoustic Best Practice - ACOUST-15 located in Auros System.
- Acoustic Best Practices - COP ACOUST located in Auros System
- CG1942 – Acoustics VCRI SOR Appendix G3 Template
- Fender insulator best practice
- GM Corporate Bill of Process (BOP)
- Manufacturer's service manual diagnosis or repair procedure
- Part Recyclability/Recoverability Report Form
- Perceived Quality Best Practice BOAPQ-4
- Program Specific SOR Appendix A
- Statement of Requirements (SOR) Appendix B, SOR Appendix B2, SOR Appendix C1, SOR Appendix C2, and SOR Appendix J
- Statement of Requirements for an Acoustic Treatments Subsystem
- Subsystem Technical Specification (SSTS)
- Technical Material Specifications (TMS)
- Vehicle Technical Specification (VTS)

3 Requirements

3.1 System/Subsystem/Component/Part Definition. The Acoustic Treatments subsystem consists of components added to provide the noise control treatment of the vehicle. Examples include insulators such as the sound barrier assembly and absorbers, sealing patches, and discrete vibration-damping pads (deadeners) applied in the body shop, paint shop or general assembly. Many similar components may be present as part of interior trim assemblies (examples include sound absorbers bonded to the B-side of a plastic garnish part), but these are included with their subsystem, not in the Acoustic Treatments subsystem. Spray or extrusion-applied Noise, Vibration and Harshness (NVH) treatments are not part of this subsystem.

3.1.1 Appearance. The appearance of any visible portion of the subsystem shall be consistent with the general theme of the interior trim and surrounding area of the car.

3.1.1.1 Specific Acoustic Treatment appearance requirements are:

3.1.1.1.1 Passenger compartment treatment parts shall not be visible to the vehicle occupants, unless they are covered with a generic black scrim or painted in generic black color, and approved by the perceived Quality Engineer.

3.1.1.1.2 When viewing the luggage compartment, acoustic treatments shall not be seen, unless they are covered with a generic black scrim or painted in generic black color, and approved by the perceived Quality Engineer.

3.1.1.1.3 Engine compartment treatments, fender to cowl seals, and any other treatments that are seen by customers shall be of a generic black color and approved by the perceived Quality Engineer.

3.1.1.2 Alignment.

3.1.1.2.1 Hood insulator and fender insulator gap and joint designs shall conceal any misalignments. These parts shall fit in such a way that there are no gaps or uneven joints exceeding those stipulated in the Perceived Quality Best Practice BOAPQ-4. (The supplier shall work with the GM responsible engineer to comprehend this requirement).

3.1.1.2.2 All visible components shall have design features to encourage correct alignment of adjacent parts.

3.1.1.3 Light Emission through Holes and Gaps. There shall be no light leakage.

3.1.2 Content. The specific required physical content for the acoustic treatments subsystem is identified in SOR Appendix B, and any exception to that content is specified within the SOR Appendix C2 Document, Program Specific Acoustic Treatment Requirements. SOR Appendix C2 also includes the expected performance values and performance expectations for the program specific acoustic content.

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3.1.2.1 Physical Content. All acoustic materials shall meet environmental requirements as specified in GMW14124, testing cycle according to the location of the acoustic part in the vehicle.

3.1.2.2 Functional Content. Not applicable.

3.1.3 Ambient Environment. The subsystem shall meet all ambient environment requirements of the VTS.

3.1.3.1 Chemical Exposure. Tests shall be made according to the applicable material specification documents.

3.1.4 Interfaces. Requirements for interfaces with other vehicle subsystems are defined in the following paragraphs.

3.1.4.1 Acoustic Treatments to Powertrain and Chassis.

3.1.4.1.1 Treatments shall not physically interfere with the powertrain and its accessories during vehicle shipping or operation (e.g., throttle control cable).

3.1.4.1.2 Treatments, including the engine-side dash treatment and interior dash mat, shall not interfere with the driver's necessary hand or foot control action.

3.1.4.1.3 The treatments shall provide required clearance to mounting and routing of wire harnesses.

3.1.4.1.4 Engine compartment and interior compartment acoustic treatments shall provide required clearance or minimum overlap for mounting and pass-through of powertrain and chassis components at dash areas, and shall minimize the negative impact in the acoustic performance.

3.1.4.1.5 Acoustic treatments shall maintain adequate clearance to the powertrain components and packaging as referenced in Acoustic Best Practices. (The supplier shall work with the GM responsible engineer to comprehend this requirement).

3.1.4.2 Acoustic Treatments to Heating, Ventilation and Air Conditioning (HVAC) and Powertrain Cooling.

3.1.4.2.1 Engine-side and interior acoustic treatments shall provide required clearance or minimum overlap for mounting and pass-through of HVAC and Powertrain Cooling components, and shall minimize the negative impact in the acoustic performance.

3.1.4.3 Acoustic Treatments to Instrument Panel (IP) and Console.

3.1.4.3.1 The dash mat shall provide required clearance for installation and mounting of the instrument panel assembly according to the best practices. (The supplier shall work with the GM responsible engineer to comprehend this requirement).

3.1.4.3.2 Hush Panels, if employed, shall maximize the coverage between the front of dash and the bottom of the IP so as to support the noise control function of the dash mat and other treatments.

3.1.4.3.3 The floor console shall have sealing, absorption, and barrier features so as to provide insulation performance equal to the surrounding floor trim.

3.1.4.4 Acoustic Treatments to Quarter/Garnish Trim.

3.1.4.4.1 Treatments shall be designed to help achieve optimum noise control of interior trim.

3.1.4.4.2 Packaging space for acoustic treatments shall be established behind quarter/garnish trim, consistent with sight line and styling requirements. However, interior spaciousness shall not be compromised just to maintain an uninterrupted treatment.

3.1.4.5 Acoustic Treatments to Floor Trim.

3.1.4.5.1 The floor carpet with its attached acoustic treatment shall provide uninterrupted insulation and overlap at its joining to the dash mat according to the Best Practice ACOUST-15 located in Auros System. (The supplier shall work with the GM responsible engineer to comprehend this requirement).

3.1.4.5.2 The floor carpet trim line shall be configured to support noise control by maximizing within the carpet blank size the area covering the body structure.

3.1.4.6 Acoustic Treatments to Roof Trim. Headliner substrates must be designed to be air permeable with optimized flow resistance for sound absorption. They must also accommodate added absorption pads attached to their top surface as part of their subsystem.

3.1.4.7 Acoustic Treatments to Seat Belts.

3.1.4.7.1 Treatments shall not interfere with function of seat belt systems.

3.1.4.7.2 The seat belt trim openings shall be configured to aid the acoustic treatments in minimizing acoustic deficiencies where belts pass through trim surfaces.

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3.1.4.8 Acoustic Treatments to Body Structure and Closures.

3.1.4.8.1 The shape of the treatment shall fit the shape of the sheet metal.

3.1.4.8.2 The subsystem shall prevent exposed sheet metal from being observed by the vehicle occupants and prevent undesirable noises from entering the passenger compartment that could affect negatively the overall acoustic performance of the vehicle.

3.1.4.8.3 Secondary acoustic sealing of pass-through shall be provided by the design of the subsystem.

3.1.4.8.4 Body-in-white, doors, hoods, tailgates and end gates shall provide packaging space, including adequate clearance, for installation of acoustic treatments, but interior spaciousness shall not be compromised just to maintain uninterrupted treatment.

3.1.4.8.5 The fender to cowl seal (insulation- rear fender) shall seal to the fender and the body structure and shall not interfere with door hinge action.

3.1.4.9 Acoustic Treatments to Electrical. Cables shall be adequately located and restrained so as not to cause appearance issues by displacing treatment or trim parts.

3.1.4.10 Squeak and Rattle Avoidance. The squeak and rattle requirement for the Acoustic Treatments is defined in the Vehicle Technical Specification and will be validated at the vehicle level per GMW8518.

3.1.5 Usage Definition. The Acoustic Treatments subsystem is an acoustic and vibration treatment of the vehicle interior, luggage, and engine compartments. The function of the Acoustic Treatments subsystem is to filter noise and damp vibration inputs to the vehicle body to help achieve the desired interior noise levels and sound quality expressed by the Voice of the Customer, as captured in engineering terms in the Vehicle Technical Specification (VTS). The subsystem shall assist to:

3.1.5.1 Provide good sound comfort, for the occupants of the vehicle.

3.1.5.2 Insulate engine, road, and wind noise.

3.1.5.3 Absorb noise inside the passenger and engine compartment. The absorbers in the engine compartment shall also take part in decreasing the external noise (pass-by noise).

The Acoustic Treatment subsystem and associated components should be designed to collaborate in the reduction of the overall vehicle interior noise. These subsystems and components are not intended to provide and/or support additional functions such as:

- Thermal management
- Water management
- Support to surrounding elements
- Beauty/appearance covers
- Protection of surrounding components, etc.

Applications of Acoustic Treatment subsystems and components not aligned with the function to reduce interior noise should be discussed and approved by the GM Bill of Material (BOM) Family Owner and Global Subsystem Leadership Team chair.

The Acoustic Treatment subsystem will include features and additional content to enable self-protection of acoustic components against thermal, water and environmental inputs.

3.2 Product Characteristics. The required product characteristics for the Acoustic Treatments subsystem are identified in the following paragraphs. They may also be noted in the part drawings.

Note: Low mass, high acoustic property materials shall be considered for new programs. These include the dissipative systems that replace heavy layers with one or more layers of low mass, controlled flow resistance materials, available from several manufacturers.

Note: Heavy layer systems should be used only where there is an important commercial or performance advantage.

3.2.1 Performance Requirements. Acoustical Performance: The interior noise performance requirements for the various elements of Acoustic Treatment subsystem are specified in SOR Appendix C2, Program Specific Acoustic Treatment Requirements.

3.2.1.1 The engine compartment treatment shall be designed to support meeting the vehicle pass-by noise requirements of the VTS.

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