General Motors Corporation Worldwide

433 Roof Trim
Appendix C "Lean"
Global Subsystem Technical Specification
Template

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Template Change Log

This change log lists all approved changes implemented in this document since the last published version. For the original release of the document, the change log is empty.

	Description of Change	Approval Date	Approver	Requestor	Revision Level
Initial Release	Created Lean GSSTS C1	9/8/2005	GSSLT	G Lambert	Initial Release

Program Specific Change Log

This change log lists all approved changes for the program specific appendix C2. Note the original release date.

Paragraph Affected	Description of Change	Approval Date	Approver	Requestor	Revision Level

1 INTRODUCTION

1.1 Scope of Document

The Roof Trim Subsystem Technical Specification is a General Motors Global Document. All requirements herein shall be adhered to as GM Global Requirements for the Roof Trim Subsystem except where noted for specific GM Programs .

This Specification establishes performance requirements, design constraints, and validation requirements for a Roof Trim Subsystem

The ADV plan shall be complete "per appendix G2 requirements," and any new SSTS updates at IVER MRD be included in the DRBFM and/or peer reviews, with validation considerations considered in that process, and effected via EWO for program specific SSTS updating (The program team shall contact the Global Interior Center to ensure the latest SSTS Templates are being used).

1.2 Mission / Theme

The main purpose of the Roof Trim Subsystem is to provide a decorative, acoustic, and functional trim covering of the underside of the vehicle's roof. The Roof Trim Subsystem also provides packaging provisions for all other functional or decorative elements in this region of the vehicle interior (i.e., coat hook, head impact foam, air ducts, controls, display, etc.)

1.3 Classification

The Roof Trim Subsystem is listed under the following UPC, FNA and BOM nomenclature.

UPC = 1C3M
FNA = 0049A
Panel -HDLING TR FIN ASM
BOM Row = 40.3:03
Roof Trim Row

2 APPLICABLE DOCUMENTS

Only the latest approved standards are applicable unless otherwise specified.

2.1 Order of Precedence

In case of a conflict between the text of this specification and the documents cited herein, the text of this specification takes precedence. Nothing in this specification supersedes applicable laws and regulations unless specific exemptions are obtained.

2.2 Government Documents

The following Government documents are sources of requirements in this specification. For each country, see appendix C2.

FMVSS 225 ECE R21
FMVSS 302

2.2.1 United States

The following United States industry documents are sources of requirements in this specification.

2.2.1.1 FMVSS 201U Occupant Protection in Interior Impacts

2.2.1.2 FMVSS 201 Occupant Protection/Sunvisor Requirements

2.2.1.3 FMVSS 208 Occupant Crash Protection

2.2.1.4 FMVSS 302 Flammability of Interior Materials

2.2.1.5 FMVSS 575 Customer Information

2.2.1.6 FMVSS 107 Reflecting Surfaces

2.2.1.7 FMVSS 101 Controls and Displays

2.2.2 Canada

The following Canada documents are sources of requirements in this specification.

2.2.2.1 CMVSS 201 Occupant Protection in Interior Impacts

2.2.2.2 CMVSS 208 Occupant Crash Protection

2.2.2.3 CMVSS 302 Flammability of Interior Materials

2.2.2.4 74/60/*78/632 Interior fittings

2.2.2.5 92/59*92/59 General Product Safety

2.2.2.6 96/79 Frontal impact

2.2.2.7 96/27/ Side impact

2.2.2.8 97/358 End of Life Vehicle

2.2.3 UN Economic Commission for Europe (ECE)

The following ECE documents are sources of requirements in this specification.

2.2.3.1 ECE R21.02 Interior Fittings

2.2.3.2 ECE R94.01 Frontal Impact

2.2.3.3 ECE R95.01 Side Impact

2.2.3.4

2.3 General Motors Documents

The following General Motors documents are sources of requirements in this specification

2.3.1 GMW3116, Recyclability, Recovery Guidelines

2.3.2 GMW3059, Restricted and Reportable Substance for Parts

2.3.3 GM1391, Production Part Approval Process, General Motors Operating Policy

2.3.4 GM2617M, Interior Trim Parts Performance

2.3.5 GM2736M, Unsupported Plastic Rolled Goods

2.3.6 GM2745M, One Piece Headlining Construction

2.3.7 GM2746M, Headlining, Sunvisor and Pillar Materials
2.3.8 GM3602M, Adhesion Requirements of Bonded Interior Assemblies
2.3.9 GM9032P, Test for Determining Impact Strength of Plastics
2.3.10 GM9070P, Procedure for Testing Flammability of Materials
2.3.11 GM9128P, Mildew Growth
2.3.12 GM9209P, Trimethylamine in Fiberglass Parts
2.3.13 GM9231P, Hydrolytic Stability
2.3.14 GM9505P, Automotive Environmental Cycles
2.3.15 GM9684P, Serviceability Design Guidelines
2.3.16 GMW 7293 TP, Component/System Squeak and Rattle Test
2.3.17 GMN 5160 TP Squeak and Rattle Degradation
2.3.18 GMUTS R-15-99, Durability Test Schedules
2.3.19 GM Bill of Process 32206 Overhead System
2.3.20 CM 20104, Interior Lighting SSTS (BOM Row 40.4)
2.3.21 EICC 80.201.01 Power and Signal Distribution SSTS
2.3.22 GME 60 261 Flammability
2.3.23 GME L-1B1203 Durability Test Sunvisor
2.3.24 GMI 01117 Sun Visor
2.3.25 GMI 01118 Roof Handle
2.3.26 GMI 01122 Headliner Assembly
2.3.27 GMI R-1C06-1 Determination of Deformation of Molded Roof Lining

2.4 Other Documents

2.4.1 GMW3172 Electrical specification of electronic modules, switches etc**.**

2.4.2 Industry Documents

The following industry documents are sources of requirements in this specification.

2.4.2.1 AIAG QS-9000 Quality System Requirements
2.4.2.2 AIAG Procedure Production Part Approval Process
2.4.2.3 ASTM C384 Standard Test Method for Impedance and Absorption of Acoustic Materials by the impedance Tube Method.
2.4.2.4 ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
2.4.2.5 ASTM C522 Standard Method of Test for Airflow Resistance of Acoustical Material.
2.4.2.6 ASTM C1036 Standard Specification for Flat Glass
2.4.2.7 ASTM D790 Standard Test Method for Flexural Properties of Un-reienforced and Reinforced Plastic and Electrical Insulating Materials
2.4.2.8 ASTM E1050 Test Method for Impedance and Absorption of Acoustical Materials Using a Tube, Two Microphones, and Digital Frequency Analysis System
2.4.2.9 ISO 11469 Marking of Plastic Parts
2.4.2.10 SAE J36 Procedure for Visual Evaluation of Interior and Exterior automotive Trim
2.4.2.11 SAE J883 Test Method for Determining Dimensional Stability of Automotive Textile Materials
2.4.2.12 SAE J964 Light Reflectivity
2.4.2.13 SAE J1351 Hot Odor Test for Insulation Material
2.4.2.14 SAE J1756 Test Procedure to Determine the Fogging Characteristics of Interior Automotive Materials
2.4.2.15 SAE J1885 Accelerated Exposure of Automotive Interior Trim Components Using a controlled Irradiance, Water Cooled, Xenon Arc Apparatus

3 REQUIREMENTS

The use of “shall” in this document denotes a binding provision that must be adhered to. “Should” denotes a preference or desired conformance, which if not adhered to, must be documented and disclosed to General Motors. Unless otherwise noted, all requirements apply over the conditions and useful life as described herein. General Motors shall be the final arbiter of performance if the requirements stated herein are not objectively defined. The design and opinion of the Roof Trim Subsystem must be in accordance with the application regulations of Section 2.2.

3.1 Subsystem Definition

The Roof Trim Subsystem (RTS) for a vehicle interior is defined as the headliner substrate assembly including all of the trim components, which are located within its envelope. The (RTS) shall cover the BIW Upper Inner Structure, and give an integrated impression and convey a quality image. The components in the (RTS) includes all fasteners, visor assemblies, coat

hooks, head impact provisions and an array of features (See Table 1) for comfort, convenience, stowage, communication, controls, entertainment, etc. The headliner substrate assembly covers the vehicle's roof underside while enhancing the vehicle's interior appearance and acoustical characteristics. In some applications, this panel also may be required to provide structural reinforcement to the roof panel of the vehicle.

An illustration of entities that have a major influence on the functionality, design and/or implementation of the Roof Trim Subsystem/ are shown in the Functional Context diagram Figure 1. A Roof Trim Subsystem may be complete, with fasteners, and ready for assembly into the vehicle as a self-contained unit and also integrate functional aspects such as air distribution ducts and wire harness routing. The large size of some assemblies imparts constraints related to handling, prior to and during the vehicle assembly process.

The subsystem, headliner and associated parts support safety requirements for interior occupant impact and field of vision.

A Roof Trim Subsystem Usage is defined in the following:

The range of physical dimensions of the user population for which the Roof Trim Subsystem requirements herein apply are bounded by the 5th percentile female and the 95th percentile male.

All parts and features of the Roof Trim Subsystem with user functions shall have a location, accessibility, shape etc. of high ergonomic standard. The ergonomic requirements are judgment by GM.

Additional regional requirements are as follows:

3.1.1 Roof Trim Appearance and Interface

The color, pattern, aesthetics and other related qualities shall be evaluated and approved by the responsible engineering department as an acceptable match to the engineering approval sample when viewed under conditions set forth in GMW6992.

A headliner that has a knit fabric with 3 mm foam shall provide a minimum 2 mm foam after headliner processing in order to provide a pleasing feel and close out potential gaps to adjacent components.

All visible headliner trim edges shall be aesthetically concealed. The following conditions shall not be visible from a normal standing or sitting position, inside or outside of the vehicle.

- Pin holes
- flow lines
- cracks
- discoloring
- sink marks
- tool parting lines
- cut edges
- blisters
- intake point
- varnish burrs
- flashes
- frayed material

3.1.1.1

3.1.1.1 Haptics (Tactile Feel)
The haptic characteristics of release (cover, button or grip) shall be evaluated subjectively**.**
The following ratings are required during evaluation according to GMN7000:

3.1.1.2 Haptics: Rating 7

3.1.2 Content

The Roof Trim Subsystem physical and functional content is identified in the following paragraphs.

3.1.2.1 Physical Content
Reference Appendix 'B' in the Program Statement of Requirements for Roof Trim content.

3.1.2.2 Functional Content
The Roof Trim Subsystem should provide the following basic functions:

An aesthetic appearance that covers the sheet metal and is in harmony with the rest of the vehicle interior.

Acoustic absorption for vehicle interior noise control.

A secure and stable position for all components, which are functional to the occupants.

Kinetic energy absorption to satisfy MVSS201U Head Impact requirements.

A soft feel (tactility) for intentional and unintentional vehicle occupant contacts.

Color fastness, indentation recovery, durability, cleanability, resistance to environmental influences, and retention of physical and structural integrity.

Allow for roof rail air bag (RRAB) deployments.

A means for providing illumination of the interior for entry, exit and/or reading. (Lighting function)

Structural reinforcement of the vehicle roof panel (in some application)

Vibration damping of the vehicle roof panel (in some applications).

A controllable means of blocking the suns rays (Sun visor function).

A means for retaining garments, garment rods and hangers (Coat hook function).

A means of assisting occupants with vehicle entry and exit and providing stability (Assist Handle function).

3.1.3 Ambient Environment

Reference VTS for Ambient environment

3.1.4 Interfaces

The following paragraphs identify the interfaces and associated requirements that the Roof Trim Subsystem has with other entities.

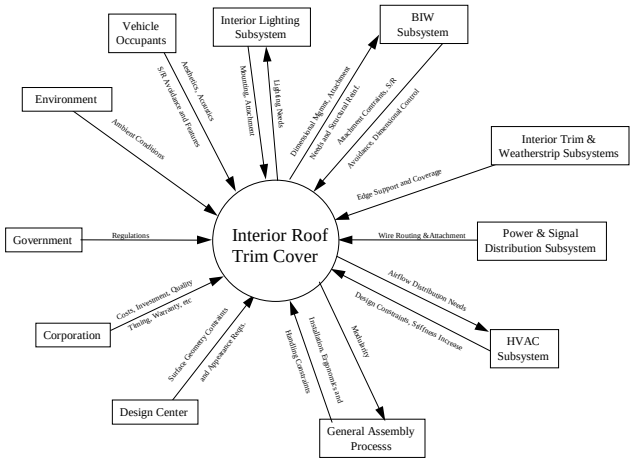


Figure 3.1.4 Roof Trim System - Functional Context Diagram

3.1.4.1 External-To-Vehicle to Subsystem: General Assembly Process Vehicle Assembly Process imposes product requirements for the Roof Trim Subsystem.

3.1.4.1.1 Modularity: Component Retention to Substrate

The extent of modularity is program and/or region specific. When modularity is required all components, accessories, wiring, fasteners, etc. which comprise this subsystem shall be securely retained to the substrate in such a manner as to withstand the rigors of shipping and the vehicle assembly process.

3.1.4.1.2 Roof Trim Subsystem Mechanical Integrity during Assembly

The Roof Trim Subsystem shall have sufficient stiffness to permit handling without folding during installation and sufficient toughness and resiliency to avoid any noticeable crease lines/marks after installation is complete. Program-specific assembly procedures apply.

3.1.4.1.3 Ergonomics During Assembly

The Roof Trim Subsystem shall meet all GM Ergonomic Guidelines (i.e. Weight, fastener insertion force, etc.) for installation.

3.1.4.1.4 Appearance of RTS from external to Vehicle

All visible headliner edges of the RTS that are or may become visible from outside the vehicle shall be aesthetically covered.

3.1.4.2 Subsystem to Subsystem

The following describe interfaces between the Roof Trim Subsystem and other subsystems with which it has a physical or functional relationship.

3.1.4.2.1 Roof Trim Best Practices

The Roof Trim Subsystem shall conform to the Roof Trim Best Practices for detailed subsystem-to-subsystem design interfaces. The best practices such as headliner to: weather-strip, garnish, sunroof, etc., can be found on the Best Practices website.

3.1.4.2.2 Safety Management

3.1.4.2.2.1 Head Impact

The Roof Trim Subsystem shall include energy absorbing features that contribute to vehicle-level compliance to the requirements of FMVSS 201U. The Roof Trim Subsystem shall be designed to meet all applicable Best Practices included in the FMVSS 201U Knowledge Set.

The Roof Trim Subsystem shall incorporate added component energy absorbing countermeasures as required to meet the head impact performance requirements specified below. Countermeasures shall be consistently applied between FMVSS 201U target points where the head has a likelihood of impacting, except where engineering analysis determines that they are not necessary.

In the initial design of the Roof Trim Subsystem, added component countermeasures shall be restricted to those listed in Best Practice # 109393, or its most recent successor. Deviations from this Best Practice require the approval of the engineer responsible for FMVSS 201U on the program. If mathematical simulation or testing shows that these countermeasures do not meet the performance requirements of this paragraph, then different or additional countermeasures shall be incorporated as required. All countermeasures must meet the requirements of the Materials Specification GMN8351.

The Roof Trim Subsystem shall be designed to meet the requirements of FMVSS 201U with a margin of performance that allows for manufacturing variation in the Subsystem and in the vehicle. Head impact performance requirements to be met at the analysis, development, and validation phases of the vehicle program are listed in Best Practice # 109237 or its most recent successor. Deviations from this Best Practice require the approval of the engineer responsible for FMVSS 201U on the program.

3.1.4.2.2.2 Roof Rail Airbag

For all vehicles, which incorporate Roof Rail Air Bags (RRAB), the following requirements apply:

The RTS shall provide all necessary requirements and accommodations for the Roof Rail Airbag by providing a deployment opening, and otherwise performing as further indicated in this section.

Note: A general enabler to RRAB deployment is lower cut line in the RTS/Garnish Trim interface resulting in deeper RTS sections near the pillars. This may require different substrate, tooling and/or processing than past practices.

Attachments/Anchors: The RTS shall have sufficient points of attachment to withstand the deployment loads of the RRAB without substantially dislodging from design position excepting the surfaces immediately over and outboard of the RRAB. The number and location of added fasteners will vary depending on included hard fastening points (Coat hook, etc.) and deployment forces imparted to the RTS.

Deployment: The RTS will flex as necessary to meet the RRAB deployment requirements. The interfaces with Garnish and the RTS substrate structural/mechanical properties shall meet the deployment mode requirements by flexing as necessary. It may be necessary to add stiffeners, scoring and/or a formed “bend-line” etc. in the B-surface to retard/promote bending during deployment. The RTS hinge or fold line shall be defined thereby, and be generally reproducible;

Labels: All vehicles that include RRAB(s) shall incorporated permanent identification using the word **“AIRBAG”**.

The following applies:

Permanently locate the identification immediately adjacent to the pillar top or along the rail out of which the RRAB deploys.

The identification shall be of sufficient size and contrast to be easily visible by vehicle occupants.

In vehicles with RRAB standard (100% content) the **“AIRBAG”** label may be molded into the Garnish Trim. Any implementation in the RTS should be coordinated with the Garnish Trim per the overall vehicle program requirements.

The RTS shall not delay airbag deployment greater than 5 milliseconds (as measured without trim) through temperature ranges of -30°C +85°C. The opening kinematics of the RRAB shall not be prevented or unduly disturbed by the RTS.

Note: The Root Cause of any delay in the RRAB deployment greater than 5 milliseconds should established as RTS, Garnish Trim or interaction(s) prior to incorporating changes to the design.

Any components or fragments of the

RTS that partially or fully separate from the subsystem (through fracture or dislodging) shall be evaluated for functional deficiency or injury potential to the occupant during the Roof Rail Airbag (RRAB) deployment through temperature ranges of -30°C +85°C. Any component that diminishes the function of the RRAB or is judged to have injury potential shall be corrected.

The RTS shall not damage the RRAB itself during deployment.

The RTS shall not present sharp or rough edges that may cut or snag the RRAB during deployment.

The RTS shall not prevent the RRAB from meeting the deployment requirements as specified in GMW 3121 'Roof Rail Airbag Modules, Requirements' and GMW 3118 'Verification of Requirements for Side/Roof Rail Airbag Modules' as furnished by the Occupant Restraints DRE and/or Validation Engineer (or functional equivalent). The RTS shall not prevent the RRAB from meeting the occupant performance requirements of the GM Bluebook as published at the time of vehicle program sourcing.

For System Validation with Environmentally conditioned components, aging of the RTS shall be completed according to RTS SSTS, aging of the RRAB shall be completed according to the RRAB SSTS. System testing shall be completed according to RRAB validation specification.

3.1.4.2.2.3 FMVSS 208 Accommodation

The Sunvisor Assembly shall meet the label and position requirements as written in FMVSS208 when applicable.

The Sunvisor Assembly in the stowed position shall provide clearance to the 50% occupant crash projectile under the conditions stated in FMVSS 208.

3.2 Product Characteristics

This section describes the Roof Trim Subsystem in terms of performance, reliability, durability, maintenance, service, repair, and user vehicle requirements. The RTS shall satisfy all requirements, in this section, under the ambient environmental conditions and any additional conditions, which are indicated herein.

3.2.1 Performance Requirements

The following paragraphs specify the functional performance requirements for the Roof Trim Subsystem. The subsystem is to perform as specified prior to and after exposure to durability and environmental conditioning as designated.

In addition to the requirements stated in this document, all components, parts, pieces, fasteners or materials used in this subsystem shall comply with any

applicable standards as set forth in the GM Material Standards. When applicable, subjective judgments shall be made by GM Engineering, unless otherwise stated.

The functional performance of components shall comply with the following:

No signs of fracturing or loosening of attachments, squeaks or other noises shall not constitute a failure at temperature extremes (-30C to 85C) provided they abate during normal operating range (-20°C to 60°C).

3.2.1.1 Human Vehicle Interface

The following Roof Trim components and interfaces shall comply with the Human Factors Design Objectives (HFDOs) specified in the table below, which can be located on the GM HVI Socrates Website at http://gmna1.gm.com/vp/vapi/hhf/hfdo/.

Component/Subsystem	Section in HFDO	Includes (but not limited to)
Sunvisors	Interior Section I – Roof and Headers	Hand clearances to trim, reach curve, efforts, grasp widths, etc.
Vanity Mirrors	Interior Section I – Roof and Headers	Hand clearances to trim, reach curve, efforts, grasp widths, etc.
Coat Hooks (Garment Hooks)	Interior Section I – Roof and Headers	Hand clearances to trim, reach curve, efforts, grasp widths, etc.
Assist Handles	Interior Section I – Roof and Headers	Hand clearances to trim, reach curve, efforts, grasp widths, etc.
Overhead Reach Comfort Zones	Interior Section I – Roof and Headers	Reach limits to controls
Sunroof Sunshade	Interior Section I – Roof and Headers	Hand clearances to trim, reach curve, efforts, grasp widths, etc.
Power Sunroof Control	Interior Section I – Roof and Headers	Hand clearances to trim, reach curve, efforts, grasp widths, etc
General Hand Controls	Controls Section U – Remote Releases	Hand clearances to trim, control sizes, efforts, etc.

3.2.1.2 Interior Fittings

The Roof Trim shall meet Export ECE

R21 and MVSS201 requirements for all countries that a vehicle is being exported to per program.

3.2.1.3 Squeak & Rattle Requirement
Subsystem Level (Roof Trim) Stand-alone Subsystem / Component

The requirement is to have absolutely no customer annoyance due to squeaks and rattles. The final authority for the determination of whether a noise is objectionable lies with the Buyer Lead Engineer and/or the Squeak and Rattle (S&R) Engineer. Squeaks and rattles include, but are not limited to all the noises described in the "Squeak & Rattle Noise Glossary".

3.2.1.3.1 Supplier Responsibility
The Supplier is to accept full responsibility to produce squeak and rattle free, subsystems and/or components. They shall cooperate with Buyer and/or other suppliers to assure that no squeak and rattle annoyance occurs at the interface of their subsystem/component to the body, chassis or other subsystem / component. If an objectionable noise is found during any phase of the program, it will be the supplier's responsibility, with Buyer cooperation, to eliminate the noise and demonstrate resolution in a vehicle prior to exiting the program phase. If the noise is found in pilot or production, the supplier will be responsible to develop a containment plan (and fix), as well a short and long term solutions, as appropriate. Any issue raised during these processes, which is demonstrated to be the responsibility of the supplier, shall be corrected with urgency at no additional cost to GM. The Supplier will be responsible for the Squeak & Rattle performance of their subsystem.

(Stakeholders: OC Noise and Vibration, 40.03 Modular Roof Trim)

3.2.1.3.2 Objective Measurement
All configurations and operating positions of the Sunvisors shall have an Instationary Zwicker Loudness of less than or equal to 4 sones N10 when evaluated in the Vertical, Fore-aft, and Lateral directions per the test procedure GMW 14011 Subsystem/Component Squeak and Rattle Test using the vibration input frequencies and amplitudes defined in the following tables.

Sun Visor and Overhead Console

Vertical Acceleration

Frequency (Hertz)	Acceleration $((m/s^2)^2/Hz)$
8	0.16599
11	1.04536
21	0.11826
34	0.18290
41	0.22629
58	0.15900
73	0.04505
87	0.01344
100	0.00100
m/s^2 RMS	3.69

Sun Visor and Overhead Console

Fore-aft Acceleration

Frequency (Hertz)	Acceleration $((m/s^2)^2/Hz)$
8	0.08333
11	0.87711
14	0.35816
18	0.36575
26	0.04060
36	0.08272
57	0.04109
73	0.01320
100	0.00014
m/s^2 RMS	2.77

Sun Visor and Overhead Console

Lateral Acceleration

Frequency (Hertz)	Acceleration $((m/s^2)^2/Hz)$
8	0.25561
10	0.51494
12	0.58321
23	0.13719
38	0.06653
56	0.03428
73	0.01906
100	0.00018
m/s^2 RMS	2.80

3.2.1.3.3 Subjective Rating (except “US Only” programs)

The subjective rating of the S&R performance of the Sunvisors contains the following elements:
rate S&R performance of the subsystem/component in all configurations and conditions according to GMW 7293 TP
rate S&R performance during adjusting/operating subsystem/component according to GMW 8518
rate S&R performance during hand impacts, hand flexures and passenger motion where the customer would normally interface with the subsystem/component, and in a manner consistent with expected average customer behaviour.

The minimum subjective rating under all conditions for any individual complaint and the overall rating for the subsystem determined according to GMW 7294 is 8.0.

3.2.1.3.4 Subsystem in the Integration Environment (Interfaces)

The requirement for this program is to have absolutely no customer annoyance due to squeaks and rattles. The final authority for the determination of whether a noise is objectionable lies with the Buyer Lead Engineer and/or the Squeak

and Rattle (S&R) Engineer. Squeaks and rattles include, but are not limited to all the noises described in the "Squeak & Rattle Noise Glossary". The Supplier is to accept full responsibility to produce squeak and rattle free, "as delivered", subsystems and/or components, as defined by functional requirements in the Subsystem and/or Component Technical Specifications (see appendix). They shall also cooperate with Buyer and/or other suppliers to assure that no squeak and rattle annoyance occurs at the interface of their subsystem/component to the body, chassis or other subsystem / component. If an objectionable noise is found during any phase of the program, it will be the supplier's responsibility, with Buyer cooperation, to eliminate the noise and demonstrate resolution in a vehicle prior to exiting the program phase. If the noise is found in pilot or production, the supplier will be responsible to develop a containment plan (and fix), as well a short and long term solutions, as appropriate. Any issue raised during these processes, which is demonstrated to be the responsibility of the supplier, shall be corrected with urgency at no additional cost to GM. The Supplier will be responsible for the Squeak & Rattle performance of their subsystem.

(Stakeholders: OC Noise and Vibration, 40.03 Modular Roof Trim)

3.2.1.4 Headliner Substrate Structure, and Mechanical Integrity
The Roof Trim Subsystem shall withstand either fixture loading and/or manual handling within the program specific shipping; handling and assembly parameters without exceeding substrate yield point (i.e. folding).

3.2.1.5 Component Positional / Structural Integrity
The positional/structural integrity and operation of all functional components shall be achieved without perceived deflection of component of Headlining Assembly.

Functional components shall not allow the following:

Deflection of more than 3 mm when a 50 N force is applied normal to the surface at any location on the component.

Deflection of more than 6 mm when a 100 N force is applied normal to the surface at any location on the component.

Note: A ***functional component*** is one where the driver/passenger will perform some action to or have some interaction with, (i.e., pushing switches, accessing storage compartments, operating doors, pulling handles, etc).This requirement also applies to bezels/housings supporting these functional components..

3.2.1.6 Environmental Cycling and Heat Aging
The Roof Trim Subsystem, as installed in

a vehicle or roof, shall undergo the following two environmental cycle tests:

3.2.1.6.1.1 Environmental Cycling
All Components of the Roof Trim System, as installed in a vehicle, shall undergo the environmental cycle tests as called out in GMW14124, § 5.5.8 (test cycle H).

Cycle H is described as follows:

Environmental: Seven cycles, run consecutively, of temperature and humidity defined

5.5 hrs @ 85C

2.5 hrs ramp

5.5 hrs @ -30C

2.5 hrs ramp

5.5 hrs @ 38C/95%RH

3.2.1.6.1.2 Heat Soak
A heat soak cycle of 168 hrs at 85C on a separate part to the above environmental cycles.

The RTS shall not exhibit delamination, odor, staining, color, gloss or other appearance change or dimensional variance, unless otherwise specified. All components of the RTS shall perform as specified prior to and after being subjected to the **above mentioned environmental and heat soak cycles**.

Other exceptions to cycle 'H' requirement is as follows:

The headliner sag requirements after environmental cycling are as follows:

Sunroof vehicles shall have maximum 1 mm sag @ sun roof opening

Passenger Cars: max 3 mm at any point with no visible remaining deformation even if < 3mm

Trucks/SUV:

3mm @ perimeter and 10 mm @ center of headliner/vehicle.

The 10 mm sag shall be gradual along the surface and will not visibly show any noticeable surface deformations.

3.2.1.6.1.3 RRAB Heat Aging
The environmental and heat soak test in 3.3.1.1.8.1 shall be run for aging the RTS for RRAB deployments

3.2.1.7 Fogging
The Roof Trim System shall meet GMW3235: Requirements: minimum 90% refection at 90ºC for textile and maximum 2mg at 100ºC for plastics.

3.2.1.8 Flammability
The subsystem and its components, shall satisfy the burn resistance requirements of the following:

Shall comply with FMVSS302, CMVSS302 (Canada - where applicable) and TRIAS 48 (Japan - where applicable) according to GMW3232.

3.2.1.9 Color fastness to Light
The subsystem components shall exhibit not more than a noticeable change of hue, color, tone, brightness, saturation or purity when subjected to:

Cycle is ISO 105-B06 rating ≤3 stained light withdraw permissible. (Check rating scale for correct reading.)

3.2.1.10 Dust
The headliner substrate material shall be compressed laterally to protect the glass fiber material from dust out, i.e. during installation (such as weather-strips around door openings and sunroof areas**.)** GM Manufacturing shall make dust out approval.

3.2.1.11 Mildew Resistance
All Roof Trim System moisture absorbing components shall not exhibit mildew growth when subjected to GMW3259

3.2.1.12 Cold Impact Resistance
All roof trim components shall withstand an impact of 2.5 J by a 50 mm ball at -30°C using test method GMI60267 without fracture or loss of function.

3.2.1.12.1 Odor
All Roof Trim materials shall meet requirements as specified in GMW3205.

The following tests are required if the presence of trimethyl-amine and or formaldehyde is anticipated or found in materials. The substrate shall contain less than 1ppm of tri-methyl-amine and less than 60 ppm of formaldehyde, as evaluated per GM9209P and GM9629P.

The substrate shall contain less than 1ppm of tri-methyl-amine and less than 10ppm of formaldehyde, as evaluated per GM9209P.

3.2.1.13 Indentation Recovery
a) Point load: The surface of the headlining assembly shall recover 100% within 17 hours after being subjected to an applied force of 22 N for 5 minutes with a 12 mm ball at room temperature

b) Surface load: The surface of the headlining assembly shall recover completely within 17 hours after being subjected to 3 KPa (7.5N) over a 2500mm^2 area for 1 hour at room temperature per GM2745M.

3.2.1.14 Bond Strength

All Roof Trim components shall meet the minimum peel strength of 525N/m, or

cohesive failure of one or both of the adherends.
Test procedure according to GMW3220. Run the test as received, and within 60 seconds after removal from each of the environments in GMW14124 test cycle H, 7 cycles, for a total of 7 peels.

3.2.1.15 Abrasion, Resistance to Wear
Fabrics: 300 cycles according to GMW 3023. Rating 6 min

3.2.1.16 Textile Parts
Textile parts must comply with the requirements in GMW3220

3.2.1.17 Hydrolytic Stability
All Components of the Roof Trim assembly shall show no sign of hydrolytic degradation when subjected to the conditions defined by the following procedure with no failure: (typically applies to components made of urethane foams)

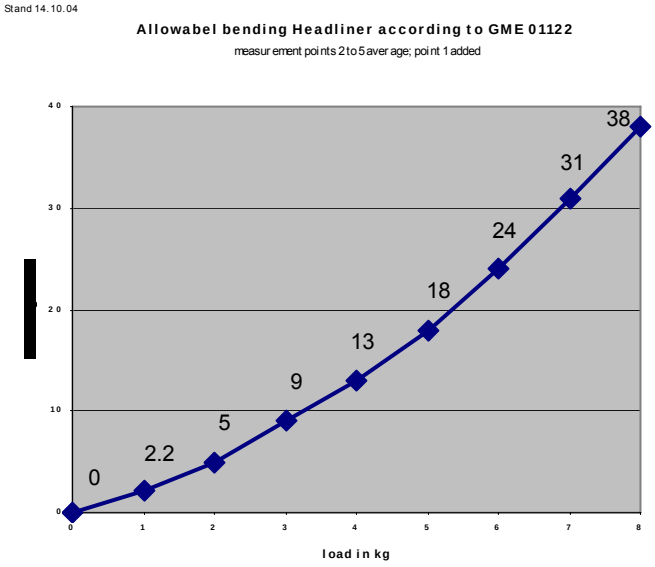
Procedure: GMW14124 - **Cycle Q or T**

3.2.1.18 Components

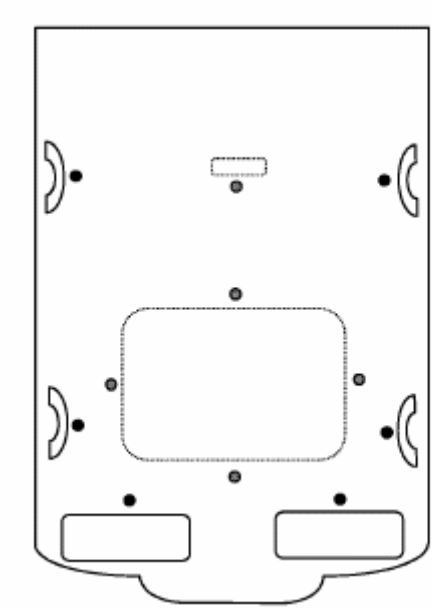
The following paragraphs describe requirements of the specific, discrete components and assemblies that in total, constitute the Roof Trim Subsystem.
Headlining Assembly

3.2.1.18.1 Rigidity Concentrated Load
The Headliner, at the specified measuring points, shall not sag more than 6 mm under a 30 N Force over a Ø20mm diameter at room temperature.

3.2.1.18.2 Rigidity distributed load / Static stiffness test
The Headliner shall perform to the following force/deflection curve as described in the test procedure GME01122 (Test is conducted on a full headliner as designed in body position):



Position of Measuring Points:



On the underside of the headliner, a gauge is positioned at each of the measuring points. The measuring direction is vertical.

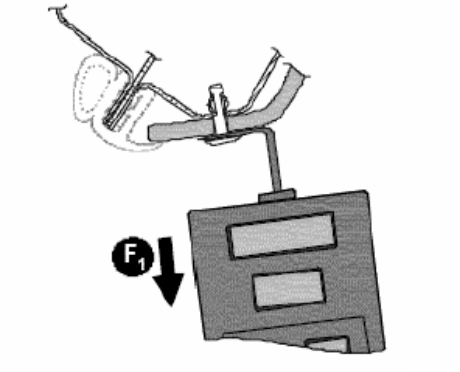
Dents in the headliner shall be prevented by protecting the contact surface of the gauge on the headliner with a plastic plate. For measuring purposes, a plastic plate with a diameter of 170 mm and a thickness of 3 mm shall be laid on the upper side of the headliner, at measuring points. The weights shall be laid on this plate.) Reference GME 0122 paragraph 4.9.2.1 for test procedure and additional information.)

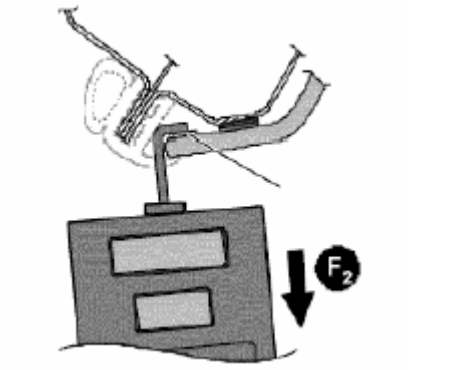
3.2.1.18.3 Headliner Fasteners

3.2.1.18.3.1 Holding Force (clips / duo lock / magnets)

The holding force for all headliner fasteners shall be 60N ± 5N. (Force is applied normal to surface as shown in the following figures)

Reference Test Procedure GME 0122 paragraph 4.5.2.





3.2.1.18.3.2 Durability Retaining Force

Fastener Durability shall be F=m/clips + 20%. Durability cycles for fasteners is measured directly on the fastener as

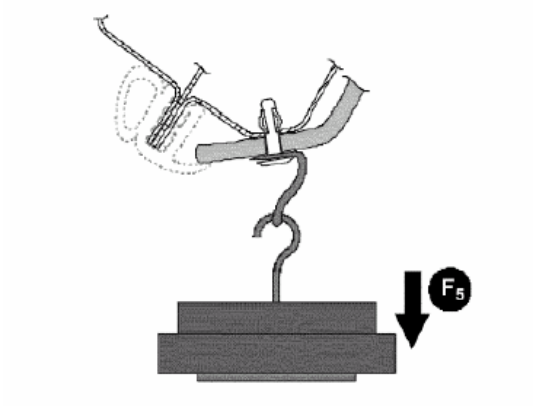
shown for the following temperature cycles:

23°C ± 5°C Screening Test

80°C ± 3°C 90%RH

-30ºC ± 3°C

Above test are to be conducted 5 days for each temperature (120 hours each test).



$$F = \frac{Weight\ of\ Headliner}{Number\ of\ Fasteners} + 20\%$$

3.2.1.18.4 Pressure Differential Deflection

(Regional Test for Opel Only)

The headliner shall perform to GMI R-1C06-1, which states the following maximum deflection during driving with windows open:

<10mm @ < 160km/h

<14mm @ >160km/h

(Reference specification GMI R-1C06-1 for Opel only.)

3.2.1.18.5 Acoustic Performance

3.2.1.18.5.1 Permeability Performance Requirements

3.2.1.18.5.2 Headliner Assembly

The headliner assembly (substrate and fabric) shall have a flow resistivity (inverse of permeability) of 1500 +/- 500 RAYLS. Permeability specifications shall be provided for all headliners submitted for quotes and prior to sourcing of the headliner and/or roof trim system.

Initial formed part measurements for performance check (permeability) shall be performed on a molded part at IVER and results submitted to PDT/VIA; validation shall be completed by Validation Test Complete milestone.

3.2.1.18.5.3 Acoustic Performance Requirements

The headliner assembly shall provide the required acoustic requirements as indicated below from the headliner assembly identified as 1) substrate and fabric alone or 2) substrate, fabric, and acoustic pad on top of the headliner.

Designed airspace of the headliner to roof panel shall be indicated.

The headliner assembly (substrate and fabric) material insulation requirements shall be stated in terms of Average Absorption Coefficient unless otherwise directed by GM. Absorption is for total part including A through C surface and optional acoustic pads. Acoustic performance of the headliner assembly (substrate, fabric, and pads) shall be submitted at time of quote.

All requirements in the following paragraphs apply for the Ambient Environment conditions specified in the VTS, and for the special vehicle, operational, or ambient conditions identified in the VTS performance requirement paragraphs. When applicable, subjective judgment shall be made by GM, unless otherwise stated.

The treatments shall provide performance from 400 to 10,000 Hertz as specified in the following table.

These requirements shall apply to standard headliner configurations or the vehicle configuration with maximum headliner coverage (i.e. non-sunroof). Due to the loss of headliner surface area with the sunroof option, the performance will be expected to be slightly lower.

3.2.1.18.6 Performance Targets

3.2.1.18.6.1.1.1 See 433 Roof Trim Appendix C2 for Acoustic Requirement Values (see referenced chart)

	Overhead System	
Procedure	GMW14177	
Requirement	Average Absorption Coefficient	
Frequency	Minimum Level	Maximum Level
400		
500		
630		
800		
1000		
1250		
1600		
2000		
2500		
3150		
4000		
5000		
6300		
8000		
10000		

Clearance holes or rigid attachments through the treatments that are made to accommodate components of other subsystems may be detrimental to achieving sub system requirements as specified in this SSTS. Therefore, it is the responsibility of the engineer for the subsystem causing noise control degradation to work with the Interior Acoustic Integrator and Acoustic Treatments Release Engineer until acoustic performance is restored or the performance requirement of this subsystem is changed by the program.

Initial formed part measurements for performance check (average absorption coefficient) shall be performed at IVER and results submitted to PDT/VIA; validation shall be completed by Validation Test Complete milestone by the parition supplier.

Regional deviation for GMNA, Holden, and GMM:
The sound absorption shall be determined analytically per the following equation:
$A = \sum \alpha_i S_i$
Where:

A is one-third octave band Total Sound Absorption in Metric Sabines
There shall be a Minimum of 6 discrete areas (i = 1 … 6)
S_i is the effective surface area (m^2) of a region of the headliner (as defined by the Design/Release Engineer).
$\sum S_i$ is the total surface area of the headliner
α_i are the random-incidence sound absorption coefficients (per ASTM C423) at specified material thicknesses and air gaps

A performance prediction based on the previous formula and flat stock absorption coefficients (“roll-up” prediction) is required for the headliner sourcing and before production hardware

is available (SVER and IVER release gates) per the ADVMS/LADV plan (reference Appendix G).
Air gaps for flat-stock conditions:
One sample with no air gap
At least 3 samples with respective air gaps to span available program headliner packaging. If program packaging is unknown, default air gaps shall be 5, 10, 15, 20 mm
Expect a minimum of 5 mm clearance to roof bows and to roof; 10-15 mm is likely to be available between roof bows
Performance of additional acoustic pads on the B surface shall be comprehended.

To verify the fully formed part performance, the molded part shall be tested in plaster cast (or equivalent) bucks, representative of the design intent sheet steel. GM shall provide sheet-metal geometry data or actual sheet metal at GM's discretion.

If a medium-sized reverberation room is used for formed part performance verification (approximately 26 m^3) six (6) unique samples shall be evaluated individually. If a large sized reverberation room is used (no less than 125m^3, recommended 200 m^3 or greater), more than one sample may be required to maintain absorptive area per ASTM C423 (suggested 4 parts). Six parts shall be produced, 4 tested randomly together per test, minimum of 3 tests. This method will eliminate any "edge/flanking/non-represenative airgap spacing" effects of the molded part that will tend to exaggerate true part performance. Edges shall be treated as in vehicle, typically sides are sealed while front and rear are exposed. It is acceptable to use an alpha cabin if correction factor is used except for large headliners (1.2 m^2 or larger).

Stakeholders: (0C Noise & Vibration, 40.03.03 Modular Roof Trim)

Test Procedures, Performance Data, Workflow Instructions:
Reference: Noise &Vibration Integration, Resource Center Application

3.2.1.18.7 Structural Headliner to Roof Panel

Vehicles that are designed to use a structural headliner that is bonded to the roof paned shall satisfy the following:

The roof assembly shall have a stiffness (load-defection slope) which is greater than a 13N/mm slope at room temperature at all points on the roof surface under the condition that the roof exterior is loaded via a 7.6 cm diameter disk to 120N.

The roof assembly shall not sustain noticeable permanent deformation following the application of a 534N load to any 20 by 40 cm area on the exterior surface of the roof.

The headliner when bonded to the roof panel shall not contribute any roof panel

deformation through all environmental temperatures.

3.2.1.18.7.1 Roof Panel Damping
With the Roof Trim Subsystem installed, the vehicle roof panel shall exhibit a vibration decay rate as follows:

Greater than 150 dB/s.

From 0 and 400 hertz at room temperature

Measured at any point on the roof.

3.2.1.18.8 Headliner Substrate Structure

The Supplier shall provide the mechanical property values of strength, stiffness, and toughness for the headliner substrate at various headliner thickness. These mechanical property values shall be determined at IVER based on the Roof Trim Module design and program requirements for roof rail air bag deployment, modularity, assembly, subsystem mass distribution, handling, acoustics, part variation, and etc.

The Mechanical property values shall be identified and maintained after environmental tests are complete.

Mechanical property values shall be documented as follows:

Initial estimates shall be submitted for quoting purposes and based on the initial SSTS and SOR requirements.

Final program material mechanical properties,(strength, stiffness, and toughness) shall be determined by IVER. The mechanical properties values shall be maintained in the ADV Plan and used for monitoring substrate mechanical properties, within + /_ 5%, for the life of the program

Preliminary Material Properties Targets					
Test Contents	Unit	Substrate Levels			Spec.
		Level 1	Level 2	Level 3	
Weight	g/m²	700 - 1000	1000 – 1200	1000 - 1200	
Tensile Strength	Kgf/5cm	115	165	250	ASTM D638

						(MS 361-13)
Elongation		%	30	40	40	“
Flexural Strength		Kgf/5cm	3	6	6	ASTM D790 (MS 361-13)
Flexural Modulus		Kgf/cm²	4980	6360	6220	“
SSTS	* Strength	N	20	30	35	OHS-028
	* Stiffness	N/mm	6	8	9	“
	* Toughness	%	90	130	130	“

Add Actual required values at IVER Build

Tolerance for above values is +/- 10%

SSTS Insert Test Procedures

3.2.1.18.9 Sunvisor Assembly
The following paragraphs define the specific sunvisor assembly requirements.

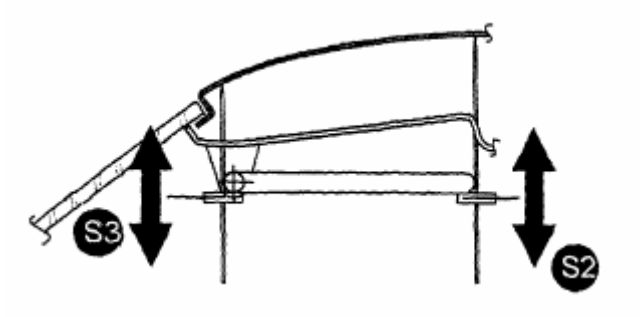
3.2.1.18.9.1 Sunvisor Dimensional Stability
The Sunvisor Assembly, as installed in a vehicle or roof, shall undergo the following two environmental cycle tests:

3.2.1.18.9.2 Sunvisor Requirements
The Sunvisor shall perform to the following:

The Sunvisor shall not exhibit delamination, odor, staining, color, gloss

or other appearance change or dimensional variance, unless otherwise specified. All components of the MRT Subsystem shall perform as specified prior to and after being subjected to the roof trim environmental tests and cycles (ref: 3.2.1.6).

The sun visor shall be checked for impairment of function as a result of distortion. Subjective evaluation shall be performed according to GMUTS UR-0-1 to determine whether the distortion indicated in S3 and S4, if present, adversely affects the appearance.

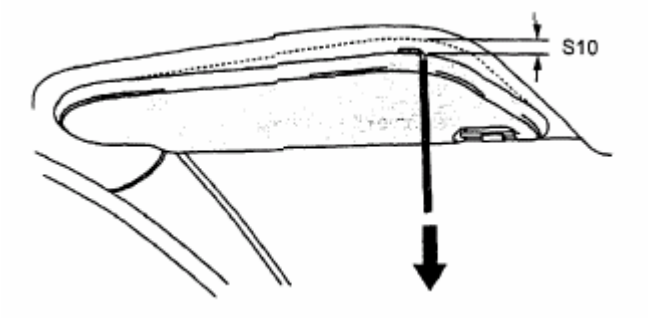


3.2.1.18.9.3 Sunvisor Distortion

3.2.1.18.9.3.1.1 In Vehicle

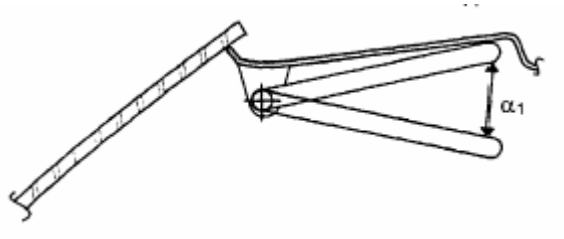
The maximum sunvisor distortion is 10 mm per the following figure.

Procedure ; The folded-up sun visor shall be pulled at the rear inner edge until the rear outer edge is just detached from the headlining. The distance by which the rear inner edge is moved shall be determined. (Reference GME01117)

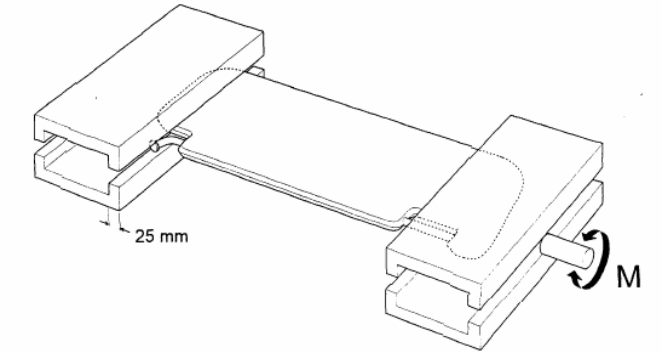


3.2.1.18.9.3.1.2 In Laboratory

The sun visor shall be clamped in the attachment across the whole width at the height of the fastening socket and thrust-bearing axle (see Figure XX). A torque of 5 Nm shall be applied to the center on the plane of symmetry and the turning angle shall be measured.



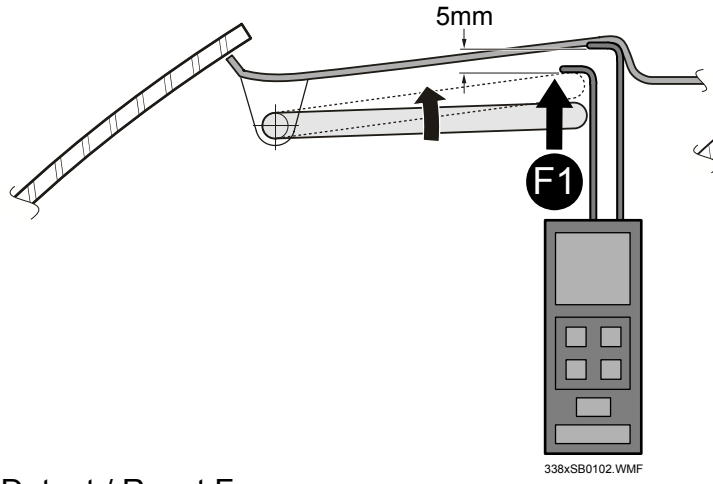
Turning angle shall be < 45 degrees @ 5 NM.



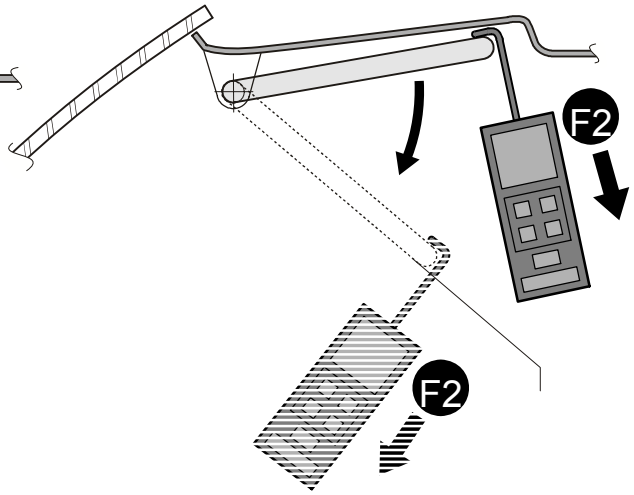
3.2.1.18.9.4 Culmination Angle
Culmination Angle a1 of the Sun Visor shall be 12 degrees +/- 3. The clinometers shall be used for measuring the culmination angle of the sun visor. The culmination angle is derived from the difference from the angle when the sun visor is folded up to the angle in the culmination position (see Figure ***5) .*** The culmination position is the folding position at which the sun visor begins to fold upwards automatically.

3.2.1.18.9.5 Sunvisor Operational Loads and Forces
The requirements in the following paragraphs apply both when the Sunvisor Assembly is engaged and disengaged from the center support. All requirements are measured at normal operating ranges of 44C and –20 C. Forces are measured after full environmental test of the modified 9505P, heat soak, and cycle testing are complete.

3.2.1.18.9.5.1.1 Detent / Reset Force
The force the sunvisor pushes to the headliner surface shall be 4 +/- 1.5 N as measured 6 mm off headliner surface in figure F1.



Detent / Reset Force



Actuation Force

3.2.1.18.9.5.1.2 Actuation Force

The force to rotate the sunvisor from its' stowed position shall be 11 +/- 4 N as measured 6mm off headliner surface in Figure F2.

3.2.1.18.9.5.1.3 Folding / Rotating Force

The force to rotate a sunvisor to or away from the windshield (after release from headliner) shall be 8 +4/-3 N as measured in Figure F3 before and after the following test cycles:

6300 cycles @ 23 +/- 3C

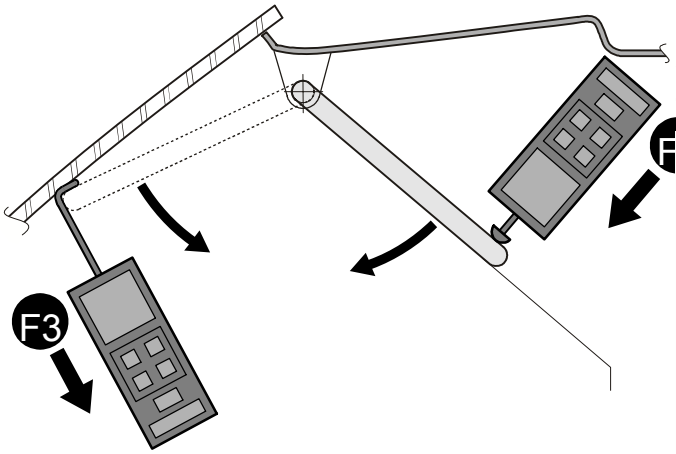
900 cycles @ 40 +/- 3C 90% RH

900 cycles @ 85 +/- 3C

900 cycles @ -30 +/- 3C

Use for all duty cycles

The sunvisor shall retain its position (at any set location) when driving in all conditions.



Folding / Rotating Force

backwards with a rotation angle of 3" after the culmination angle **a1** has been exceeded.

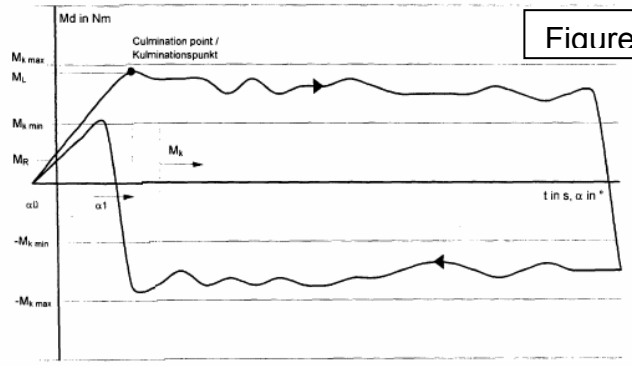
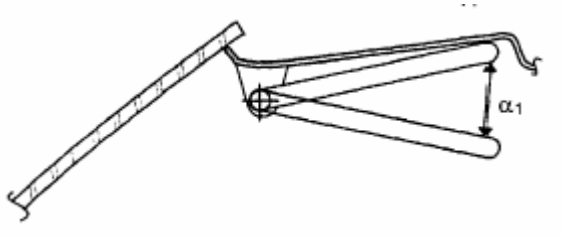


Figure 12



3.2.1.18.9.5.1.4 Folding Torque

The Folding Torque measurements shall be performed using the torque measurement procedure. The sun visor **is** mounted on the fastening base (bearing) and support (bracket). The torque is applied into the extension of the rotation axis.

The zero point of the measurement is the position in which the sun visor **is** unloaded and folded in. The torque shall be measured over the entire folding angle range (see relevant drawing) when the visor is folded forwards and backwards and shall be illustrated in a torque/rotation angle diagram (see **Figure 6).**The maximum value until the culmination point is reached is the release torque ML; the rotation angle from the drawing position to the culmination point is the culmination angle **al.** Measurement of the folding torque is performed when folding forwards and

The permissible force or torque increase/decrease over the whole folding/swivel movement is 20% max.

3.2.1.18.9.5.1.5 Pivot / Swivel Force

The force to pivot the sunvisor to and from the front glass and side glass positions shall be 6 +/- 4 N as measured in Figure 4 before and after the following test cycles:

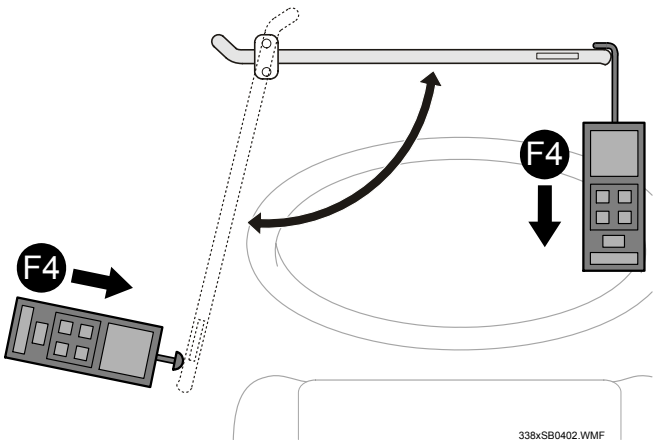
4200 cycles @ 23 +/- 3C

600 cycles @ 85 +/- 3C

600 cycles @ -30 +/- 3C

600 cycles @ 40 +/- 3C 90% RH

The sunvisor shall retain its position (at any set location) when driving in all conditions.



Pivot / Swivel Force

The permissible force or torque increase/decrease over the whole folding/swivel movement is 20% max

3.2.1.18.9.5.1.6 Center Support Retention

The force required to engage and disengage the sunvisor from its center support shall be the following per figure F5:

32±7,5N @ -30ºC

25±5N @ +23ºC

19,5±7,5N @ +80ºC

Forces shall be shall remain before and after the following test cycles:

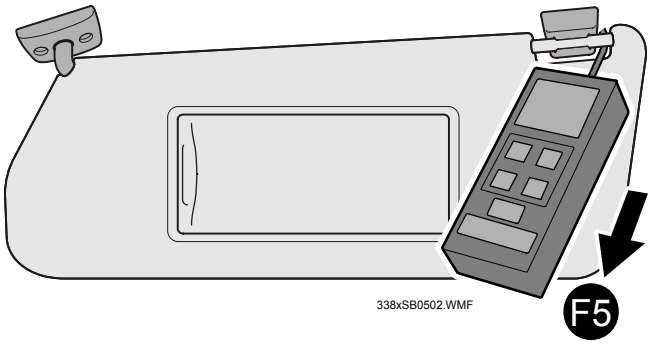
4,200 cycles at 23 °C +/- 3°C

600 cycles at 85 °C +/- 3 °C

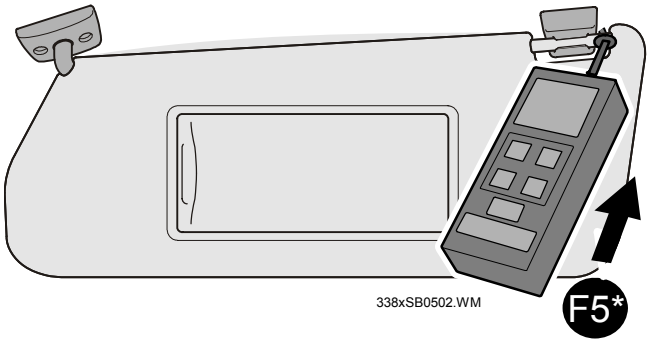
600 cycles at -30 °C +/- 3 °C

600 cycles @ 40 +/- 3C 90% RH

.



Disengaging force



Engaging Force

3.2.1.18.9.6 Sliding Forces

3.2.1.18.9.6.1.1 Sliding Sunvisor Force (where applicable)

The force to slide the sunvisor along its axis (on the rod) shall be 6 +/- 2 N as measured in Figure 5 before and after the following test cycles:

4200 cycles @ 23 +/- 3ºC

600 cycles @ 85 +/- 3ºC

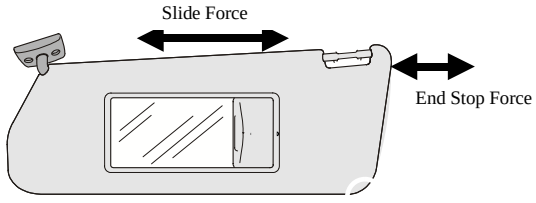
600 cycles @ -30 +/- 3ºC

600 cycles @ 40 +/- 3C 90% RH

The sliding force shall be smooth and consistent providing a quality tactile feel. The sliding force shall not change more than 1 N for the entire length of the sliding rod.

The sliding end-stop shall sustain a minimum force of 90 N in both directions without permanent damage

Figure 5



3.2.1.18.9.6.1.2 Sunvisor Extender
The extender sliding force shall be 6N +/- 2N, measured at the midpoint of the extender before and after the following cycles:

4200 cycles @ 23 +/- 3ºC

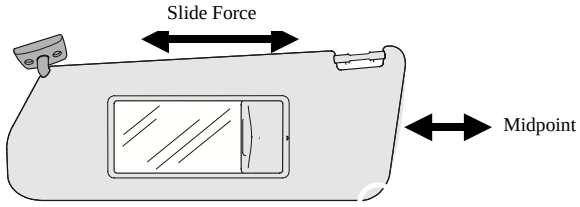
600 cycles @ 85 +/- 3ºC

600 cycles @ -30 +/- 3ºC

600 cycles @ 40 +/- 3C 90% RH

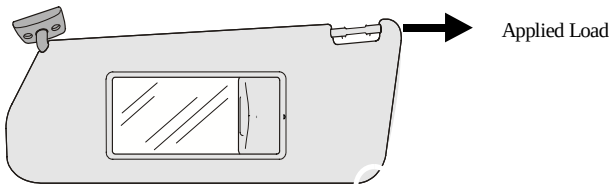
The sunvisor shall withstand a 90 N force at the end-stops of the sliding axis without damage or loss of function.

Figure 6



3.2.1.18.9.6.1.3 Ultimate Load - Pull Out Force of Pivot to Arm Receiver
The sunvisor's arm receiver shall not separate from the pivot arm when subjected to >250 N force applied along the applied load per Figure 3.3.1.2.2.1–1.

Figure 3.3.1.2.2.1–1



3.2.1.18.9.6.1.4 Sunvisor Center Support

3.2.1.18.9.6.1.4.1 Pull Out Force
The sunvisor center support shall not separate from the BIW upper-structure sheet metal when subjected to a 100 N force applied normal to the attachment plane of the center support for 3 seconds at room temperature.

3.2.1.18.9.6.1.4.2 Center Support Retention

The force required to engage and disengage the sunvisor from its center support shall be the following per figure F5:

32±7,5N @ -30ºC

25±5N @ +23ºC

19,5±7,5N @ +80ºC

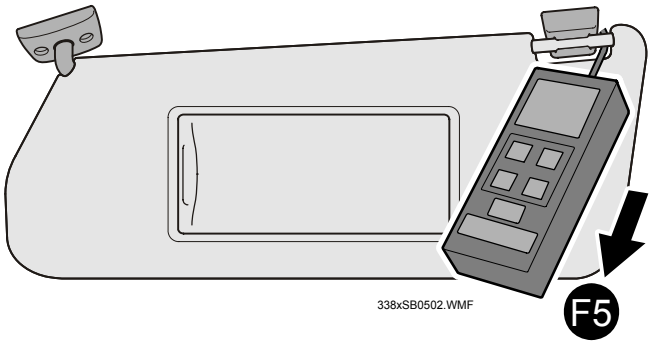
Forces shall be shall remain before and after the following test cycles:

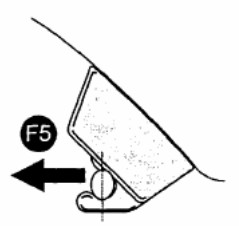
4,200 cycles at 23 °C +/- 3°C

600 cycles at 85 °C +/- 3 °C

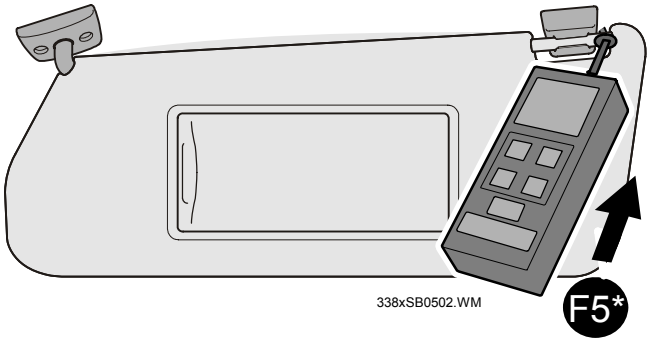
600 cycles at -30 °C +/- 3 °C

600 cycles @ 40 +/- 3C 90% RH





Disengaging force



Engaging Force

3.2.1.18.9.6.1.5 Permanent Set – Outboard Bracket

The following requirements are to evaluate the performance of the sunvisor assembly with the sunvisor installed to

production intent, but not engaged to the center support assembly.

The sunvisor shall withstand the following vertical loads

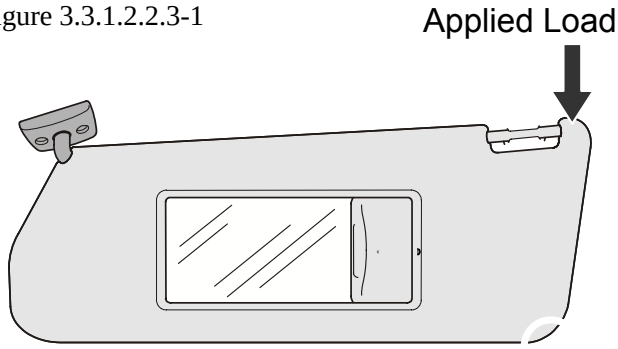
10 N load without exhibiting a permanent set of more than 5 mm from design position measured at the inboard edge.

50 N load without exhibiting damage or a permanent set of more than 15 mm from design position measured at the inboard edge.

(Applied Load) applied for 5 seconds at room temperature at the inboard edge, in any position along the pivot (front to side window) range, shown in Figure 3.3.1.2.2.3-1:

If the sunvisor assembly slides along the rotational axis, the measurement is to be taken with the sunvisor in the fully closed position.

Figure 3.3.1.2.2.3-1



3.2.1.18.9.7 Damping

The design of the sunvisor assembly shall provide energy damping to keep it from oscillating up/down during normal driving conditions. The sunvisor assembly shall provide energy damping in any position such that when excited by a square wave pulse of 1.3 mm minimum deflection, it will create a sine wave motion, with an amplitude not to exceed 1.4mm peak to peak, that diminishes by at least 60% within 200 ms. Damping is to be measured with the assembly mounted to a very rigid fixture and without the aid of center retention.

Normal driving conditions include but not inclusive of such driving conditions as: driving at any speed, moderate swerving at 55-60 mph, driving over bumpy roads at 25-30 mph. (This test should emulate test conducted at the GM Proving Ground Ride and Handling Loop, Belgian

Block Road, and Seven Sisters Loop).

3.2.1.18.9.7.1.1 Sunvisor Position and Stability

The sunvisor shall remain in any selected position from stowed position to full range of motion, when installed in a vehicle through all driving conditions.

3.2.1.18.9.8 Sunvisor Convenience Features

The specified requirements for the Sunvisor Assembly convenience features are as follows:

3.2.1.18.9.8.1.1 Sunvisor Map Strap

The sunvisor map strap shall comply with the following requirements:

Map Strap Retention/Flexibility (where applicable)

The map strap shall remain functional and retain a block 7 mm thick X 120 mm wide after being subjected to environmental conditions stated in GM9505P, modified cycle H.

The test cycle and procedure shall include a 120 m wide x 15 mm thick x 25 mm long (wood) block retained by strap during cycling through GM9505P modified cycle H.

Map Strap Pullout Strength (where applicable)

The map strap shall withstand 90 N minimum perpendicular pull force, after GM9505P modified H environmental tests. Pullout force is applied at the points where the strap wraps around the edges of the sunvisor, without separation from the sunvisor substrate or degradation to the strap, fabric cover, or sunvisor

Map Pocket Retention and Flexibility (where applicable)

The map pocket shall not exhibit visible fabric edge cuts or excessive wear and

remain fully functional and retain a wood block of 7 mm thick and 120 mm wide after the GM9505P modified H cycle.

The map strap is to be stretched throughout the GM9505P modified H cycles with a “map block” of dimensions width = 120 mm, thickness = 15 mm, length = 25 mm greater than the map strap width, and radius = 7.5 mm.

3.2.1.18.9.8.1.2 Auxiliary Sunvisor (where applicable)

The auxiliary sunvisor shall meet the same requirements for detent, rotation, position stability, damping and maximum pull down and sliding efforts as the primary sunvisor.

3.2.1.18.9.8.1.3 Sunvisor Vanity Mirror Assembly (where applicable)

Vanity Lighting / Electrical / Switches

3.2.1.18.9.8.1.3.1 Light Intensity

The sunvisor vanity light shall comply with the GM Global Lighting SSTS Specifications contained in CG959 and GMW3172.

3.2.1.18.9.8.1.3.2 Lamp Continuous On

The vanity mirror lamp assemblies shall not show loss of function (open/close, auto shutoff) or visible loss of material integrity (distortion or discoloration) after four hours of continuous on at 85 °C (dead air) with the vanity powered to 12.5 VDC at both Hi and Low intensity.

3.2.1.18.9.8.1.3.3 Lens Load

The vanity mirror lens shall withstand a vertical load of 45 N applied normal to the center of the lens from the inside surface without loss of retention from the vanity frame.

3.2.1.18.9.8.1.3.4 Hi/Lo Intensity Switch (where applicable)

The vanity mirror Hi/Lo intensity switch force and load requirements are:

The force required to operate the Hi/Lo intensity switch shall be – 3 +/- 2 N before and after the following test cycles:

2450 cycles at 23 ºC +/- 3 ºC

350 cycles at 85 ºC +/- 3 ºC

350 cycles at -30 ºC +/- 3 ºC.

350 cycles @ 40 +/- 3C 90% RH

The Hi/Lo intensity switch shall withstand a 40 N load without mechanical failure.

3.2.1.18.9.8.1.3.5 Lighted Vanity Cover, Sliding/Hinged, Auto Shutoff Switch Life Cycles (where applicable)

After subjection to the following cycles, the lighted vanity auto shutoff switch shall perform as specified in Paragraph 3.2.1.3.5.16.10.

2,940 @ 23 ºC+/- 3ºC

420 @ 85 ºC +/- 3ºC

420 @ -30 ºC+/- 3ºC

420 cycles @ 40 +/- 3C 90% RH

A cycle consists of operating the cover from fully closed to fully open and return to fully closed.

3.2.1.18.9.8.1.3.6 Lighted Vanity Hi/Lo Intensity Switch Life Cycles (where applicable)

After subjection to the following cycles, the Hi/Lo intensity switch performance shall be as specified in Paragraph 3.2.1.3.5.16.11.

2,450 @ 23 ºC+/- 3ºC

350 @ 85 ºC+/- 3ºC

350 @ -30 ºC+/- 3ºC

350 cycles @ 40 +/- 3C 90% RH

A cycle consists of operating the Hi/Lo Intensity Switch from Lo intensity to Hi intensity and return to Lo intensity.

Vanity Mirror

3.2.1.18.9.8.1.3.7 Mirror Reflectivity

The mirror surface shall meet the requirements of the mirror surface shall reflect a minimum of 80% of incident light per SAE J964.

3.2.1.18.9.8.1.3.8 Mirror Temperature Resistance Appearance

Appearance and function of the mirror must not be adversely affected and the safety backing must not separate from the mirror.

3.2.1.18.9.8.1.3.9 Vanity Mirror Safety Backing

No glass particles must separate from the safety backing at temperature ranging from -30 - +70ºC

3.2.1.18.9.8.1.3.10 Mirror Distortion

Maximum mirror distortion shall be less that 2%

3.2.1.18.9.8.1.3.11 Mirror Scratch Resistance
Max reduction of reflection 10% (other than glass mirrors)

3.2.1.18.9.8.1.3.12 Mirror Resistance to Cleaning Agents
Max reduction of reflection 10% after testing

3.2.1.18.9.8.1.3.13 Vanity Mirror Retention
The vanity mirror shall withstand a minimum of 90 N normal load applied to the front center of the mirror without glass fragmentation or loss of retention from the vanity frame.

Hinged Vanity Mirror Covers
3.2.1.18.9.8.1.3.14 Hinged Vanity Mirror Cover (where applicable)
The following requirements apply to a hinged vanity mirror cover as shown in figure F6- F7:

3.2.1.18.9.8.1.3.15 Hinged Mirror Cover Operation
Folding Angle of Mirror Cover. The clinometers shall be used to measure the entire opening angle of the mirror cover a2. The clinometers shall then be used to measure the opening angles a3 or a4, at which the mirror cover closes or opens automatically (see Figure8).

Open and close angle requirements are as follows:

alpha 2 103°±5°

alpha 3 30°±2°

alpha 4 90°+5°

3.2.1.18.9.8.1.3.16 Cover Light Switch Operation

The mirror cover opening angle ***a5*** at which the illumination is switched on or *off* shall be measured using the clinometers. (See figure 9)

Figure 9

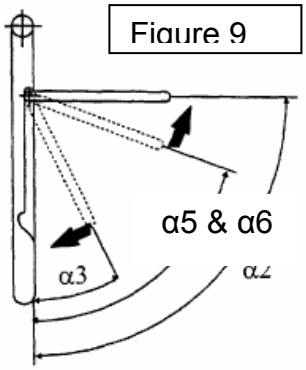
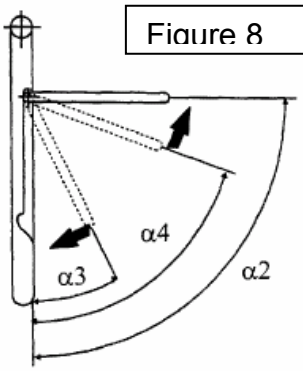


Figure 8



The sun visor folding angle a6 at which the illumination is switched on or off shall be measured using the clinometers.

3.2.1.18.9.8.1.3.17 Cover Rotational Effort

The force required to rotate the hinged vanity mirror cover as shown in figure F6 and F7

Open = 4 +/- 2 N as shown in F6

Close = 3 +/- 1 N as shown in figure F7..

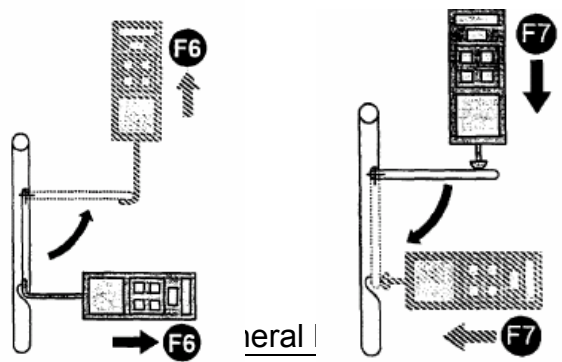
Forces shall be maintained before and after the following opening and closing cycles:

3010 cycles at 23 ºC +/- 3 ºC

430 cycles at 85 ºC +/- 3 ºC

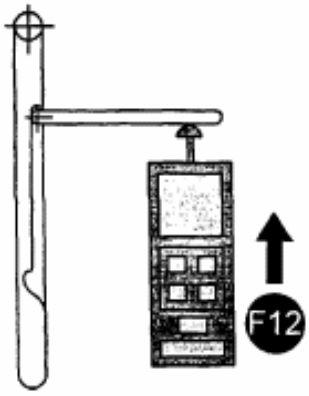
430 cycles at –30 ºC +/- 3 ºC

430 cycles @ 40 +/- 3C 90% RH



3.2.1.18.9.8.1.3.18 Cover Load

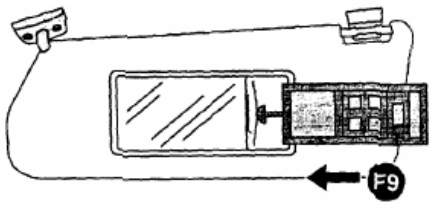
The vanity cover shall sustain a force of 20 N without damage or loss of function to the cover or vanity assembly as shown in figure F12.



Cover Loading

3.2.1.18.9.8.1.3.19 Sliding Vanity Mirror Cover

The force required to open or close the vanity mirror's sliding cover shall be 6 +/- 2 N as shown in figure F8 & F9 before and after the following test cycles:



F9 -- Closing Force

3010 cycles at 23 ºC +/- 3 ºC

430 cycles at 85 ºC +/- 3 ºC

430 cycles at -30 ºC +/- 3 ºC

430 cycles @ 40 +/- 3C 90% RH

The auto shutoff switch shall be actuated in the 80 % range of the cover full open position.

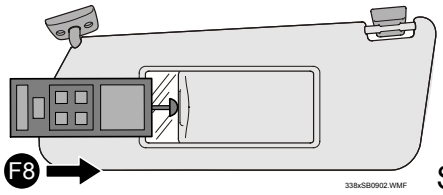
Switch Life Cycles are as follows:

2940 cycles at 23 ºC +/- 3 ºC

630 cycles at 85 ºC +/- 3 ºC

630 cycles at -30 ºC +/- 3 ºC

.



Sliding Force

F8 -- Opening Force

3.2.1.18.10 Coat Hook Assembly
The Coat Hook Assembly retains garments and hangers in the vehicle. It may be integral to other components such as assist handles The stand alone coat hook shall have a primary attachment to the body structure using M-6 threaded fasteners.

3.2.1.18.10.1 Dynamic Road Performance
The coat hook shall retain hangers, with and without load, under severe driving conditions. A dynamic road test for hanger retention should be conducted to evaluate this capability. This test consists of swerving at 55-60 mph, bumpy roads at 25-30 mph, severe cornering at 30 - 35 mph, and emergency stopping from 60 mph. This test should emulate test conducted at the GM Proving Ground Ride and Handling Loop, Belgian Block Road, and Seven Sisters Loop.

For with load conditions, use 2 wire hangers loaded to 1,35 kg (3 pounds each of weight). Total weight should be less than 2,7 kg (6 pounds). Without load conditions, use 2 empty wire hangers (laundry hangers).

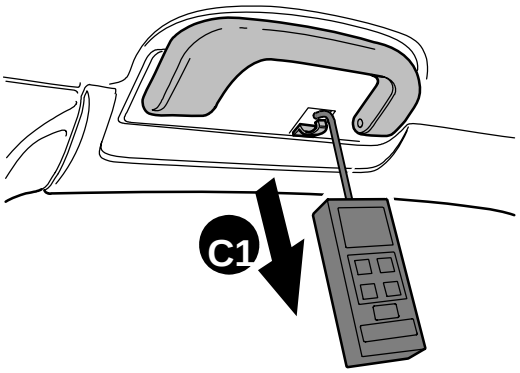
3.2.1.18.10.2 Convenience Features
The Coat Hook Assembly may be integral to other accessories such as lighting components and assist handles.

3.2.1.18.10.3 Coat Hook Ultimate Load
The Coat Hook Assembly installed to production intent shall withstand a downward vertical load, as specified below. Ultimate load, tested at room temperature, shall not cause loss of function, evidence of cracking, scuffing, grooves or other loss of material integrity.

The Coat Hook ultimate load shall withstand either of the following requirements based on program specific Coat Hook requirements.

Jacket Hook:	120 N
Fixed or Pivot:	180 N

Refer to figure C1 for test procedure.



Coat Hook Ultimate Load

3.2.1.18.10.4 Coat Hook Static Load
Coat Hooks shall perform to the following:

3mm flex @ 90N for Jacket Hook at 23C

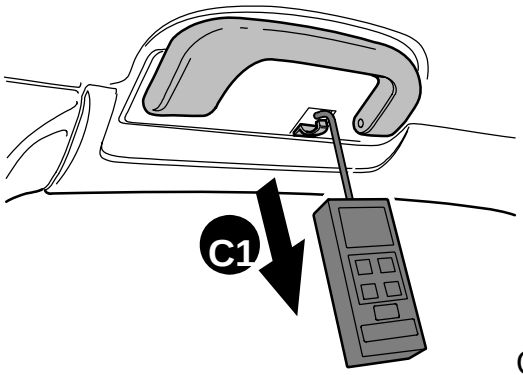
4mm flex @ 130N for Fixed or Articulated at 23C

Less then 1 mm permanent deformation after the test of 30N/mm, duration 2 hour per the following:

2 hrs @ 23°C

2 hrs @ 85°C

2 hrs @ -30°C



Coat Hook Static Load

3.2.1.18.10.5 Articulated Coat Hook -- Extension and Stowage Loads
The following requirements apply to an Articulated Coat Hook Assembly when pulling the Coat Hook from its stowed position.

The Coat Hook shall not extend under its own weight when installed in production intent position and with the vehicle in rest or in motion.

The force required to extend the Coat Hook from the stowed position to the functional position shall not exceed 4 N +/- 2.

The force required to stow the Coat Hook from the extended/ functional position shall be 4 N +/- 2

A coat hook that has motion control shall have a pivot open time of the following:

+23ºC 11 cm/s +5 / -4 cm/s

-30ºC min 0,5 cm/s

+80ºC max 25 cm/s

3.2.1.18.10.6 Durability Cycle
All Coat Hooks shall have the Durability Cycles as follows:

2450 cycles at 23°C +/- 3°C

350 cycles at 85°C +/- 3°C

350 cycles at -30°C +/- 3°C

350 cycles @ 40 +/- 3C 90% RH

A Coat Hook Load Cycle shall consist of the following:

Jacket Hook:

A load of 50 N shall be applied to the Jacket Hook

Fixed Coat Hook:

A load of 100 N shall be applied to the Fixed Coat Hook

Articulated Coat Hook:

A load of 100 N shall be applied to the Articulated Coat Hook

Teat Procedure:

Rotate the hook from the stowed position through the maximum rotation and apply a 45 N load. Return the hook to the stowed position and repeat the cycle.

With no load applied, rotate the hook from the stowed position through maximum rotation and release. (Slap test)

3.2.1.18.11 Assist Handle Assembly (Roof Rail Mounted)

The Assist Handle Assembly aids occupants with riding stability, ingress, and egress to the vehicle

3.2.1.18.11.1 Assist Handle Ultimate Load

The Assist Handle ultimate load requirement is program specific relative to Standard Performance, or Off Road Performance as shown in figure S1 and as identified below.

Standard Ultimate Load Performance:

1000N vertical +23ºC

750N vertical +80ºC

700N @ 45º pull in Vehicle Position

Load shall be applied for a min 30sec – Width of load strap is 75 mm

Requirement: The Assist Handle Assembly shall withstand a downward vertical load and held for 30 seconds and shall not have loss of function and show no signs of material degradation or deformation.

Off Road Ultimate Load Performance:

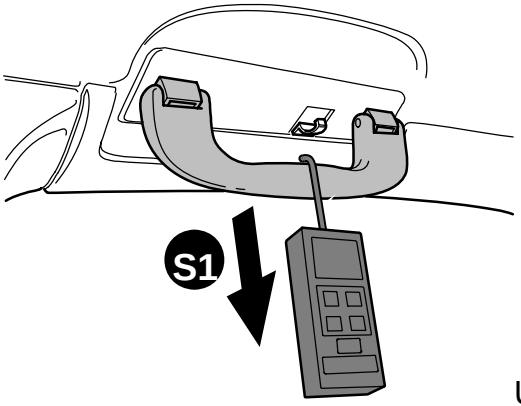
1555N vertical +23ºC

1000N vertical +80ºC

800N @ 45º pull in Vehicle Position

Load shall be applied for a min 3sec – Width of load strap is 75 mm

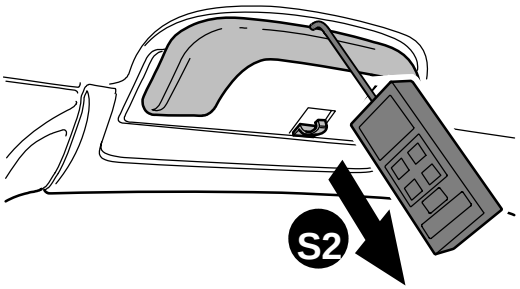
Requirement: The Assist Handle Assembly shall withstand a downward vertical load and held for 30 seconds and shall not have loss of function and show no signs of material degradation or deformation.



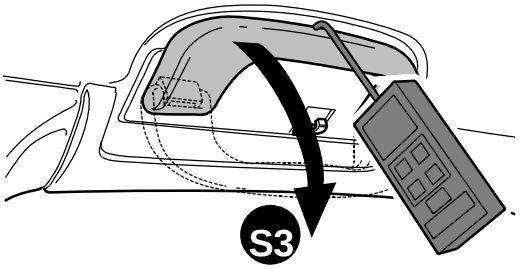
Ultimate Load in Vertical Direction

3.2.1.18.11.2 Pull Down Moment (Hinged Handles)

The Assist Handle shall not move under its own weight with the vehicle in rest or in motion in all driving conditions.



The load required to rotate the handle out of the stowed position shall be 4 +/- 2 N at room temperature and applied at the midpoint of the handle, in a circumferential direction as shown in figure S3.



Rotation Effort

The Return Force shall be 1 +/- .3 N as shown in S4

3.2.1.18.11.2.1.1 Assist Handle Damper

An assist handle designed with motion-controlled devices (dampener) shall rotate per the following:

11 cm/s +5 / -4 cm/s @ +23ºC

Minimum speed = 0,5 cm/s @ -30ºC

Maximum speed = 25 cm/s @ +80ºC

3.2.1.18.11.3 Detent/Extension and Retraction Effort (Retractable Strap)

The following requirements apply to the Assist Strap Assembly when pulling the Assist Strap from its stowed position.

The Assist Strap shall not extend under its own weight when installed in production intent position and with the vehicle in rest or in motion.

The force required to extend the Assist Strap from the stowed position to functional position shall not exceed 15 N applied to the midpoint of the handle, normal to the mounting plane.

3.2.1.18.11.4 Lamp Lens (where applicable)

The lamp lens shall withstand a vertical load of 45 N applied to the center of the lens from the inside surface, without loss of retention from Assist Handle Assembly.

3.2.1.18.11.5 Assist Handle Durability -- Pull Down Moment, Detent, & Rotation

The assist handles durability shall be cycled to the following:

5050 cycles at 23°C +/- 3°C

850 cycles at 85°C +/- 3°C

850 cycles at -30°C +/- 3°C

850 cycles @ 40 +/- 3C 90% RH

Standard Performance Handles:

Apply a 300 N vertical Load; 225N at 45°; 50/50

Off Road Performance Handles

Apply a 600N vertical load

3.2.1.18.11.6 Assist Handle Quality Feel

Apply a load of 350 N and the handle shall flex less than 5 mm (70N/mm) with a permanent deformation less then 1 mm.

3.2.1.18.12 Roof Trim Electrical Performance

3.2.1.18.12.1 Roof Trim Lighting

3.2.1.18.12.1.1.1 Lighting Performance Requirements

Roof Trim Subsystem Interface to Interior Lighting Subsystem Specifications is as follows:

Interior lighting subsystem components are to be packaged on or in other elements of the roof trim subsystem and both subsystems shall be designed to meet the following specifications, refer to Interior Lighting Best Practices for detailed design criteria:

The roof trim subsystem shall provide mounting surfaces for the interior lighting subsystem to ensure a fit that shall allow for the lens of the interior lighting subsystem to withstand a normal load of 45 N applied to the center of the lens without loss of retention from the surrounding interior lighting subsystem trim and without loss of retention from the surrounding roof trim subsystem that contains the interior lighting subsystem.

The roof trim subsystem shall provide an

interface to the interior lighting subsystem to ensure that the desired fit between subsystems is executed. The interface between the interior lighting subsystem to the roof trim subsystem shall be designed in a manner that will not allow visible light leaks or light transparency through any interior subsystem component. Refer to Interior Best Practices for dimensional specifications that define gap, flush, and crush interface fits.

If necessary, the roof trim subsystem shall provide a surrounding trim bezel that may contain other non-interior lighting components in addition to an interior lighting subsystem.

The roof trim subsystem shall allow the interior lighting subsystem to be located in a vehicle position and orientation to meet all Interior Lighting Subsystem Technical Specifications contained in CG959.

The roof trim subsystem shall provide the necessary packaging space and clearance to allow for the execution of the desired interface, to allow the customer to easily interface with the interior lighting subsystem functional components, and to provided for the appropriate ventilation of the lighting element contained in the interior lighting subsystem. Detailed design specifications are identified in the Interior Lighting Best practices.

If the interior lighting subsystem contains a switch or functional component, then the functional component shall be actuated without perceived deflection of the interior lighting subsystem and without perceived deflection of the adjacent roof trim subsystem that contains the interior lighting subsystem. Subsystem deflections shall not exceed 3 mm with a 50 N applied force and 6 mm with a 100 N applied force.

All interior lighting electrical components (e.g., wiring harnesses and connectors) shall not be visible to the customer in any seating position or while standing outside the vehicle with the doors open.

3.2.1.18.12.1.1.2 Interior Lighting Subsystem Performance Specifications

The interior lighting subsystem shall meet all performance specifications contained within the Interior Lighting SSTS GMW3172 and CG959.

3.2.1.18.12.1.1.3 Electrical Switch Performance

See Electrical and Interior Lighting SSTS

3.2.1.18.12.2 Electrical Mechanical Performance

3.2.1.18.12.2.1.1 Lamp Integrity: The lens on all lighting components and/or assemblies shall withstand a load of 45N applied normally to the center without loss of retention from the housing or Headlining Assembly

3.2.1.18.12.2.1.2 Switch feel: Light switching operation shall be achieved without perceived deflection of housing or Headlining Assembly

3.2.1.18.12.2.1.3 Impact Strength: The console shall withstand impact with no loss of function or no loss of material integrity (fracture) Lighting components/assemblies shall perform as defined in GM 2617M (Use rubber mallet as impact or.)

3.2.1.18.12.2.1.4 Bulb Load, Insertion, and Retention: Bulbs shall withstand a load of 10±2N without loss of retention.

Insertion shall be 10N±2N

Removal effort shall be 14N±2N each bulb type.

Bulbs shall not dislodge from vibration inputs incurred during Squeak and Rattle validation testing

3.2.1.18.12.3 Light Leaks Performance Lighting components/assemblies shall be attached and fitted to the MRT in a manner that will not allow visible light leaks through or around adjacent components. There shall be no light leak between lamp and trim surfaces, including mating components, around switch lenses and through housings. b the illumination /transparency of the roof trim including all components shall not show improper light diffusion.

3.2.1.18.13 Roof Console Assembly
The Roof Console Assembly provides stowage for small articles and may serve as a mounting substrate for various features (i.e. displays, controls, lighting, sensors, mirrors, audio/video, etc.). The console shall be pre-attached to the Headlining Assembly prior to vehicle assembly.

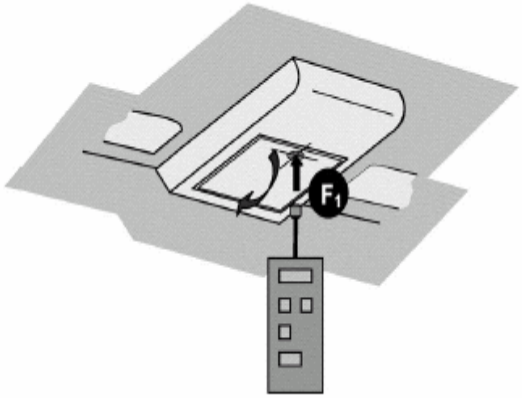
3.2.1.18.13.1 Engaging Force on Self Opening Systems (F1)

Engaging force shall be:

7.5±2.5N for small size box approx 200mm x 150mm.

12±5N for medium size box approx 200mm x 300mm

According to test method GME8723GS



Engaging Force on Self-Opening Tip Systems and Systems with Release Button (F1)

Engaging force shall be:

7.5±2.5N according to test method GME8723GS

3.2.1.18.13.2 Engaging Force on Systems that are not Self Opening (F1)

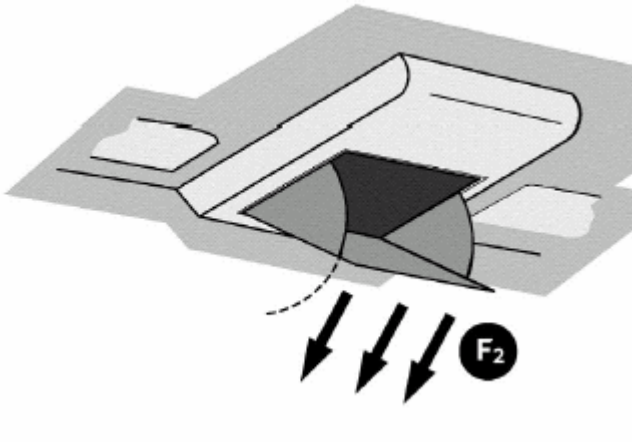
Engaging force shall be:

7.5±2.5N according to test method GME8723GS

3.2.1.18.13.3 Opening force (F2)

Opening force shall be:

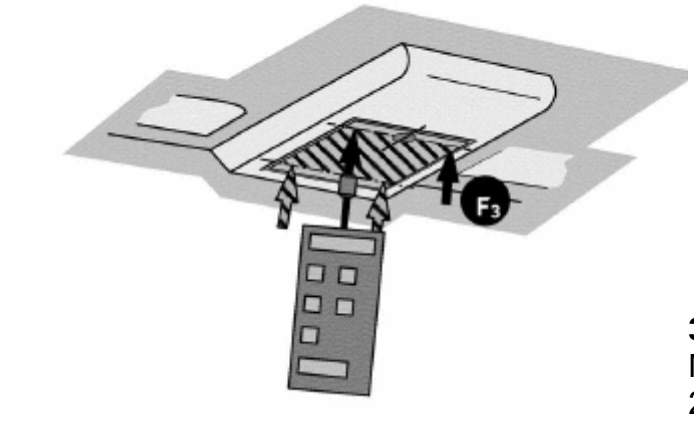
7.5±2.5N according to test method GME8723GS



3.2.1.18.13.4 Closing Force (F3)

Closing force shall be:

7.5±2.5N according to test method GME8723GS



3.2.1.18.13.5 Latching Force (F4)
Latching force shall be:

7.5±2.5N for small size box approx 200mm x 150mm.

12±5N for medium size box approx 200mm x 300mm

According to test method GME8723GS

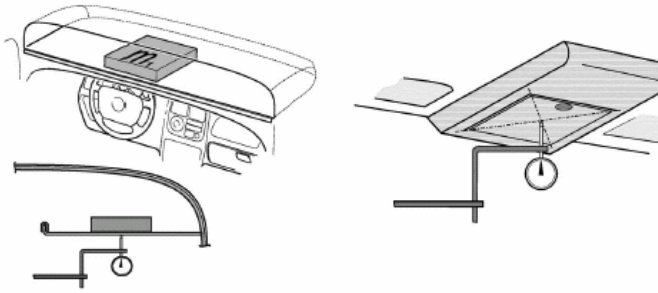
3.2.1.18.13.6 Actuation Time
Actuation time shall be:

10cm/s±3cm/s @ 23ºC

Min 3cm/s @ -30ºC

Max 25 cm/s @ 80ºC

3.2.1.18.13.7 Elastic Deformation
Maximum elastic deformation shall be 2mm with a mass of 0,4g/cm³ for 15minutes



3.2.1.18.13.8 Plastic Deformation
Maximum plastic deformation shall be 2mm with a mass of 0,4g/cm³ for 15minutes

3.2.1.18.13.9 Elastic and Plastic Deformation of the entire System after long term test:
Rating 10 according to GMN7000TP

3.2.1.18.13.10 Dynamic load test:
Rating 8 according to GMN7000TP

3.2.1.18.13.11 Opening and closing behavior
No visible deformation is allowed according to GMN7000TP

3.2.1.18.13.12 Deformation test (twist)
Maximum 1 mm gap.

Rating 8 according to GMN7000TP

3.2.1.18.13.13 Functional Test
No function in the area of the

compartment shall be impaired.

Front seat rating 8 and rear seat rating 7 according to GMN7000TP

3.2.1.18.13.14 Compartment Opening Behavior

No opening of the box according to GME8723GS

Rating 8 according to GMN7000TP

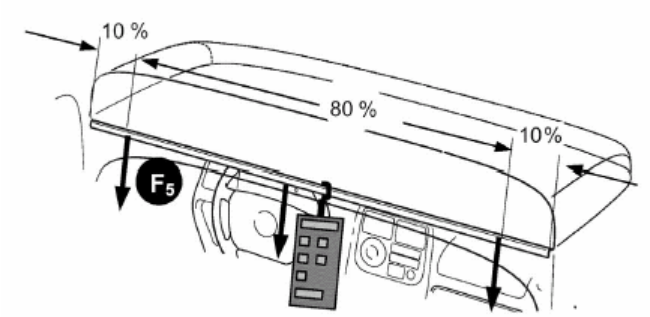
3.2.1.18.13.15 Retention Force (F5)

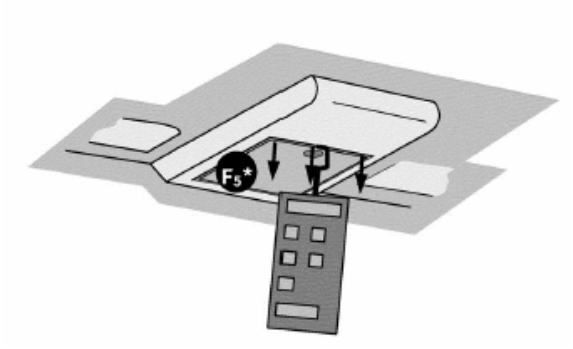
The retention force shall be 10x maximum allowed load.

Min 100N,

Max 1000N

(according to GME8723GS.)

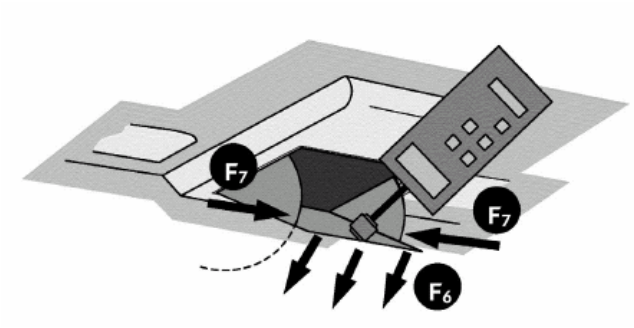




3.2.1.18.13.16 Overload Vertical force (F6)

Apply a load of 150N according to GME8723GS. Cover shall have no damage.

Damage before excess force of 150N is reached is not permitted.



3.2.1.18.13.17 Overload Horizontal force (F7)

Apply a load of 150N according to GME8723GS. Cover shall have no damage.

Damage before excess force of 150N is reached is not permitted.

3.2.1.18.13.18 Overload Vertical force (F8)

Apply a load of 150N according to GME8723GS. Cover shall have no damage.

Damage before excess force of 150N is reached is not permitted.

3.2.1.18.13.19 Load test

No visible deformation @ max load and @ 78h 80ºC according to GME8723GS

3.2.1.18.13.20 Durability Test

The Roof Console durability shall be cycled to the following

5250 @ 23ºC

750 @ 80ºC

750 @ -30ºC

750 @ 40ºC 95%RH

3.2.1.18.13.21 Fastening

All fasteners are to be selected from the NAO Fastening Catalog. Those not on the fastening catalog require the approval of GM Fastening Engineering.

Joint Function Requirements

The attachment process shall not adversely affect the corrosion protection and structural integrity of the interfacing components.

The production process (i.e. positioning of spot weld, surface treatment, corrosion protection, etc.) must not negatively affect the function of the joint.

Insertion Efforts

Attaching clips installation loads shall be less than 50 N.

Extraction Efforts

Attaching clips shall have extraction load greater than 100N.

Torque Requirements

The joint must have full function between minimum and maximum assembly (dynamic) torques. The joint must not deform permanently at maximum assembly torque. Due to loose fasteners, the joint must not require re-tightening over the lifetime of the vehicle. The minimum static torque must be achieved after assembly.

Tapped Holes, Extruded Holes, Clinch Nuts, and Weld Nuts

No vehicles are to use tapped or extruded holes. M6 or greater Weld nuts and Clinch Nuts are to be used for RRAB, assist handle, and coat hook attachments.

3.2.1.18.14 HVAC Duct Assembly & Outlets

The HVAC subsystem contained in the Roof Trim Subsystem provides the means for distributing airflow from overhead to vehicle occupants. All outlets and ducts/air caps that are modular to the Roof Trim Subsystem shall be securely attached to the Headliner Assembly prior to vehicle assembly.

3.2.1.18.14.1 HVAC Component Attachment to Roof Trim Subsystem

The seal between the air cap and headliner shall be continuous and the adhesive shall not intrude into the duct opening. All outlets and ducts/air caps that are modular to the Roof Trim Subsystem shall be securely attached to the Headliner Assembly prior to vehicle assembly.

The scfm airflow is tested per GMTG test procedure #4928 shall have a loss of less than 95% of the total collected outlet airflow. (Note: Headlining substrate permeability contributes to this performance therefore, barrier scrims may need to be added.)

The ducts/air cap shall be assembled to the Headlining Assembly within +/-3mm build tolerance.

No light leaks or translucency shall be

visible at any of the HVAC outlet openings or through the substrate.

3.2.1.18.14.2 HVAC Air Flow Performance

GM HVAC Engineering shall provide all HVAC performance requirements.

The outlet, duct and air cap requirements (i.e. airflow, number and location of outlets, etc.) will be the responsibility of the GM HVAC Engineering.

3.2.1.18.15 Stowage Compartment

All RTS stowage compartments shall meet the 100 N maximum load requirements for 15 seconds at room temperature after all of the following test cycles have been completed: heat resistance heat aging, moisture aging, and environmental test.

3.2.1.18.16 Miscellaneous Features (as applicable)

3.2.1.18.16.1 Primary Attachment

The primary attachment of any feature shall provide structure to sufficiently ensure stability and may be self-contained within the RTS or may require mechanical connection to the BIW. All such BIW attachments shall comply with GM Bill of Process 32206 for Roof Trim System (See Appendix A).

3.2.1.18.16.2 Functional Performance

The functional requirements of any miscellaneous feature(s) shall be as designated by the appropriate GM releasing authority. Some of those assignments are indicated in the table below.

Electrical Connector Location:

The location of the single connector between the Overhead Wiring Harness Assembly and the vehicle electrical system shall be in accordance with GM Electrical Engineering and the BOP.

Electrical Feature Name
Speakers
Microphones
Video / Entertainment
Antenna(s)
CHMSL
Etc.

3.2.2 Physical Characteristics

The required physical characteristics for Roof Trim Subsystem are specified in the following paragraphs.

3.2.2.1 Dimensions and Capacities

The dimensions, shape, thickness, tolerance and all other geometric information/data for the Roof Trim Subsystem shall conform as required to meet program specific requirements.
Mass Properties:

The total mass of the Roof Trim Subsystem shall not exceed specific program targets.

3.2.2.2 Handling Robustness

The Roof Trim Subsystem shall perform the following requirements:

Shipment to the point of assembly without damage

Normal handling during vehicle assembly without dust out of material or damage

Perform service operations without damage

Show no visible changes of the show surface during handling

Loss of load carrying capability at any attachment location.

Visible changes include cracks, creases, sagging, indention or contamination from other MRT Subsystems.

3.2.3 Dependability / Reliability

3.2.3.1 Dependability

Dependability is the ability of the Roof trim system to function during a specified time within the performance levels specified in this SSTS

The dependability requirements for the Roof trim system are specified in the following paragraphs.

3.2.3.2 Reliability Evaluations Point (REP) (Was Target Life).
The Reliability Evaluation Point is 100,000 miles (160.900 km) or 10 years which ever comes first. Compliance with

these durability requirements will be evaluated using severe levels of customer usage through 100,000 miles plus 10 years of severe environmental exposure.

Note: The Reliability Evaluation Point is not, by itself, a complete requirement. Rather, it is a common ”anchor” point used when defining several dependability-related items:

The environmental exposure data in 3.1.3 are stated through the number of years given in the

Reliability Evaluation Point

The customer usage data in 3.1.5 are stated through the number of miles given in the Reliability Evaluation Point.

The longest-term dependability measures (e.g., problems per vehicle or % reliability) are generally stated through the target life.

Any long-term test measures are usually based on environmental exposure through the given number of years, plus customer usage through the given number of miles.

Any long-term field measures are usually based on whichever point, miles or years, occurs first, on average, for the vehicle segment.

Note: Reliability Evaluation Point deploys directly to the subsystem and component specifications.

3.2.3.3 Potential Safety-Related Incidents.

During the design, development and/or validation phases, the vehicle shall have no un addressed safety-related incidents.

A potential safety-related incident is:

one which could occur under any expected combination of environmental and usage conditions, based on those specified in paragraphs TBD and

leads to major injury to any person (e.g. vehicle occupant, pedestrian, or service personnel).

Note: Such an incident will be considered “addressed” when the product has been shown to achieve an acceptable level of risk, as indicated by some measure and/or design feature appropriate to the product’s intended functions. Possible measures include (but are not limited to): a specified reliability value; or specific severity, occurrence, and/or detection rankings in an FMEA. Possible design features include (but are not limited to): redundancy, self-checks, scheduled maintenance, graceful degradation, etc., which will mitigate the effect of the

incident if it occurs, or minimize the possibility of its occurrence. Requirements for specific subsystems and components will be stated in the appropriate product technical specification and/or Statement of Requirements.

3.2.3.4 Potential Walk-Home Incidents.

During the design, development and/or validation phases, the vehicle shall have no un addressed walk-home incidents.

A potential walk-home incident is:

one which could occur under any expected combination of environmental and usage conditions, based on those specified in paragraphs TBD and,

leads to the vehicle being disabled and requiring towing to a repair facility for service.

Note: Such an incident will be considered “addressed” when the product has been shown to achieve an acceptable level of risk, as indicated by some measure and/or design feature appropriate to the product’s intended functions. Possible measures include (but are not limited to): a specified reliability value; or specific severity, occurrence, and/or detection rankings in an FMEA. Possible design features include (but are not limited to): redundancy, self-checks, scheduled maintenance, graceful degradation, etc., which will mitigate the effect of the incident if it occurs, or minimize the possibility of its occurrence. Requirements for specific subsystems and components will be stated in the appropriate product technical specification and/or Statement of Requirements.

3.2.3.5 Reliability Requirements
Reliability is defined as the probability that the System will meet all the performance and durability requirements stated herein, within the operating conditions listed, for the Reliability Evaluation point and other specified time limits.

The functional probability at Reliability Evaluation Point should be minimum 96% field reliability for the Roof Trim System.

In laymen's terms it could be explained like this: GM requires statistical proof that only

Four Roof Trim Systems out of 100 fail to fulfill the requirements after 10 years or 160 900 km.

The supplier shall demonstrate

conformance to the reliability requirement through lab tests designed at the 50% confidence level and in accordance with Engineering Report No. PG068560, May 7, 1998,

Simplified Field Reliability - to -Test Reliability Conversion Process.

Here's an example of the Field vs. Test conversion for a 20* component system:

	Field Reliability	Test Reliability
System Level	0.97.	na
Component Level	0.998	0.99

*assumptions:

Weibull Slope = 1.5 for testing

Customer Variability Ratio = 3

Test to failure is required. Success test maybe approved based on the program business case.

The Roof Trim components, i.e., sun visors, coat hooks, lighting, assist handles, overhead consoles, HVAC outlets, controls & switches, displays, sensors, storage compartment doors, latches, etc., shall have a demonstrated reliability of 99% on test or greater @ one severe customer usage.

Reliability demonstration profiles shall be consistent with the 99.8 percentile customer usage profile (loads, cycles etc.) in combination with environmental stress extremes identified in the product requirements section of this subsystem technical specification. One severe customer usage shall represent a 99.8 percentile customer at 10 Years of exposure and 100,000 miles of usage.

If the test severity (99.8 percentile customer usage and environment) cannot be determined then the component or subsystem shall demonstrate that it is capable of exceeding the reliability of the best-in-segment component/subsystem as selected by GM.

A failure is defined as a loss of function and/or non-compliance to performance requirements described in section 3.0 of this specification. Unless otherwise specified, refer to section 3 for rates of allowable degradation.

The supplier is responsible for design validation (DV) /product validation (PV) of Component and Subsystem reliability demonstration by means of either

physical or analytical test methods. Incorporate as appropriate, accelerated test methods.

3.2.3.6 Critical Incidents

The Roof Trim Subsystem should have no Critical Incidents within its target life when subjected to any combination of usage and environment given in this specification. A Critical Incident is defined as any of the following conditions:

Non-compliance with any applicable governmental regulation

Loss of function that could significantly affect the product's safety, that in leading to major injury to any person such as vehicle occupants, pedestrians, or service personnel.

Loss of function such that the vehicle is disabled and requires repair at a dealership or other repair facility before it can be driven again (for example, "walk-homes" which cannot be addressed at the problem occurrence site via a typical roadside assistance vehicle);

Reasonable efforts should be made to identify critical incidents, perform risk analysis, and address potential incidents.

The vehicle shall have no incidents of any type listed above that have not been addressed before the start of production of saleable vehicles. The incidents intended, are incidents, which occur during development, or validation under conditions expected to occur within the target life and target market area of the vehicle.

An incident or potential incident will be considered "addressed" when the product has been shown to achieve an acceptable level of risk, as indicated by some measure and/or design feature appropriate to the product's intended functions.

Possible measure include (but are not limited to): a specified reliability value; and specific severity, occurrence, and/or detection rankings in a FMEA; and other reliability and safety analysis such as e.g. Fault Tree Analysis.

Possible design features include (but are not limited to): redundancy, self-checks, scheduled maintenance, graceful degradation, etc., which will mitigate the effect to the incident if it occurs, or minimize the possibility of occurrence

3.2.3.7 Class 1-Type and 2-Type Problems

Class 1-Type

Non-compliance with any applicable

governmental regulations;

Loss of function leading to major injury to any person (such as vehicle occupants, pedestrians, or service personnel) and/or major vehicle damage;

Loss of function such that the vehicle is disabled and requires repair at a dealership or other repair facility before it can be driven again (for example, walk home failures which cannot be addressed at the problem occurrence site via a typical roadside assistance vehicle);

Class 2-Type

Vehicle function severely degraded, requiring immediate service at a dealership or other repair facility;

Repair expense greater than $TBD, based on diagnosis, parts, and labor.

Repair time should not be longer than TBD min..

3.2.4 Reliability

3.2.4.1 Reliability Requirements
Reliability is defined as the probability that the sub system will meet all the performance, durability and appearance requirements stated herein, within the operating conditions listed, for the period of target life and other specified time limits.

Reliability at the reliability evaluation point: All parts shall pass the criteria defined for the durability tests. For wear out conditions, testing should be completed to failure. Accelerated testing, which has been approved by the validation engineer may be used to demonstrate this reliability. The reliability should demonstrate a minimum .978 with 50% confidence.

Reliability profiles shall be consistent with the 99.8% customer usage profile at 10 years of exposure. If the test severity cannot be determined then the component or subsystem shall demonstrate that it is capable of exceeding the performance and reliability of the best in class component/subsystem as selected by GM.

3.2.5 Service

3.2.5.1 Serviceability
The following paragraphs define the

constraints and requirements associated with serviceability of the headliner and trim installation. Serviceability is the ease and cost of performing the maintenance, diagnosis, and repair operations necessary to preserve the original performance level of the vehicle throughout its lifecycle.

The Roof Trim Subsystem shall be independently serviceable in accordance with program specific guidelines. Additionally, the following components shall be independently serviceable without removal of the Roof Trim Subsystem.

Sun Shade Assemblies

Coat Hooks

Assist Handles

Overhead Console

Lighting Components

Other components as designated

3.2.5.2 Serviceability / Repairs Requirements associated with service/repair procedures (e.g. components removal/re-installation, target times) will be evaluated and negotiated with the responsible service engineer (Refer to SOR Appendix J, GMN10068 and Appendix J2 CG1188).

This paragraph provides the requirements associated with performing repair procedure(s).

Use interior fasteners like snap-fit, screws, etc to gain fast, easy removal.

Avoid heat staking because once separated, heat staked parts are not reusable. If heat staking is used provide an feasible service repair

No bonding where service activities are involved

Bulbs, interior lighting should be accessible without tools to the customer.

Provide access to connectors or components that are packaged above headliner (e. g. antennae).

Give consideration to one piece headliner designs with reusable fastening systems

Design of the headliner should not include Dual Lock

Wiring should not be integral to the headliner (All wiring harnesses today are 100% glued to the headliner. Comment.)

Specify trim mounted lamps with simple lens and bulb removal

Provide an adequate service loop (lead wire) to allow electrical disconnect with removing the headliner

All fasteners requiring a secondary tool (e.g., socket wrench, box wrench, vice grips) shall have adequate accessibility for the secondary tools

Design interior components (moldings, trim and trim panels) shall be lapped so areas of highest repair potential shall be removed first

Provide clearance for removal and installation of one-piece headliner through the door opening without removing the door, windows, or seat(s). Otherwise, two-piece headliners are preferred.

Modular headliners/roof rail air bag systems must allow for service of the headliner without air bag removal.

Design all MVSS 201 countermeasures to remain fixed to the headliner substrate for the component life

Design an in-line connection for the headliner wiring harness to be located behind upper pillar trim to reduce warranty cost

3.2.5.2.1 Damage or Degradation Due to Service/Repair

Service/Repair procedures shall be completed without damage or degradation to part, or related parts/components.

3.2.5.2.2 Fasteners

All fasteners requiring removal for service/repair of other components, including snap-fits, shall be reusable and will withstand a minimum of ten (10) removal and installation cycles.

Risk of Injury

The performance of repair tasks shall not subject the individual performing the task to risk injury due to contact with hot components, or sharp edges.

3.2.5.2.3 Design of Production Parts for Service

Serviceable sub assemblies and components shall follow the requirements of North American Simultaneous Parts Release Process. http://spo.gm.com/dept/eng/naspe/index.html

Service labor times for diagnosis and removal and reinstallation procedures shall be kept to a minimum to reduce the cost of service, vehicle ownership and Warranty cost.

3.2.5.3 Serviceability, New Essential Tools

The trim panels shall be removable with existing tools (NOTE: A tool categorization has been included in the Delta VTS). Trim panels should not require special knowledge for removal and reinstallation.

The design shall not require any new special tools.

3.2.5.4 Exterior and Interior Cleaning

Headliner and trims shall be capable of being cleaned with any common cleaning agent.

Refer to GM Spec. GM9126P. Type in the GM9126P in the document id after clicking on this link.

http://uspccsaedm01.naeng.gm.com/Global/Eng/EDM/Search.nsf/Standardssearch_D?OpenForm

3.2.5.5 Performance of Maintenance

The headliner and roof trim panels shall not require any maintenance during the life of the vehicle, but provide service access if panels obstruct access to maintainable components.

3.2.5.6 System Diagnosis

This paragraph provides the requirements associated with conducting the system diagnosis to identify the appropriate repair procedure(s).

Provide unobstructed access to electronic control units, wiring harnesses, and connectors for diagnostic activities.

Provide under foldable parts of headliner and/or by disassembling of a component to give an access to the backside of the headliner.

Dome Lamp module, Sliding Roof, CHMSL, Antenna and Antenna socket, microphones, speakers, sensors, actuators, control units and multimedia units.

3.3 Design and Construction

Requirements and constraints applicable to the design and construction characteristics of the Roof Trim Subsystem are identified in the following paragraphs.

Subparagraphs are to contain requirements that constrain or affect the design and physical composition of the subsystem. “Design” here refers to design practices and constraints. “Construction” refers to the materials used and the manner in which they are used.

3.3.1 Materials, Processes, and Parts Selection Guidelines

Constraints and guidelines that apply to the materials, processes, and parts used in the MRT Subsystem follow:

3.3.2 Material Requirements for Recycling

Every effort should be made to ensure that selected materials are recyclable.

3.3.3 Identification and Marking

The Labels & Literature Team recommends that the following paragraphs be added to your SSTS under section 3.3.3 Identification and Marking:

The following labels/embossments/markings are required by government regulations:

- Airbag Caution Label to the visor (FMVSS 208)
- Utility Vehicle Handling Label (CIR 575.105)
- Transmission Shift Pattern Label (if applicable)
- Vehicle Noise Control Label (vehicles > 10,000 lbs)

The following labels/embossments/markings are corporate required:

- Diesel Start Procedure Label (if applicable)
- 'Airbag' marked at deployment locations per NOA GICC-112

3.3.3.1 Design Requirements

Labels must meet the design requirements defined in GMN11194 – *Label Design Criteria General Specification*. The labels must comply with any regulations associated with them. Factors identified in regulations may include location, font size, text and graphic areas, and color. The latest regulations can be found in the Global Legal Database.

3.3.3.2 Visibility

Labels must be readily visible and in close proximity to the component/system they describe. Corporate common labels must be used whenever possible.

3.3.3.3 Label material specifications

Material specifications must be selected in accordance with GM501M - *Automotive Label Material Specification Selector*. Label performance must meet the requirements outlined in GM179M – *Label, Interior, Heat Transfer* for heat-applied labels.

3.3.3.4 Validation

Validation testing must be performed on the labels. Testing must be done on production intent labels located on production intent components, installed using the production process.

3.3.3.5 Identification and Marking Changes

If any changes need to be made to a label, or if a new label needs to be added,

it must be brought to the Corporate Label Core PDT for review and approval.

3.3.3.6 Government Requirements

The following label is required by a government regulation:

Utility Vehicle Label

3.3.3.7 Label Design

This label must meet the design requirements given in the Label Design Criteria section of the Labels & Literature website. The website can be found in Socrates under "L" of the A-Z list. The label must comply with any regulations associated with it. Factors identified in regulations may include location, font size, text and graphic areas, and color. The latest regulations can be found in the Global Legal Database.

3.3.3.8 Label Placement

The label must be readily visible and in close proximity to the component/system they describe. Corporate common labels must be used whenever possible.

3.3.3.9 Label Material

Label material specifications must be selected in accordance with the label material specification section of the Labels & Literature website.

3.3.3.10 Label Validation

Validation testing must be performed on the labels. Testing must be done on production intent labels located on production intent components, installed using the production process.

3.3.3.11 Label Changes

If any changes need to be made to a label, or if a new label needs to be added, it must be brought to the Corporate Label Core PDT for review and approval.

3.3.4 Material Guidelines

Each element of the Roof Trim Subsystem shall meet its individual GM materials specification. Constituent material shall be identified on the subsystem drawing. Generic requirements are:

Plastic Interior Parts

GME requirement: Plastic interior parts must comply with the requirements of GME 00004.

GMNA requirement: Plastic interior parts must comply with the requirements of GM2617M.

All materials shall comply with the restricted and reportable substance for parts requirements given in GMW3059.

All materials shall be optimized for recyclability to provide maximum end-of-life cycle value per GMW3116.

Headliner Substrate construction shall comply with the following:

GM2745M +++++ when not superceded by this SSTS.

3.3.4.1.1 Build Materials to be Avoided
PVC, lead, mercury, hexavalent chromium and cadmium shall not be used.

3.3.4.1.2 Restricted and Reportable Substances
The Roof Trim shall comply with GMW3059, Restricted and Reportable Substances for Parts, most recent version.

3.3.4.2 Recycling/Recovery
3.3.4.2.1 Design of Recyclable/Recoverable Systems
Per GMW3116, Recyclability/Recoverability Guidelines, most recent version
No calculations according to chapter 4 in GMW3116 is required.

3.3.4.2.2 Use of Recycled Materials
There are a number of recycled materials that are approved to GM Material Specifications. Please refer to GMW3116, Recyclability/Recoverbility Guidelines, most recent version for examples.
For GMNA, contact the Design for Environment Group for further information.
For GME , refer to recycled materials file or contact *GME-ITDC Environmental Strategy & Regulations*.
GMSupplyPower - Engineering Power - library, folder: GM Europe / ITDC - Opel / Vehicle Recycling
3.3.4.2.3 Design for Pre-Treatment Prior to Recycling
The Roof Trim shall allow for fast deployment and/or removal of all pyrotechnical items during the pre-treatment phase.

3.3.4.2.4 Marking of Polymeric Parts
PER GMW3116, Recyclability/Recoverability Guidelines, most recent version

3.4 Documentation

The Roof Trim Subsystem documentation requirements are:

Installation procedures shall be developed and included in the Product Assembly Document (PAD).

Removal and reinstallation procedures shall be developed and included in the service manual of the vehicle.

Cleaning instructions shall be developed and included in the vehicle owner's manual.

Feature instructions for operations shall be included in the vehicle owner's manual.

Incomplete vehicles (i.e. up-fitter van) shall provide additional information as furnished in the Incomplete Vehicle Document.

3.4.1 Assignment of Requirements to Components

Requirement Description	Headliner	Sunvisor	Assist Handle	Roof Console	Interior Lighting	Energy absorber
Fogging	X	X	X	X	X	X
Flammability	X	X	X	X	X	X
Impact Strength	X	X	X	X	X	X
Smell	X	X	X	X	X	X
Color/Gloss	X	X	X	X	X	X
Mould	X	X	X	X	X	X
Toxicity	X	X	X	X	X	X
Dust	X	X	X	X	X	X
Heat Resistance	X	X	X	X	X	X
Heat Aging	X	X	X	X	X	X
UV-resistance	X	X	X	X	X	X
Moisture Aging	X	X	X	X	X	X
Varying Climate	X	X	X	X	X	X
Rigidity	X	X	X	X	X	
Scratching	X	X	X	X	X	
Resistance To Chemicals	X	X	X	X	X	X
Head Impact	X	X	X	X	X	X
Energy Absorption	X	X	X	X	X	X
BS&R	X	X	X	X	X	X
Mass	X	X	X	X	X	X
Ergonomics		X	X		X	X
Field of Vision	X	X	X	X	X	
Interior Fittings	X	X	X	X	X	
Occupant protection	X	X	X	X	X	X

4 Validation

4.1 General

The following paragraphs of this section identify the validations by which it must be shown that the Roof Trim Subsystem satisfies the requirements given in this document. Paragraph 4.2 relates the subsystem requirements to the procedures to be used in the validation process. Subparagraphs of paragraph 4.3 provide additions/clarifications of existing procedures that are needed to fully validate the subsystem or give brief descriptions of necessary procedures

where none presently exist. Note that Section 4 is not the validation plan, but does provide technical input to the validation plan. The level of the car at which the validation is to be performed is included in the Validation Cross-Reference Index (VCRI) and in the Development Planning Schedule.

4.2 Validation Cross Reference Index

The Validation Cross-Reference Index (VCRI), Table 4.2-I, relates the Roof Trim Subsystem requirements to their associated validation procedures. The VCRI identifies the applicable validation procedures, the method of validation (test, analysis, demonstration, or inspection) to be performed, the level (vehicle, subsystem, or component) at which the validation is to be performed, and whether General Motors or the MRT Subsystem supplier is responsible for the validation.

Table 4.2-I Validation Cross-Reference Index

REQUIREMENT		VALIDATION				
Description	Paragraph	Procedure	Paragraph	Method	Level	Responsibility
Appearance Harmony		Design Review	---	I	V	Supplier, GM
Physical Content		Design Review	---	I	S	Supplier
BOP Compliance		GMBOP 32206	---	D	V	Supplier
Module Component Retention		TBD	---	T	S,V	Supplier
Module Mechanical Integrity		TBD	---	T	V	Supplier
Installation Ergonomics		NAO Ergonomic Guidelines	---	D	V	Supplier
Headliner to Weather strip Interface		Appearance assessment	---	I	V	Supplier, GM
Headliner to Garnish Molding Interface		Appearance assessment	---	I	V	Supplier, GM
Roof Trim Interior Lighting		Design Review Appearance Assessment	---	T	S	Supplier
Electrical Power and Signal Interface		Design Review	---	I	S	Supplier

REQUIREMENT		VALIDATION				
Description	Paragraph	Procedure	Paragraph	Method	Level	Responsibility
Module Provides HVAC Ducting		Design Review	---	I	S	Supplier
Controls and Displays		Design Review		I	S	Supplier
Module to Sunroof Interface – Edge of Headliner is not visible from inside or out.		Design Review	---	I	V	Supplier
Roof Trim System to BIW		Design Review	---	I	V	Supplier
Structural Module Design Interface with BIW		Design Review	---	I	V	Supplier
Roof Panel Damping		Measure Vibration Decay	---	I	C,V	Supplier
Sunvisor Design and Swing Envelope		Design Review	---	I	V	Supplier
Safety Management		Comply to SSTS, FMVSS 201U, FMVSS 208, Etc.	---	I	V	Supplier, GM
FMVSS201U Head Impact		TP-201U-01	---	T	V	Supplier, GM
FMVSS208 Labels		FMVSS208 Section S4.5	---	I	C	Supplier

Appendix C GMW General Specification Template

REQUIREMENT		VALIDATION				
Description	Paragraph	Procedure	Paragraph	Method	Level	Responsibility
Roof Rail Airbag System – Interface to Headlining		Install System	---	D,T	V	Supplier
Product Characteristics -- All requirements		Test at environmental conditions noted in 3.1.3	---	T	C,S, V	Supplier
Performance		Verify compliance with GM Material Standards	---	T	C	Supplier
Appearance Harmony		Design Review	---	I	C,V	Supplier, GM
Export Requirements		Design Review	---	I,T	C	Supplier
Squeak and Rattle		GMW14011	4.1.6	T	S	Supplier
Module Mechanical Integrity		TBD	TBD	D,T	V	Supplier
Component Positional / Structural Integrity		Physical Test to SSTS	---	T	C, V	Supplier
Environmental Cycling		GM9505P Cycle H-Modified	---	I,T	C,S	Supplier
Fogging		SAE J1756	---	T	S	Supplier

REQUIREMENT		VALIDATION				
Description	Paragraph	Procedure	Paragraph	Method	Level	Responsibility
Flammability		FMVSS302, FMVSS302, TRIAS 48 GM9070P	---	T	S	Supplier
Color Fastness to Light		SAE J1885	---	T	S	Supplier
Dust		STD3977	---	T	S	Supplier
Mildew Resistance		GM 9128P		T	S	Supplier
SAAB Material Requirements		Comply to SAAB SSTS Requirements	---	T	S	Supplier
Headliner Appearance		Appearance assessment.	---	I	V	Supplier, GM
Headliner Shape and Surface Fidelity		Headlining material assessment	4.3.4	T	C	Supplier, GM
Headliner Acoustic Performance		Analytical Method ASTM C423	4.3.1	T	C	Supplier
Structural Capability of Headliner Material		Headlining material assessment	4.3.3	T	C	Supplier
Odor Requirements		Measure Odor SAE J1351 (modified), GM9209P, & STD 1060 - #6	4.3.2	T	C	Supplier

REQUIREMENT		VALIDATION				
Description	Paragraph	Procedure	Paragraph	Method	Level	Responsibility
Headliner Indentation Recovery		Time Recovery	---	T	C	Supplier
Headliner Adhesion Peel		GM3602M	---	T	C	Supplier
Sunvisor Assembly		Design Review	---	I	C	Supplier
Sunvisor Pull Out Force – Pivot to Arm Receiver		Apply Force	---	T	C	Supplier
Pull Out Force from Body		Apply Force	---	T	C	Supplier
Permanent Set		Apply Load	---	T	C	Supplier
Sunvisor Indentation Recovery		Time Recovery	---	T	C	Supplier
Sunvisor Cold Impact Resistance		GM9032P	---	T	C	Supplier
Shock		Impact Attachment	---	T	C	Supplier
Sunvisor Hydrolytic Stability		GM9231P	---	T	C	Supplier
Sunvisor Adhesion Peel Requirements		GM3602M,	---	T	C	Supplier
Sunvisor Odor		Measure Odor (SAE J1351 (modified))	4.3.1	T	C	Supplier
Convenient Features		Design Review	---	I	C	Supplier

REQUIREMENT		VALIDATION				
Description	Paragraph	Procedure	Paragraph	Method	Level	Responsibility
Sunvisor Vanity Package Mounting Provisions		Design Review	---	I	C	Supplier
Sunvisor Vanity Light Intensity		Measure Light Intensity	---	I	C	Supplier
Sunvisor Vanity Continuous-On		TBD	---	T	C	Supplier
Sunvisor Assembly Map Strap Retention/Flexibility		Load Map Strap	---	T	C	Supplier
Sunvisor Assembly Map Strap Pullout Strength		Apply force	---	T	C	Supplier
Sunvisor Assembly Map Pocket Retention/Flexibility		Load Map Pocket	---	T	C	Supplier
Auxiliary Sunvisor Efforts		Measure efforts	---	T	C	Supplier
Sunvisor Assembly Package Programmable GDO		Design Review	---	I	C	Supplier
Sunvisor Assembly Rotational Force		Measure Efforts	---	T	C	Supplier
Sunvisor Assembly Detent Force		Measure Efforts	---	T	C	Supplier

REQUIREMENT		VALIDATION				
Description	Paragraph	Procedure	Paragraph	Method	Level	Responsibility
Sunvisor Assembly Position Stability		Inspect for stability	---	T	V	Supplier
Sunvisor Assembly Pivot Force		Measure Efforts	---	T	C	Supplier
Sunvisor Sliding Operation		Measure Force	---	T	C	Supplier
Sunvisor Extender Operation		Measure Force	---	T	C	Supplier
Vanity Mirror Cover - Hinged		Measure Force	---	T	C	Supplier
Vanity Mirror Cover - Sliding		Measure Force	---	T	C	Supplier
Vanity Mirror Retention		Measure Force	---	T	C	Supplier
Vanity Auto Shut-off Switch		Measure Force	---	T	C	Supplier
Hi-Lo Intensity Switch		Measure Force	---	T	C	Supplier
Vanity Mirror Lens Retention		Measure Retention Force	---	T	C	Supplier
Sunvisor Assembly Center Support Retention		Measure Retention Force	---	T	C	Supplier
Sunvisor Assembly Pull Down Moment, Detent, & Rotation Durability Cycles		Measure Efforts, Check for Retention	---	T	C	Supplier

REQUIREMENT		VALIDATION				
Description	Paragraph	Procedure	Paragraph	Method	Level	Responsibility
Sunvisor Assembly Pivot Durability Cycles		Measure Efforts, Check for Stability	---	T	C	Supplier
Sunvisor Assembly Mirror Cover Durability Cycles		Measure Force, Check for Obstruction	---	T	C	Supplier
Sunvisor Assembly Extender/Sliding Durability Cycles		Measure Force, Impact in both directions	---	T	C	Supplier
Sunvisor Assembly Center Support Retention Durability Cycles		Measure Force	---	T	C	Supplier
Auxiliary Sunvisor Rotational / Detent / Sliding Durability Test		Measure Efforts	---			
Squeak and Rattle Degradation		GMN 5160 TP	---	T	S	Supplier
Sunvisor Assembly Lighted Vanity Cover – Sliding / Hinged / Auto Shut-off Switch Durability Cycles.		Measure position / angle	---	T	C	Supplier
Sunvisor Assembly Lighted Vanity Hi-Lo Intensity Switch Durability Cycles.		Measure force	---	T	C	Supplier

REQUIREMENT		VALIDATION				
Description	Paragraph	Procedure	Paragraph	Method	Level	Responsibility
Coat Hook Assembly Modular to Headliner		Design Review	---	I	C,V	Supplier
Coat Hook Dynamic Road Performance		Perform dynamic road test	---	T	V	Supplier, GM
Coat Hook Ultimate Load		Measure Load	---	T	C	Supplier
Hinged Coat Hook Ultimate Load		Measure Load	---	T	C	Supplier
Coat Hook Load Durability Cycle		Apply Load	---	T	C	Supplier
Coat Hook Impact Strength		GM2617M	---	T	C	Supplier
Assist Handle Assembly Modular to Headliner		Design Review	---	I	C	Supplier
Assist Handle Assembly Convenience Features		Design Review	---	I	C	Supplier
Assist Handle Ultimate Load		Apply Load	---	T	C	Supplier
Hinged Assist Handle Pull Down Moment		Measure Force	---	T	C,V	Supplier

REQUIREMENT		VALIDATION				
Description	Paragraph	Procedure	Paragraph	Method	Level	Responsibility
Hinged Assist Handle Detent/Extension and Retraction Efforts		Measure Efforts	---	T	C	Supplier
Assist Handle Lamp Lens Retention		Apply Load	---	T	C	Supplier
Pull Down Moment, Detent, and Rotation Durability Cycles		Apply Load	---	T	C	Supplier
Assist Handle Impact Strength		GM2617M	---	T	C	Supplier
Roof Trim Lighting Assembly		Design Review	---	I	S	Supplier
Roof Trim Lighting Performance		Interior Lighting SSTS, CM20104 (BOM Row 40.4) & SAAB 4975769	---	T	V	Supplier
Electrical Performance		Power & Signal SSTS or EEIC 80.20.01 and/or EICC TBD SSTS (for Switches).	---	T	V	Supplier
Mechanical Performance		Operate Switches	---	D	V	Supplier, GM

REQUIREMENT		VALIDATION				
Description	Paragraph	Procedure	Paragraph	Method	Level	Responsibility
Light Leak Performance		Inspect for leaks	---	I	C	Supplier
Lighting and Electrical Performance		TBD	---	T	C	Supplier
Wire Harness Assembly		TBD	---	T	C,V	Supplier
Electrical Performance Durability		Power and Signal Distribution SSTS, EICC 80. 201. 01	---	T	C,V	Supplier
Roof Console to Headlining		Design Review	---	I	S	Supplier
Overhead Console Attachment		Cycle Functional Portions	---	D	V	Supplier
HVAC Outlets and Ducts/Air Caps to Headliner		Design Review	---	I	S	Supplier
HVAC Duct/Air Cap Attachment		Design Review	---	I	S	Supplier
HVAC Air Flow		Measure Air Flow	---	T	V	Supplier, GM

REQUIREMENT		VALIDATION				
Description	Paragraph	Procedure	Paragraph	Method	Level	Responsibility
Stowage Compartment		Measure LOAD	---	T	V	Supplier
Cover Load-Net		SAAB TFI-99-0285	---	T, I	C,V	Supplier
Controls, Switches and Displays Modular to Headlining		TBD	---	D	S	Supplier
Controls, Switches and Displays Functional Performance		EICC **TBD** SSTS	---	T	V	Supplier, GM
Structural Compliance		See Paragraph 3.2.1.1.7	---	D	V	Supplier, GM
Miscellaneous Features Modular to Headlining		TBD	---	D	S	Supplier
Miscellaneous Features Primary Attachment Integrity		Design Review	---	T	S,V	Supplier
Miscellaneous Features Functional Performance		Design Review	---	I,T	S	Supplier
Electrical connector location		Design Review	---	I	S	Supplier
Dimensions and Capabilities		Design Review	---	I	S	Supplier

REQUIREMENT		VALIDATION				
Description	Paragraph	Procedure	Paragraph	Method	Level	Responsibility
Mass Requirements		Develop Mass Target	---	I	S	Supplier
Handling Robustness		See SSTS	---	D	S	Supplier
Target life		See VTS		D	S	Supplier
Critical Incidents		See SSTS		D	S	Supplier
Reliability		See VTS	---	D	S	Supplier
Reliability Requirements		DFMEA	---	D	S	Supplier
Serviceability		See SSTS Requirements	---	D	V	Supplier
Material Guidelines		See SSTS Guideline Requirements	---	T	C	Supplier
Materials to be Avoided		Design Review	---	D	S	Supplier
Restricted and Reportable Chemicals		Design Review	---	D	S	Supplier
Design for Recyclable/Recoverable Systems		TKLE 97-0007	---	D	S	Supplier
Development / Sourcing Process Guidelines		See SSTS	---	I	S	Supplier
Field of Vision		TIB-TM-P019	---	T	V	Supplier, GM
Occupant Protection		FMVSS 208	---	T	V	Supplier, GM
Occupant Protection		FMVSS 214	---	T	V	Supplier, GM

Note: A--analysis; D--demonstration;

I--inspection; T---test

V---vehicle; S---subsystem (the Roof Trim Subsystem and perhaps one or more components of another subsystem); C---component (one or more of the parts of the MRT Subsystem)

4.3 Supporting Paragraphs

The following paragraphs define/describe modifications to existing procedures and/or additional procedures that are needed to be able to adequately verify that the Roof Trim Subsystem meets its complete set of requirements.

5 PROVISIONS FOR SHIPPING

GM manufacturing logistics group determines if parts require sequenced delivery. See SOR Appendix H for delivery requirements.

6 NOTES

6.1 Glossary

Auxiliary Sunvisor: A second Sunvisor used to shade the sun from the front when the main Sunvisor is pivoted to the side. It is typically smaller than the main Sunvisor, stored under the main Sunvisor and rarely contains convenience features.

Hand (finish): The tactile qualities of a fabric, e.g., softness, firmness, elasticity, fineness, resilience, and other qualities perceived by touch.

Modular Assembly: A Headlining Assembly with attached components such as Sunvisors, coat hooks dome lamps and assist straps.

Reliability: A measure of a product's ability to perform its intended functions within specified performance levels for a given period of time under stated conditions.

Sabin: A unit of Acoustic absorption equivalent to the absorption by one square foot of a perfect absorber: W. Sabine, an American physicist.

Tactility: The capability of being felt or touched.

Target Life: The time interval throughout which a product is to function within defined.

Up fitter: Incomplete vehicle that is sold to a conversion company.

Vanity: The mirror positioned on the Sunvisor Assembly

Cracks: Breaks extending through the surface later of a composite or laminate so that the under laying layer is visible, or completely through a one-layer specimen.

Serious injury: Life threatening or permanently disabling injuries.

Shall: Denotes a binding provision that must be met.

Should: Denotes a preference or desired conformance, which if not met must be documented

Validation: The formal process of

confirming, through analysis, demonstrations, inspections, and/or tests, that a product meets its requirements.
Analysis: Simulation of the product and the specified conditions using mathematical representation (e.g., mathematical models, algorithms, and equations), and evaluating the results.
Demonstration: Exercising the product, under specified conditions, in accordance with a procedure, and noting the results.
Inspection: Examination of the product to note specified physical characteristics.
Test: Exercising the product, under specified conditions, in accordance with a test procedure, collecting quantitative data via test instrumentation, and evaluating the results.

6.2 Acronyms, Abbreviations, and Symbols

AIAG: Automotive Industry Action guide.
ASTM: American Society of Testing and Materials
BOM: Bill of Material
BOP: Bill of Process
CMVSS: Canadian Motor Vehicle Safety Standard
DFM/DFA: Design for Manufacturing/Design for Assembly
DFMEA: Design Failure Mode Analysis
FMVSS: Federal Motor Vehicle Safety Standard
FNA: Functional Name Address
GMUTS: General Motors Uniform Test Specifications
HDLNG TR FIN-ASM FNA for the Modular Roof Trim Subsystem
HIC(d): Head Injury Criteria (from FMVSS201)
HVAC: Heater/Vent/Air Conditioner
MATSPC: GM approved source list for materials
NAO: North American Operations
PPAP: Production Parts Approval Process
RTS: Roof Trim Subsystem
SAE: Society of Automotive Engineers
SEC: Systems Engineering Center (GM)
SSLT: Subsystem Leadership Team
SSTS: Subsystem Technical Specification
TBD: To be determined
UPC: Uniform Parts Classification
VCRI: Validation Cross-Reference Index

Saab
ADR: Australian Design Rules
BOP: Bill of Process
CMVSS: Canadian Motor Vehicle Safety Standard
CTS: Component Technical Specification
EEC: European Economic Community
ECE: Economic Commission for Europe
FMEA: Failure Modes and Effects Analysis

FMH: Free-Motion Head form
FMVSS: Federal Motor Vehicle Safety Standard
N/A: Not Applicable
NHTSA National Highway Traffic Safety Administration
RRAB: Roof Rail Airbag

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