



Specification for the Door Trim 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 document establishes the requirements for door trim subsystems used in General Motors (GM) vehicles. All requirements in this standard apply to each unique swing door trim subsystem or component design and interface. Lift gate trim, side sliding door trim, fixed rear quarter trim and window frame garnish moldings are outside the scope of this document. The required functions, performance, appearance, design constraints, and validation of the door trim subsystem and their components are defined by this document.

Certain sections or paragraphs are broad in scope as this document must cover many different constructions, design concepts, and content levels to meet the needs for the full range of GM vehicles. The user must follow the specific Vehicle Technical Specification (VTS) when developing the actual specification. Those portions of this template that are not applicable because of the previously described variations are to be identified or revised in the Statement of Requirements (SOR) Appendix C2 to fit the exact needs for the door trim.

1.2 Applicability. This specification addresses the front and rear swing door trim for the vehicle models listed in Appendix B of the SOR.

1.3 Remarks. The door trim subsystem provides an attractive appearance for the occupants of the vehicle thereby contributing to customer perception of the vehicle. The door trim subsystem also assists in occupant crash protection and structural support for other components.

2 References

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

2.1 External Standards/Specifications.

96/27/EC	CNCA-02C-060: 2005	ISO 11469	U.S. Side NCAP
2000/53/EC	Euro NCAP	ISO/TS 16949	UN R 21.01
CMVSS 201	FMVSS 118	KMVSS 100	UN R 95.03
CMVSS 214	FMVSS 201	SAE J361	
CMVSS 302	FMVSS 214	SAE J941	
CNCA-02C-023: 2008	FMVSS 302	SAE J1885	

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2.2 GM Standards/Specifications.

GM9538P	GMW7699	GMW14233	GMW15589
GMW3059	GMW8518	GMW14234	GMW15783
GMW3116	GMW14011	GMW14264	GMW15862
GMW3118	GMW14089	GMW14444	GMW15987
GMW3172	GMW14109	GMW14454	GMW15996
GMW3232	GMW14118	GMW14573	GMW16331
GMW3402	GMW14149	GMW14576	GMW16334
GMW6992	GMW14188	GMW15049	GMW16586
GMW7293	GMW14223	GMW15272	
GMW7294	GMW14231	GMW15350	

2.3 Additional References.

- Best Practices. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.
- CG1945. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.
- CG2503. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.
- China Compulsory Certification mark and report.
- Dimensional Technical Specification (DTS).
- Door Trim Knowledge Set.
- Dynamic Side Impact Layout (program specific).
- Engineering drawing.
- GM Automotive Regulation Information Database.
(<https://businessconnect.gm.com/sites/ARID/SitePages/Home.aspx>)
- GM Global Fastener Catalog.
- GP-11 in GM Supply Power. (<https://gmsupplypower.covisint.com/web/portal/home>)
- Human Factors Design Objectives.
- Interior Fittings Guidelines.
- Material Compatibility Matrix (See Program Squeak and Rattle Engineer).
- Material Isolation Guide (See Program Squeak and Rattle Engineer). The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.
- Owner's Manual.
- Production Part Approval Process (PPAP) standards.
- Program engineering work order.
- Program Fastener List.
- Program Storage Tracker or Storage Allocation List (SAL) for General Motors Europe (GME) is documented in the Program Notebook and Program Product Content (PPC) SharePoint site.
(https://businessconnect.gm.com/sites/PPCPNB_SiteLinks/SitePages/Home.aspx)
- Service Manual.
- SOR Appendix A.
- SOR Appendix B.
- SOR Appendix C2.
- SOR Appendix E1.
- SOR Appendix F3.

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- SOR Appendix F4.
- SOR Appendix F5.
- SOR Appendix F10.
- SOR Appendix F11.
- SOR Appendix F12.
- SOR Appendix G2.
- SOR Appendix H.
- Squeak and Rattle Checklist (See Program Squeak and Rattle Engineer).
- Technical specification(s).
- Test plan.
- Validation Plan.
- Vehicle Technical Specification (VTS).

3 Requirements

3.1 Door Trim Definition. The door trim subsystem is used to position and support components of other vehicle subsystems for the comfort, convenience, and protection of vehicle occupants.

3.1.1 Appearance. SOR Appendices F4 and F5 define the program grain, color, and gloss requirements. Visual evaluations of the door trim appearance to be conducted per GMW6992.

3.1.1.1 Nap Crush. Door trim fabrics shall not exhibit objectionable nap crush.

Note: Most cloth materials are susceptible to nap crush and should not be wrapped over high traffic/occupant interaction areas, e.g., belt line or armrest.

3.1.2 Content.

3.1.2.1 Physical Content. Refer to the vehicle specific VTS for the door trim content and the SOR Appendix B for a detailed list of the new, corporate common, and carryover components as well as the commonization constraints.

3.1.2.2 Functional Content. The door trim is to provide the functions shown in Table 1.

Table 1: Functional Content

1	The door trim shall cover the inner door panel.
2	The door trim shall provide a pleasing appearance inside the passenger compartment.
3	The door trim should comply with the Human Factors Design Objectives (HFDO) for comfort and convenience.
4	The door trim shall maintain appearance, shape, color, texture, fit, and alignment over the target life of the vehicle.
5	The door trim shall provide useable storage areas as defined by the vehicle program.
6	The door trim shall assist in occupant energy management.
7	The door trim shall contribute in reducing exterior noise transmission to the vehicle's interior.
8	The door trim shall provide structural support for attaching decorative trim, speaker grilles, and other subsystem components such as switches, the inside release handle assembly, and interior lighting.
9	The door trim shall comply with all applicable government regulations.
10	The door trim shall support the design theme.
11	The door trim shall support product differentiation for brand characteristics.
12	The door trim shall comply with side impact air bag deployment requirements.

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3.1.3 Ambient Environment. The door trim shall meet the performance requirements identified in this specification while operating in the environmental conditions listed in this document, the VTS and all referenced test standards.

3.1.3.1 Operational Temperature. The operational temperature ranges for the door trim subsystem and components are identified in Table 2.

For some performance requirements, other environmental conditions can be appropriate, based on 95th percentile historic data for a given component within the subsystem. These variances shall be noted within the technical specification(s) and/or Appendix C2 of the SOR.

Table 2: Operational Temperature Ranges

Element	Low	Normal	High
Door Trim Top Surface Tinted Glass	-30 °C	+23 °C	+95 °C
Door Trim Top Surface Absorbing Glass	-30 °C	+23 °C	+85 °C
Door Trim Vertical Surface Tinted Glass	-30 °C	+23 °C	+85 °C
Door Trim Vertical Surface Absorbing Glass	-30 °C	+23 °C	+75 °C
Door Trim Armrest Surface Tinted Glass	-30 °C	+23 °C	+95 °C
Door Trim Armrest Surface Absorbing Glass	-30 °C	+23 °C	+85 °C
Door Trim Lower Surface Tinted Glass	-30 °C	+23 °C	+75 °C
Door Trim Lower Surface Absorbing Glass	-30 °C	+23 °C	+70 °C
Relative Humidity (RH) ^{Note 1}	0%	(10 to 80)%	100%

Note 1: Relative Humidity (RH) percentage varies with temperature.

3.1.3.2 Shipping and Storage Environment. The anticipated shipping and storage conditions relative to temperature and humidity are: (90 to -40) °C for Temperature Range and 95% RH maximum.

Note: These are shipping conditions, which are unique and could be more severe than the environment inside a vehicle. These conditions must be anticipated and designed for when designing door trim and when designing shipping containers.

3.1.4 Interfaces. The doors trim interfaces with the following Vehicle Part Partitioning Systems (VPPS):

- Front and Rear Heating, Ventilating and Air Conditioning (HVAC) Airflow (30.02, 30.03).
- Decorative Trim (40).
- Instrument Panel (40.01).
- Seats (40.02).
- Garnish Trim (40.03.01).
- Interior Lighting (40.04).
- Acoustic Treatment (40.05).
- Safety Belt (40.06).
- Airbag Module (40.07).
- Body Side Closures (55.01).
- Front and Rear Window Molding (55.01.01, 55.01.02).
- Inside Release Handle (55.01.01.04.03, 55.01.02.04.03).
- Window and Guidance (55.01.01.05, 55.01.02.05).
- Weatherstrip (55.01.01.06.01, 55.01.02.06.01).

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- Rear View Mirror (55.04).
- Exterior Paint (60).
- Information and Controls (70).
- Electrical Function (80).

Environmental operating conditions, occupants, governmental regulations, and the ability to manufacture, assemble, and service the door trim define the requirements for the door trim, their components, and the interfaces that locate, mount, and establish the clearance to other subsystems or components. These interfaces are numerous and vary by program. The Appendix A of the SOR shall establish that all interfaces are identified, developed, documented, agreed to, and validated for the specific vehicle.

3.1.5 Usage Definition.

3.1.5.1 Subsystem User Description. The door trim subsystem is to be designed so that the adult 5th percentile female through the 95th percentile male, unless otherwise noted in the VTS, can see and use the controls and features in an effective manner while in their normal seated positions.

3.2 Product Characteristics.

3.2.1 Performance Requirements.

3.2.1.1 Government Regulations. The door trim subsystem and components must comply with the latest government regulations in the country of sale listed in the GM Automotive Regulation Information Database and in Appendix C2 of the SOR.

Note: All door trim subsystems and components must comply with European governmental regulation UN R 21.01, Interior Fittings, regardless of country of sale.

3.2.1.1.1 Assist in Occupant Energy Management. The door subsystem along with the door trim shall be designed to assist in managing the energy associated with a side impact collision as defined in FMVSS 214, CMVSS 214, UN R 95.03, and 96/27/EC. The requirements to be fulfilled during and after side impact are shown in Table 3.

Note: For program specific requirements, refer to Appendix C2 of the SOR.

Table 3: Requirements to be Fulfilled During and After Side Impact

1	In the thorax and pelvic impact zones, the door trim shall be energy absorbing.
2	During the force application of the side airbag to the door trim, no separation of the door trim elements is allowed. In particular, the door trim should not splinter or break.
3	During the side impact crash configuration, the door trim shall assist the deployment of the side airbag by a compliant material, a deployment passage and the prevention of protruding edges even during crash conditions.
4	No complete or partial detaching nor splintering or breaking of the door trim or of parts of the door trim should occur during all test configurations defined in this specification and Appendix C2.

3.2.1.1.2 Occupant Protection in Interior Impact. The door trim shall comply with all applicable sections of FMVSS 201, CMVSS 201, and KMVSS 100.

Note: All door trim compartment latches must comply with FMVSS 201 and CMVSS 201 latch requirements.

3.2.1.1.3 Zone Crush Requirements. The door trim should comply with the requirements shown in Table 4 when tested per the procedure shown in Appendix C2 of the SOR.

Note: For Supplier Integration (SI) Level III programs, the door trim supplier is responsible for conducting the testing under the supervision of the GM Safety Engineer. For SI Level I programs, the GM Safety Engineer is responsible for conducting the testing.

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Table 4: Zone Crush Requirements

Thorax Impact Zone Crush Requirements	
1	Any local trim attachments should be outside the thorax zone as defined by the Dynamic Side Impact layout or managed through crush initiators.
2	Other local hard spots - pull handles, etc., should be outside the occupant zones defined in the Dynamic Side Impact layout. If not, then the object should have the following force versus deflection profile: 2.0 kN peak load over the total amount of crush.
3	The total amount of crush is defined as 50% of the initial dimension from the door sheet metal inner (inboard side) to the inboard surface of the door trim (i.e., a-surface) in the thorax zone.
Pelvic Impact Zone Crush Requirements	
4	Any local trim attachments should be outside the pelvic zone as defined by the Dynamic Side Impact layout or managed through crush initiators.
5	Other local hard spots - pull handles, etc., should be outside the occupant zones defined in the Dynamic Side Impact layout. If not, then the object should have the following force versus deflection profile: 2.0 kN peak load over the total amount of crush.
6	The total amount of crush is defined as 50% of the initial dimension from the door sheet metal inner (inboard side) to the inboard surface of the door trim (i.e., a-surface) in the pelvic zone.

3.2.1.1.4 China Compulsory Compliance. The door trim subsystem and components shall comply with the requirements of Certification Accreditation Administration of the People's Republic of China CNCA-02C-023: 2008 and CNCA-02C-060: 2005 for all parts that will be exported to or sold in the China market. The supplier is responsible for the China Compulsory Certification mark and report. The China Compulsory Certification report shall be submitted on time.

3.2.1.2 VTS Requirements. The door trim shall comply with all applicable requirements in the program VTS.

3.2.1.3 Subsystem Performance Requirements. The door trim shall meet all of the subsystem performance requirements of GMW14109.

3.2.1.3.1 Reduce Exterior Noise Transmission to Interior. The door trim is to contribute to satisfying the vehicle interior noise level requirements.

The Sound Power Based Insertion Loss (PBIL) of the door trim, including all added acoustic treatments, shall meet or exceed the values shown in Appendix C2 of the SOR, as defined in GMW14223, and measured in a test fixture for the door trim as defined by the Global Noise and Vibration Center. Contact the GM Global Noise and Vibration Center (NVC) for clarification.

Note: The PBIL requirement values for front and rear doors may differ.

3.2.1.3.2 Squeak and Rattle. The door trim shall have a minimum rating of 8, using GMW7294, when it is in tested under the conditions shown in Table 5.

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Table 5: Squeak and Rattle Conditions

No.	Condition	Mounting
1	Opening and closing the door.	In Vehicle
2	Opening and closing the window.	In Vehicle
3	When the door trim is pressed, especially in areas that contact sheet metal.	In Vehicle
4	When the engine is running or when driving on expressways, federal roads and cobble stones, e.g., Milford Proving Grounds Belgian Blocks, Dudenhofen Test Center Rheinstraße, or equivalent.	In Vehicle
5	When tested according to GMW7699 for audio system excitation.	In Vehicle
6	When tested according to GMW8518 for vehicle level performance.	In Vehicle

No. Number.

3.2.1.3.2.1 Subsystem Level Requirements. Two parts should be tested and measured in the order outlined in Table 6 using only the vertical acceleration vibration input frequencies and amplitudes defined in Table 7 (fore-aft and lateral acceleration is not required). Each part is to be mounted to a door-in-white with all of its noises isolated prior to door trim attachment in order to limit any contribution from the door-in-white system.

Table 6: Squeak and Rattle Testing

No.	Requirement
1	The test sample is to be set up for objective measurements and evaluated as specified in GMW14011.
2	Test the sample per GMW14188 to 25% of the full cycle described in the specification at (+23 ± 3) °C.
3	Evaluate the test sample as specified in GMW14011.

Table 7: Vibration Table

Vertical Acceleration		Fore-aft Acceleration		Lateral Acceleration	
Frequency Hertz (Hz)	Acceleration ((m/s ²) ² /Hz)	Frequency (Hz)	Acceleration ((m/s ²) ² /Hz)	Frequency (Hz)	Acceleration ((m/s ²) ² /Hz)
8	0.57463	8	0.30035	8	0.32951
10	2.30976	12	1.37810	9	0.33846
12	2.48289	13	0.56837	11	1.48204
19	0.30401	25	0.25820	14	0.29140
23	0.51005	29	0.04687	20	0.21749
34	0.12915	36	0.16139	42	0.13483
65	0.02213	56	0.01905	55	0.03734
100	0.00289	76	0.00847	100	0.00933
-	-	100	0.00447	-	-
m/s ² RMS	4.54	m/s ² RMS	3.35	m/s ² RMS	3.33

RMS = Root mean square.

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At the end of the test and measurement sequence outlined in Table 5, the door trim subsystem shall have a Zwicker Loudness of less than the target shown in Table 7A. The following guidelines are to be used for documenting issues:

- **Sone readings lower than target.** Document in the test report. No Problem Resolution and Tracking System (PRTS) report is to be issued for these items.
- **Sone readings greater than target.** Complete a root cause analysis on each issue exceeding the target. Root cause analysis is completed by isolating the various components and sources of noise until a sone reading of the target or lower is achieved. A PRTS is to be issued for each issue exceeding the target with the root cause. A PRTS without a root cause will be rejected because the testing is incomplete.

Note: It is recommended that a follow-up evaluation be performed on one part with remediation completed to ensure that the issues are closed.

Table 7A: GMW14011 Performance Requirements

Vehicle Acoustic Performance Level	Requirement
A	4.0 sones N10 (90 th percentile)
B	5.5 sones N10 (90 th percentile)
C	7.0 sones N10 (90 th percentile)
D	7.0 sones N10 (90 th percentile)

3.2.1.3.2.2 Degradation. For subjective degradation evaluation, the door trim subsystem shall have a minimum subjective rating of 8.0, using GMW14264, as explained in GMW7293 when tested per GMW14188 using the vibration input frequencies and amplitudes defined in Table 7.

3.2.1.4 Component Performance Requirements. The following components shall meet all of the performance requirements of GMW14109:

- Armrest.
- Courtesy Lamp.
- Fasteners.
- Pull Handle/Pull Cup.
- Storage Compartments.
- Switch Module.
- Switch Plate.

3.2.1.4.1 Ashtray. The preferred locations for ashtrays are the instrument panel and the console. Door mounted ash trays are not recommended.

If a program team selects to release a door mounted ashtray, the requirements for the ashtray, its mounting, and all surrounding materials, under the test conditions defined in GMW16334, are specified in Table 8.

Table 8: Ashtray Performance Requirements

No.	Requirement
1	An ashtray fire shall not ignite the door trim and/or surrounding components, while closed or in any open position.
2	A fire in an open ashtray may result in evident flame damage, but shall not propagate flame damage to the passenger compartment, door trim or adjacent components.
3	An ashtray fire shall not cause heat-induced drippings or burning material to fall from the door trim onto the floor.

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3.2.1.4.2 Decorative Trim. The decorative trim and its attachments to the door trim shall meet the applicable performance requirements of GMW15783.

3.2.1.4.3 Inside Release Handle. The inside release handle attachments to the door trim shall meet all of the performance requirements provided in Appendix C2 of the SOR.

3.2.1.4.4 Interior Lighting. Interior lighting should meet the requirements of GMW14118.

3.2.1.4.4.1 Light Bleed. While shining, no light bleed of the interior lighting is permitted.

3.2.1.4.5 Speaker Grille. The speaker grille shall meet the applicable performance requirements of GMW16586.

3.2.1.4.5.1 Add-on speaker grilles shall not rattle when subjected to the frequency range specified by the GM Audio Engineer, when tested in the door trim.

3.2.1.4.6 Storage Compartments. The door trim storage compartments shall retain the items listed in Appendix C2 of the SOR and in the Human Vehicle Integration (HVI) Program Storage Tracker throughout the normal operating conditions of the vehicle.

3.2.1.4.6.1 Covered/Articulating Storage Compartments. The door trim covered/articulating storage compartments shall comply with the requirements specified in Table 9.

Table 9: Covered/Articulating Storage Compartment Requirements

No.	Requirement
1	Articulating primary storage compartments shall fulfill the requirements listed in Appendix C2 of the SOR.
2	Covered/articulating secondary storage compartments shall fulfill the applicable requirements of GMW14576.
Closing Sound Quality Requirements	
1	Covered/articulating storage compartment closing sound shall consist of one perceivable impact sound of short duration rather than an initially perceived impact sound followed by rebound sounds and/or ringing sounds or rattles.
2	The closing sound spectral content is to be biased toward low frequency.
3	The storage compartment closing sound shall have a rating ≥ 8 per GMW14264 when evaluated per GMW14233.

3.2.1.4.7 Sunshade. The sunshade and its attachments to the door trim shall meet the requirements of GMW14454. Section 4.6 (Test During Driving Operation) of GMW14454 states the test is to be performed at a speed of V_{max} . V_{max} is the maximum speed of the vehicle and is provided in the VTS. If the VTS does not specify a maximum speed, the test shall be performed at a speed of 129 km/h (80 mph).

3.2.1.4.8 Switches. The GM Electrical Subject Matter Team (SMT) shall have all switches validated to GMW3172 prior to release for packaging in the door trim.

3.2.1.4.8.1 Switch Interface to Trim (Process Verification (PV) Confirmation). The interface between the door trim and any electrical switch mounted to the door trim shall comply with the requirements of GMW15987. The interface between the door trim and any electrical switches mounted to the door trim shall comply with the requirements of GMW15996 (FMVSS 118 prevention of inadvertent activation of switches).

Note: This is a PV requirement that will be evaluated under the supervision of the GM Supplier Quality organization as part of the Production Part Approval Process (PPAP).

3.2.1.4.9 Trim Mounted Reflectors. A trim mounted reflector, when present, shall meet the reflectivity and location requirements in the program VTS.

3.2.1.5 Natural Frequency. The door trim shall have sufficient attachments and subsystem stiffness to assure that the local and global resonant frequency of the door trim subsystem is at least 35 Hz.

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