



Inside and Outside Rear View Mirrors - Shared Requirements

1 Introduction

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

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

1.1 Scope. This standard establishes the minimum requirements and associated test methods that are shared between, and apply to all Inside Rear View Mirrors (ISRV) and all Outside Rear View Mirrors (OSRV) for use in passenger cars, multi-purpose passenger vehicles and trucks, engineered by General Motors (GM) for the worldwide market. Requirements that apply uniquely to different types of mirrors and/or their features are found in other documents.

1.2 Mission/Theme. Not applicable.

1.3 Classification. Not applicable.

2 References

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

2.1 External Standards/Specifications.

72/245/EEC	GSO 422
2003/97/EC	ISO 11469
2005/27/EC	JIS D5705
2009/19/EC	Korea Article 50
ADR 14/02	Korea Article 111-15
ADR 42/02	Mercosur GMC 32/94
AIS-001/2001	Norway Chapter 30
AIS-002/2001	SAE J1344
AIS-037/2002	SAE J1545
CMVSS 111	SAE J1739
CNCA-02C-059: 2005	SAE J2886
CONTRAN 226/07	Taiwan Item 25
ECE R46.01	Taiwan Item 29
ECE R46.02	TRIAS 29
FMVSS 111	TRIAS 39
GB15084-2006	TRIAS 62-2004
GSO 42	TRIAS 62-2-2004

GSO 421

2.2 GM Standards/Specifications.

GMW3059	GMW15760
GMW3116	GMW15804
GMW3172	GMW15942
GMW6992	GMW15943
GMW7293	GMW16044
GMW14528	GMW16224
GMW15272	

2.3 Additional References.

- AIAG (2008). FMEA-4: Potential Failure Mode and Effects Analysis (Reference Manual) - 4th Edition. AIAG - Automotive Industry Action Group.
- Commission Internationale De L'Eclairage (CIE) International Commission on Illumination web site at <http://www.cie.co.at>.
- Engineering Drawing Services web site at http://gmna1.gm.com/engineering_drawing_services/.
- Global Design infoBOOK web site at <http://gmna.gm.com/external/infobook/>.
- GM Catalogue of Engineering Solutions (COES) in the GM Global BOM Tool.
- GM Global Fastening Catalog web site at: <http://gmna1.gm.com/eng/globfast/supplypower/globalcat/globalcatalog.pdf>.
- Key Characteristics Designation System (KCDS) web site at <http://gmna1.gm.com/kcdfs/>.
- Supply Power web site at <http://www.gmsupplypower.com>.

3 Requirements

3.1 System/Subsystem/Component/Part Definition.

3.1.1 Appearance. The following applies to both ISRVs and OSRVs. Appearance requirements that are specific to certain types of mirrors will be documented in another standard or elsewhere in the Statement of Requirements (SOR).

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3.1.1.1 Styling. The shape of the mirror will be co-developed by resources at the GM Design Studio and the Product Development Team (PDT). The final styling of the part will balance aesthetics, perceived quality (PQ) requirements, marketing and/or program objectives, supplier criteria, GM engineering criteria, appearance engineering requirements, etc.

3.1.1.2 Perceived Quality. The mirror shall look smooth and finished with no exposed fasteners, holes, sharp edges, gaps, gates, visible electrical wiring, or objectionable parting lines due to poor tooling conditions visible from the installed vehicle position.

3.1.1.3 Color, Gloss, and Grain.

3.1.1.3.1 Mold-In Color Components. All mold-in color components of the mirror shall match master standard plaques for color, gloss, and grain (texture).

3.1.1.3.2 Painted Components. All painted components of the mirror shall match master standard plaques for color and gloss and shall meet GM's requirements for painted parts appearance.

3.1.1.3.3 Hardware Components. All hardware components (i.e., actuator motor packs, brackets, springs, fasteners, washers, etc.) that may be visible to the customer in the mounted vehicle position must be black.

3.1.2 Content.

3.1.2.1 Physical Content. Not applicable.

3.1.2.2 Functional Content. Not applicable.

3.1.3 Ambient Environment. Unless otherwise specified, tests shall be performed in the as received condition at $T_{room} = 23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.

3.1.4 Interfaces. Not applicable.

3.1.5 Usage Definition. The range of physical dimensions of the user population shall be bounded by the dimensions of the 5th percentile female and the 95th percentile male.

3.2 Product Characteristics.

3.2.1 Performance Requirements.

3.2.1.1 Regulatory Requirements. The mirrors shall comply with all global regulatory requirements, and shall be certified (when required) for all countries in which GM does business unless otherwise stated in the SOR. The list of governmental documents has to be updated on a regular basis since new editions can always be introduced. If this standard has not been updated recently, check the validity of the following regulations before usage and/or distribution.

Regardless, the Supplier Integrated Engineer (SIE) and the GM Lead Engineer are both co-responsible for meeting all applicable government regulations, as identified in the Validation Cross-Reference Index (VCRI) in Section 4.

Note: While the details of some countries' regulations may be based on, or in some cases, be an exact replicate of, another regulatory body's standards such as Economic Commission for Europe, (ECE R46.01, and ECE R46.02) or FMVSS 111, this section is only referencing the specific regulations for each example country. In addition, not all countries are listed below as this is not intended to be all-inclusive, but rather a sampling of the various existing regulations.

3.2.1.1.1 Australia.

- ADR 14/02 Rear Vision Mirrors.
- ADR 42/02 General Safety Requirements.

3.2.1.1.2 Brazil.

- CONTRAN 226/07 Rear View Mirrors.

3.2.1.1.3 Canada.

- CMVSS 111 Rear View Mirrors.

3.2.1.1.4 China.

- CNCA-02C-059: 2005 Compulsory Certification.
- GB15084-2006 Rear View Mirrors.

3.2.1.1.5 Economic Commission for Europe.

- ECE R46.02 Rear View Mirrors.

3.2.1.1.6 European Community (EC).

- 2003/97/EC Rear View Mirrors.
- 2005/27/EC Rear View Mirrors.
- 2009/19/EC Electromagnetic Compatibility.
- 72/245/EEC Electromagnetic Compatibility.

3.2.1.1.7 Gulf Cooperation Council.

- GSO 42 General Safety Regulations.
- GSO 421 Rear View Mirrors Testing.
- GSO 422 Rear View Mirrors.

3.2.1.1.8 India.

- AIS-001/2001 Rear View Mirrors.
- AIS-002/2001 Rear View Mirrors.
- AIS-037/2002 Safety Critical Component.

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3.2.1.1.9 Japan.

- TRIAS 29 Rear View Mirrors.
- TRIAS 39 Rear View Mirrors.
- TRIAS 62-2004 Direct Frontal FOV.
- TRIAS 62-2-2004 Immediate Front and Left Hand (LH) Mirrors.

3.2.1.1.10 Korea.

- Article 50 Rear View Mirror.
- Article 111-15 Rear View Mirror.

3.2.1.1.11 Mercosur.

- GMC 32/94 Rear View Mirrors.

3.2.1.1.12 Norway.

- Chapter 30 Mirrors.

3.2.1.1.13 Taiwan.

- Item 25 Rear View Mirrors.
- Item 29 Rear View Mirrors.

3.2.1.1.14 United States.

- FMVSS 111 Rear View Mirrors.

3.2.1.2 Reflective Surface - Color Hue (Non-Auto-Dimming). The green/red balancing factor a^* and the yellow/blue balancing factor b^* shall be limited by the chroma value equation:

$$C^* = [(a^* + da^*)^2 + (b^* + db^*)^2]^{1/2} < 16$$

Colored glass is permissible where desired. (Reference Figure 1: CIELAB Color Chart; also CIE web site, <http://www.cie.co.at>, for more information).

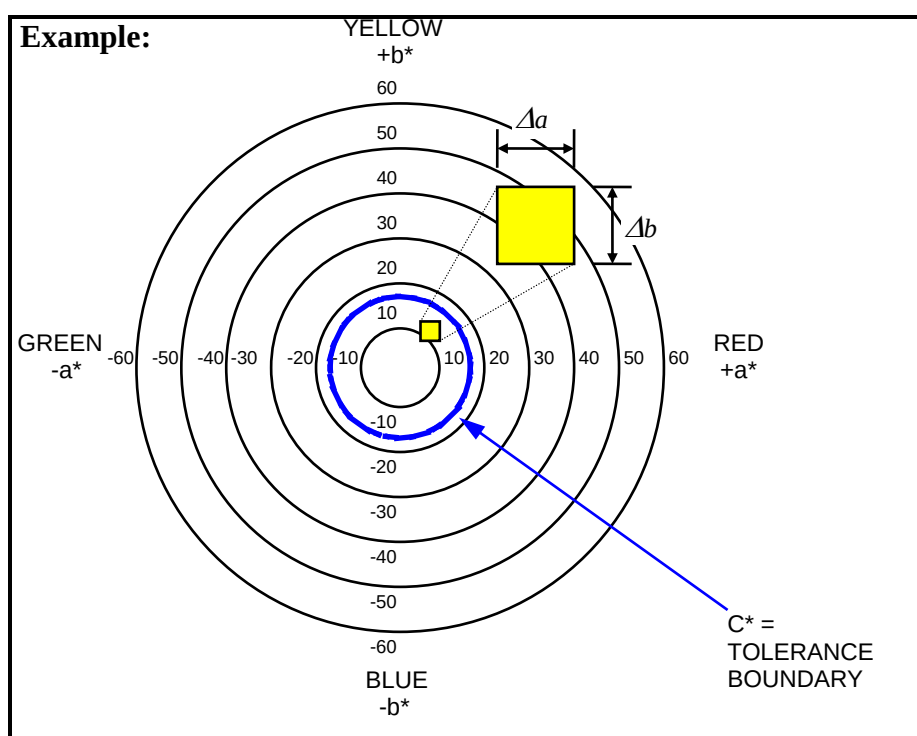


Figure 1: CIELAB Color Chart

3.2.1.3 Reflective Surface - Color Hue Tolerance (Non-Auto-Dimming).

da^* and db^* = ± 1 for uncolored glass

= ± 3 between driver and passenger

3.2.1.4 Reflective Surface – Distortion. Distortion must not exceed values listed below when tested to JIS D5705.

3.2.1.4.1 OSRVM.

3.2.1.4.1.1 Flat Glass. One of the following two requirements shall be met.

3.2.1.4.1.1.1 Flat mirror glass distortion shall not exceed 2.0%. In addition, the Supplier shall demonstrate 3.7 sigma statistical capability (i.e., 1 discrepant part of 10 000).

3.2.1.4.1.1.2 D = 1.0% maximum.

3.2.1.4.1.2 Convex Glass. D = 4.0% maximum.

3.2.1.4.1.3 Aspheric Portion. Not applicable.

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3.2.1.4.1.4 Auxiliary Mirror. D = 8.0% maximum.

3.2.1.4.2 ISRVM.

3.2.1.4.2.1 Flat Glass. D = 2.0% maximum.

3.2.1.5 Reflective Surface - Double Images (2nd Surface Only). Images seen in the mirror shall be concentric, overlapping or tangent at any driver's viewing angle, and shall not be separated when tested as described below.

3.2.1.5.1 Equipment.

- Red Spot Projector.
- Box with a 12.7 mm aperture.
- No. 3480 Corning Yellow Red Glass Filter.
- 25 W bulb.

3.2.1.5.2 Preparation.

3.2.1.5.2.1 Cover aperture with No. 3480 Corning Yellow Red Glass Filter.

3.2.1.5.2.2 Place the Red Spot Projector 4.67 m from the test sample.

Note: This simulates the size of a 190.5 mm (7.5 in) diameter headlight at 91 m (300 ft).

3.2.1.5.3 Procedure.

3.2.1.5.3.1 Turn on the Red Spot Projector and position the observer so that their back is to the projector and the beam of light is aimed over their shoulder.

3.2.1.5.3.2 The observer shall be positioned between 380 and 510 mm from the mirror.

3.2.1.5.3.3 The observer will see a red dot in the mirror. Move the mirror so that the red dot moves around the surface of the glass, and check for double images per the criteria.

3.2.1.6 Reflective Surface - Unit Magnification/Flatness. Meet applicable regulatory requirements. For regions following FMVSS 111 or CMVSS 111, the inside mirror and driver's side outside mirror shall have unit magnification as required by FMVSS 111 or CMVSS 111. Unit magnification is measured using an illuminated grid of 12.7 mm graduations and a clear aperture eyepiece, and by measuring at the mirror, using a pair of calipers and a precision scale. The mirror is placed in a holding fixture at a distance of 500 + 100 mm from the grid and from the clear eyepiece.

3.2.1.7 Reflective Surface - Safety Backing (Anti-Shatter).

3.2.1.7.1 Coverage. For single-plane glass mirrors only, the anti-shatter coating must cover the mirror glass completely, except a maximum of 2.5 mm uncoated along the edges.

3.2.1.7.2 Performance. After the glass breaks, fragments separated from mirror surface shall not exceed the size limits specified in ECE R46.01, and ECE R46.02.

3.2.1.7.2.1 Preparation. The test shall be made on a mirror assembly which has passed the required environmental exposure tests.

3.2.1.7.2.2 Procedure. Perform the mirror pendulum impact test. Test five mirror glass components at 0 °C and +70 °C, after 1 h soak. Replacement of the mirror glass components and impact test must be completed within 1 minute after removal from the respective storage temperature. Verify that the impact resulted in glass breakage. If not, mount the mirror so that the glass is facing upward and dropping a steel ball of mass 900 g from a height of 1.0 m onto the geometrical center of the mirror.

3.2.1.8 Free Fall.

3.2.1.8.1 Purpose. This test shall verify that the component will not suffer functional degradation after a falling event if no visible damage is observed. Damage may occur if the component is dropped on the floor during handling, assembly, or service.

3.2.1.8.2 Procedure. Perform per GMW3172.

3.2.1.8.3 Samples that show visible damage are not considered failures and will be removed from test.

3.2.1.8.4 Samples that show no visible damage must be able to meet performance requirements.

3.2.1.9 Squeak and Rattle.

3.2.1.9.1 ISRVM and OSRVM Subsystem. 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 and Rattle Noise Glossary**.

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 to demonstrate resolution in a vehicle prior to exiting the program phase. If the noise is found in pilot or

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production, the supplier will be responsible to develop a containment plan (and fix), as well as 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 and at no additional cost to GM. The Supplier will be responsible for the S&R performance of their subsystem.

3.2.1.10 Bending Test.

3.2.1.10.1 Procedure. Test per the procedure outlined in China specification GB15084-2006.

3.2.1.10.2 The reflecting surface of the mirror must not break during the test described; however, breakage will be allowed if one of the following conditions is fulfilled.

3.2.1.10.2.1 The fragments of glass shall still adhere to the protective housing or to an object firmly attached to the housing.

3.2.1.10.2.2 Partial separation of the glass is admissible provided that this does not exceed 2.5 mm on either side of the cracks.

3.2.1.11 Corrosion Resistance. The mirror assembly must meet the requirements of GMW15272.

3.2.2 Physical Characteristics.

3.2.2.1 Dimensions and Capacity. Not applicable.

3.2.2.2 Mass Properties. Not applicable.

3.2.3 Reliability.

3.2.3.1 Reliability Evaluation Point. Not applicable.

3.2.3.2 Reliability Requirements.

3.2.3.2.1 Minimum. Reliability: 98%, Confidence: 50%.

3.2.3.2.2 Strategy. The preferred approach to meeting this requirement is to test 6 pairs of mirror assemblies minimum to 2 lives with no failures, stop testing after 3 lives with operational checks after each completed life. The VCRI in Section 4 lists minimum sample sizes.

3.2.3.2.3 Sample Selection. The sample selection procedure is to conform to GMW15760.

3.2.4 Serviceability. The following paragraphs define the constraints and requirements associated with serviceability of the Inside Rear View Mirrors and the Outside Rear View Mirror subsystem. 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 target life.

3.2.4.1 Service Infrastructure.

3.2.4.1.1 Essential Tools. The subsystem shall not require the development of any new **essential tools**, for the performance of diagnosis, maintenance, and repair procedures.

3.2.4.1.2 Fasteners/Fittings/Connectors/Seals.

3.2.4.1.2.1 All serviceable fasteners that are considered reusable shall withstand a minimum of five (5) remove and replace procedures.

3.2.4.1.2.2 Fasteners with a service specification of torque plus angle should be avoided in the areas where customer performed maintenance or service is recommended (wheel lug nuts, oil pan drain plug, etc.)

3.2.4.1.2.3 Effort should be made to avoid the use of torque to yield fasteners in areas where fasteners are typically reused or in areas where an adjustment point is located.

3.2.4.1.2.4 Fasteners requiring a back-up wrench for removal shall have adequate clearance for back-up tools.

3.2.4.1.2.5 The system shall use fasteners that are readily available from GM.

3.2.4.1.2.6 Dynamic torque values shall be provided for service publications.

3.2.4.1.2.7 Quick connectors/fittings and seals shall be reusable and serviceable separately.

3.2.4.2 Maintenance.

3.2.4.2.1 Performance of Scheduled/Unscheduled Maintenance.

3.2.4.2.1.1 System components shall not interfere with normal maintenance procedures.

3.2.4.2.1.2 The ISRV and OSRV shall not require any periodic or schedule maintenance for the target life of the vehicle.

3.2.4.2.2 Lubricants and Chemical Products. Lubricants and chemical should be compatible with current products already released by GM.

3.2.4.2.3 Exterior and Interior Cleaning. The system shall be capable of being cleaned with any current cleaning agents currently released by GM.

3.2.4.2.4 Washability. Perform the Static Tests per GMW14528 ("Low-Pressure Hose", "High-Pressure Spray Wand", "Universal Water Test Booth (UWTB)", and "Commercial Automatic Car Wash"). The OSRVs shall not cause interference or be damaged by any of the car wash equipment as evaluated by GMW14528 Vehicle Total Body Water for washability.

3.2.4.3 Repair.

3.2.4.3.1 Mechanical and electronically integrated components shall be serviced separately.

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3.2.4.3.2 System components shall be accessible for adjustment or replacement with standard shop hand tools without removal of unrelated parts or components.

3.2.4.3.3 Repair procedures shall be completed without damage or degradation to the service part or related components.

3.2.5 User System/Subsystem/Component/ Part Interface. The mirror shall be designed to meet all Human Vehicle Integration (HVI) requirements and criteria.

3.3 Design and Construction.

3.3.1 Materials, Processes and Parts Selection Guidelines.

3.3.1.1 Material Guidelines. Materials shall be selected from the "Materials Decision Tree" of the GM Materials Engineering Requirements appendix in the SOR and/or the GM Materials Engineering Preferred Materials Catalogue (Materials BOM).

3.3.1.1.1 Restricted Materials, Environmental Protection, and Toxicity.

3.3.1.1.1.1 The use of Polyvinyl Chloride (PVC) as product material is not recommended; its use must be approved by GM.

3.3.1.1.1.2 If sulfur in any form is used in any of the components involved (e.g., rubber buttons), then the use of a silicone lacquer (to coat the Printed Circuit Board (PCB), etc.) is absolutely not allowed. This prohibition is required to reduce the risk of silver alloys corroding in the components.

3.3.1.1.2 Regrind and/or Remelt.

3.3.1.1.2.1 No regrind and/or remelt material is to be used for any non-painted surfaces/parts that are visible to the customer.

3.3.1.1.2.2 If regrind and/or remelt material is to be used in the production of any other component parts, then a part made from the maximum amount of regrind/remelt must meet all part requirements. To satisfy this objective, samples (quantity per the VCRI) must be made from the maximum amount of regrind/remelt, and these samples must be tested, documented, and certified to product specifications as part of the component Analysis, Development, Validation Plan & Report (ADVP&R), and the Production Part Approval Process (PPAP).

3.3.1.2 Processes Guidelines.

3.3.1.2.1 Parting Lines. Parting line location and quality must be approved by the GM Design Quality and Verification (DQ&V) group.

3.3.1.2.2 Ejector Pins. Location of ejector pins must be approved by GM Engineering prior to the start of tool construction.

3.3.1.2.3 Mold Gates. Location of molding gates must be approved by GM Engineering prior to the start of tool construction.

3.3.1.3 Parts Guidelines.

3.3.1.3.1 Fasteners. All fasteners used must be listed in the GM Global Fasteners Catalogue, which can be accessed through www.gmsupplypower.com.

Reference:

<http://gmna1.gm.com/eng/globfast/supplypower/globalcat/globalcatalog.pdf>.

3.3.1.3.2 Corporate Common Components. If a mirror assembly or one of its subcomponents are designated as a GM Corporate Common Component (CCC), and this CCC meets the functional, feature, and styling requirements of the part being considered for development, then this CCC must be used in place of developing a new subcomponent or assembly.

3.3.1.3.3 Vehicle BOM Picks. All future mirrors released for vehicle usage will be selected from recommended and approved BOM row variants, as documented in the GM Catalogue of Engineering Solutions (COES) in the GM Global BOM Tool.

3.3.2 Design Guidelines and Constraints.

3.3.2.1 All three dimensional (3D) math data shall be released in UniGraphics/Teamcenter and meet the requirements/standards of GM Vehicle Product Engineering as documented in GM "Global Design infoBOOK". Reference:

<http://gmna.gm.com/external/infobook/>.

3.3.2.2 Each mirror Part Number (PN) is to be released in 3D math data as an assembly of sub-assemblies and/or subcomponents (i.e., glass, bezel, shell, etc.) If a sub-assembly and/or subcomponent has a GM PN assigned to it (i.e., it is a service-released part, a CCC, a fastener, etc.), then this GM PN must be used as the file name for that sub-assembly and/or subcomponent. The remaining assemblies and/or subcomponents are to be released as alpha-numeric files.

It is permissible to also have additional sub-assemblies beneath the final PN where it makes sense to organize the file as such (i.e., an ISRVM double-pivot mount assembly as part of the ISRVM itself). It is not acceptable to group all the 3D math data together within the PN file itself; GM PNs or alpha-numeric for each discrete subcomponent must be used per the requirements/standards of GM Vehicle Product Engineering as documented in GM "Global Design infoBOOK".

Reference:
<http://gmna.gm.com/external/infobook/>.

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Documents

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