



Inside and Outside Rear View Mirrors, Certification Field of Vision, ECE R46.01

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.

This standard describes how to validate/certify the vision rays and lines describing the geometric field of vision of rear view mirrors. These vision rays and lines assist in demonstrating compliance with European standard, Economic Commission for Europe (ECE); ECE R46.01 for Inside Rear View Mirrors (ISRV) and Outside Rear View Mirrors (OSRV).

1.1 Purpose. The purpose of this analysis is to demonstrate that the vehicle meets the requirements of European standard, ECE R46.01, for ISRV and OSRV. The Mirror Certification function allows Unigraphics (UG) users to perform analysis on driver's side and passenger's side OSRV and ISRV. This function will generate vision rays and lines describing the geometric field of vision of rear view mirrors, along with reporting out the numerical results and summarizing the input data.

1.2 Applicability. This standard complies with European standard, ECE R46.01, for Inside and Outside Rear View Mirrors.

1.3 Remarks. While in the past, a physical witness test was used to demonstrate that the vehicle's mirrors meet these requirements, this is an analysis procedure, which is the standard certification method currently performed internally at GM. The certification analysis is done within UG through the function Mirror Certification in the general packaging menu.

Note: Reference GMW16157 for additional requirements which support ISRV and OSRV certification.

2 References

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

2.1 External Standards/Specifications.

ECE R46.01 SAE J1100

2.2 GM Standards/Specifications.

GMW16157

2.3 Additional References.

- GM Global Best Practice OSRV-9 Minimum Glass Size Requirements. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.
- GM Global Best Practice OSRV-11 Obscuration of the Mirror Glass Reflective Surface Criteria. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.
- GM Global Best Practice ISRV-32 Inside Rearview Mirror Certification Requirements. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.
- GM Global Design infoBOOK at <http://gmna.gm.com/external/infobook/>
- Mirror Certification User Guide. Reference UG under the menu GPD 5-B; select Documentation, GPD 5-B.3 Application Information, scroll down to MMR Mirror Certification, and then select Users Guide.
- Seating Arrangement Drawing.

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- Suspension Heights and Wheel Travel Document.

3 Resources

3.1 Facilities. Not applicable.

3.2 Equipment. UG workstation with Vehicle Assembly Structure (VAS) access.

3.3 Test Vehicle/Test Piece. See 4.3.1 for revision and variant rules.

3.4 Test Time. Not applicable.

3.5 Test Required Information. See Appendix A.

3.6 Personnel/Skills. Personnel capable of performing analysis within the Mirror Certification function with UG.

4 Procedure

4.1 Preparation. Certification model is built up with parts from the VAS, see 4.3.1.

4.1.1 Review the detailed information in the GM Global Design infoBOOK, at the following website:

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

4.1.2 Review the Mirror Certification User Guide. This is part of the UG software package. Look under the menu **GPDL 5-B**; select **Documentation**, and then **GPDL 5-B.3 Application Information**. Scroll down to **MMR Mirror Certification**, and then select **Users Guide**.

4.1.3 Review the GM Global OSRVM Best Practices OSRVM-9 and OSRVM-11. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.

4.1.4 Review the GM Global ISRVM Best Practice ISRVM-32. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.

4.2 Conditions. Not applicable.

4.2.1 Environmental Conditions.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.2.3 Coordinates. The Mirror Certification function is built on the assumption that the data is in vehicle position and follows GM data creation standards. In particular, that the X direction is established such that X increases from the front to the rear of the vehicle (length), that the Z component increases from the ground upward (height), and that the Y component starts at the centerline of the vehicle and increases heading outboard to the right (cross-car). The standard GM coordinate system should be used, i.e., Cartesian, right-oriented, X, Y, Z-system with axes according to Figure 1.

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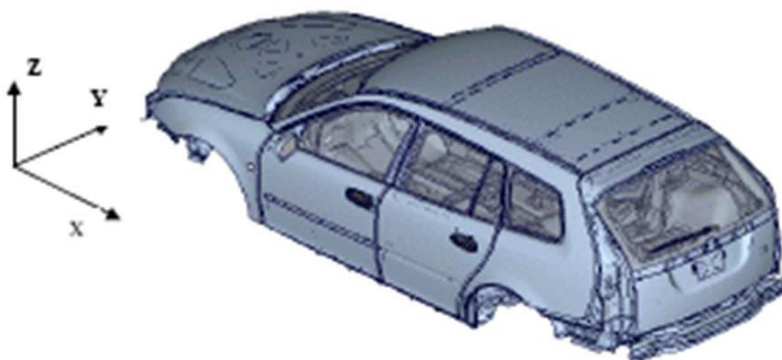
Figure 1: Standard GM Coordinate Directions

Where:

X: Rearwards in the vehicle, starting from in front of the front bumper.

Y: Rightwards in the vehicle, starting from the center of the vehicle.

Z: Upwards, starting from below the body.

**4.3 Instructions.**

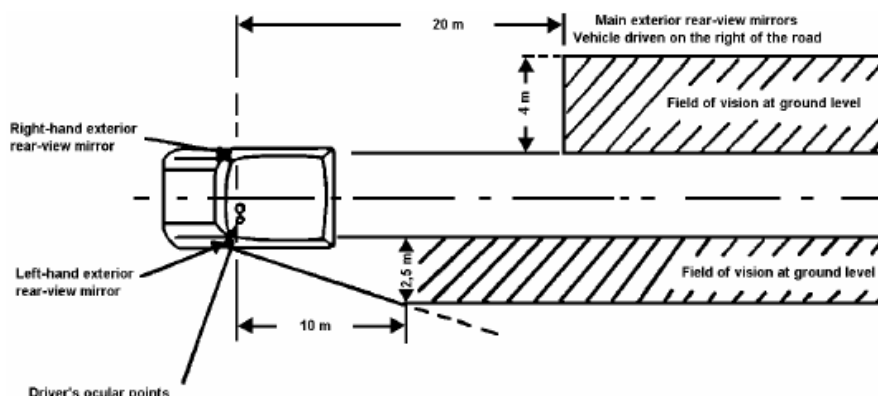
4.3.1 Certification Model. The certification model is built up with parts from the Vehicle Assembly Structure (VAS) system, or Teamcenter Engineering (TcAE). The parts, mirrors, backlight and other needed parts (e.g., side panel outer, etc.) shall have the revision rule equal to a status representing serial production before loading them into UG. Also be sure that the variant rule is set to the correct product line, body design, market specification and steering wheel position.

Note: The standard can also be used during the development phase of a vehicle project. Then, the revision rule should be set to status, which corresponds to the actual development phase.

4.3.1.1 The hip point must be included. It is found in the Seating Arrangement Drawing from the packaging group. Furthermore, the ground line must be included. This originates from the vehicle loading. The points needed to create this line are found in the Suspension Heights and Wheel Travel Document from the Chassis Subsystem Management Team (SMT).

4.3.1.2 Driver's Side Mirror. The ECE standard specifies that the target distance is 10 m behind the driver's ocular point for driver's side mirrors. The OSRVM **ground wide point** is defined as the vehicle's widest outboard point behind the mirror (may be different driver's side versus passenger's side). The target width for driver's side mirrors is 2.5 m outboard from the driver's side ground wide point. This driver's side Field of View (FOV) is shown in Figure 2 for a Left Hand (LH) drive vehicle.

Figure 2: OSRVM Field of Vision for LH Drive

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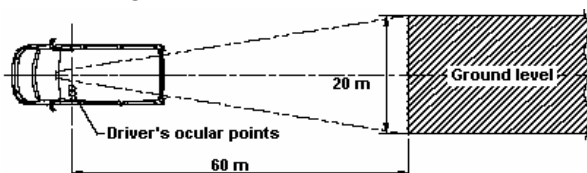
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4.3.1.3 Passenger's Side Mirror. The ECE standard specifies that the target distance is 20 m behind the driver's ocular points for passenger's side mirrors. The OSRVM ground wide point is defined as the vehicle's widest outboard point behind the mirror (may be different driver's side versus passenger's side). The target width for passenger's side mirrors is 4 m outboard from the passenger's side **ground wide point**. This passenger's side Field of View (FOV) is also shown in Figure 2 for a LH drive vehicle.

4.3.1.4 Inside Mirror. The ECE R46.01 standards state that the field of vision must be such that the driver can see at least a 20 m wide, flat, horizontal portion of the road centered on the vertical longitudinal median plane of the vehicle and extending from 60 m behind the driver's ocular points to the horizon, as shown in Figure 3. The ISRVM ground point is defined as a point at $Y = 0$ (vehicle's centerline), 60 m behind the hip point along the ground line.

Figure 3: ISRVM Field of Vision



4.3.2 Certification Standard. The certification is done within UG through the function Mirror Certification in the general packaging menu. The Mirror Certification function provides numerical and visual performance of a given mirror design. It is the user that actually certifies the mirror when the results are compared to the established national rear view mirror standards. The Mirror Certification function for OSRVM is virtually identical for driver's side and passenger's side mirrors. Therefore, only the driver's side Mirror Certification analysis is discussed.

4.3.2.1 Basic High Level Sequence.

4.3.2.1.1 Select the Location and the Standard, and then select OK to continue. This will lead to the next dialog: **Mirror Definition**.

4.3.2.1.2 Follow the cue line messages and select all the required objects. Select OK to continue. Next, the **Hip Point** selection dialog will be displayed.

4.3.2.1.3 Select the **Hip Point** (i.e., the **R-Point**) based on the standard, and then select OK to continue. This will lead to the next dialog: **Options**.

4.3.2.1.4 Change the Default Mirror Construction if desired, including adjusting the required Convex Radius. Do not select the **Deviate from Standard** option, unless specifically stated in the detailed steps of Appendix A or Appendix B. Select the restrictions to certify with mirror restrictions. Select OK from the Options dialog. This will lead to the next dialog: **Output Options**.

4.3.2.1.5 Select the optional colors for output, and then enter any user remarks. Select OK to continue the processing.

4.3.2.1.6 The mirror certification output will appear. Save this text to a file. This shall later be included in the Simulation Report.

4.4 Result Evaluation.

4.4.1 Results Presentation. The results shall be presented as per the following examples in Table 1, Figure 4 and Figure 5, along with Table 2. Figure 6 shows the ISRVM output in the larger context of the analysis model.

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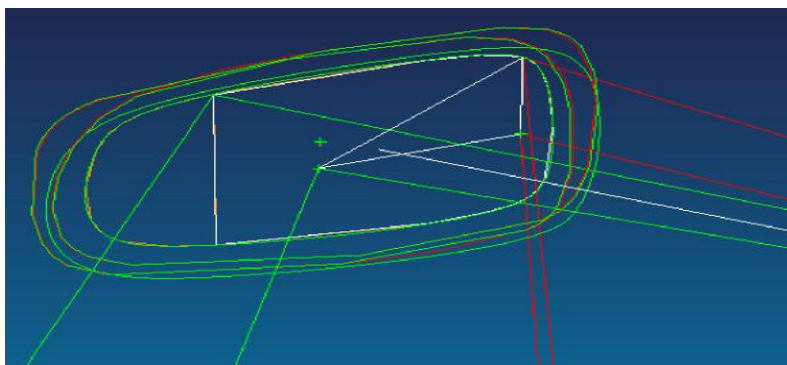
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Table 1: Table of Analyzed Models

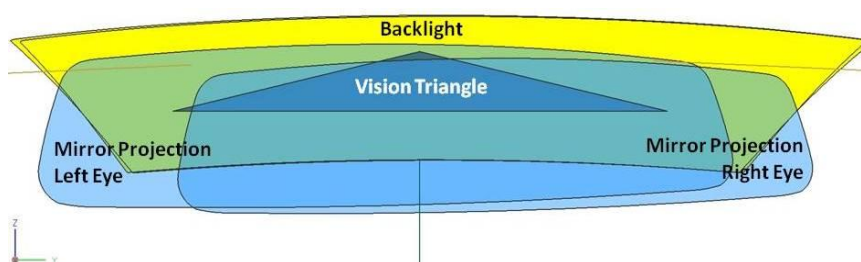
	Outside Rearview Mirror: Driver's Side Left Hand (LH)
	Outside Rearview Mirror: Passenger's Side Right Hand (RH)
	Inside Rearview Mirror

Figure 4: OSRVM Output, Vision Triangle



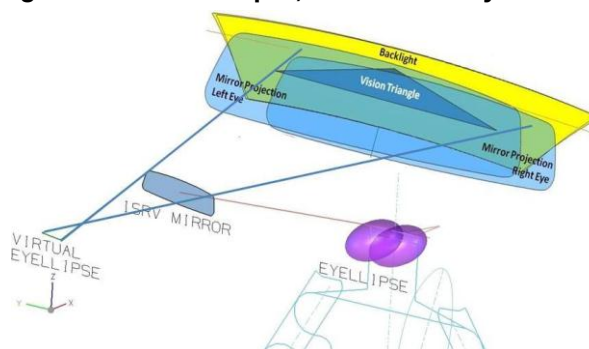
Note: Include a picture of vision triangle displayed on the mirror glass for each mirror (Driver's side mirror shown; passenger's side is similar).

Figure 5: ISRVM Output, Rear View Mirror Projection on Backlight



Note: For Inside Rear View Mirrors (ISRVM), the projection on the backlight shall also be included.

Figure 6: ISRVM Output, with Full Analysis Model



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Table 2: Mirror Certification Function Results Summary ^{Note 1, Note 2}

Mirror Certification Passenger Outside		Summary Results	Units
Standard	=	Europe (M1/N1) only	Not applicable
Designation	=	ECE R46.01	Not applicable
Standard Distance	=	20 000.0000	mm
Standard Width	=	4000.0000	mm
Mirror Rotation Angle Left Side (LS) View	=	3.6237	degrees
Mirror Rotation Angle Plan View (PV)	=	1.8106	degrees
Head Turn Angle PV	=	0.0000	degrees
Maximum Ambinocular Angle PV	=	14.4293	degrees
Ambinocular Angle at Ground PV	=	10.8332	degrees
Inboard Deviation	=	12.4362	mm
Outboard Deviation	=	31.6450	mm
System Messages:		Vision Triangle is NOT Obstructed	

Note 1: This example is for the passenger's side Outside Rear View Mirror (OSRVM). Each mirror can produce a similar results summary.

Note 2: For certification, must review the "Complete Results" report for each mirror (Driver's side and Passenger's side OSRVM and the ISRVM) which is different and more detailed than this Table 2 "Results Summary" report.

Key: M1 = Passenger Vehicles, N1 = Commercial Vehicles.

5 Data

5.1 Calculations.

5.2 Interpretation of Results. See Appendices for the detailed steps to obtain calculated results from the mirror certification function within UG general packaging menu.

5.3 Test Documentation. See Appendix A (Inside Mirrors) and/or Appendix B (Outside Mirrors), Results Presentation (see 4.4.1) and Simulation Report.

6 Safety

This standard may involve hazardous materials, operations, and equipment. This standard does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

7 Notes

7.1 Glossary.

Backlight Sheet for ISRVM Only: Indicates the rear window (backlight) Day Light Opening (DLO). The backlight DLO should take into account any intrusions caused by the following geometric elements, Center High Mounted Stop Lamp (CHMSL) housing and dot matrix blackout. See InfoBOOK for how to handle the dot matrix blackout.

Bezel Curve for OSRVM Only: Represents the inside periphery of the closed protective cover (or shell) around a mirror. Review allows the user to view the previously selected sheet.

The best definition for the bezel curve(s) is the rearmost face of the mirror housing which acts as a window through which the mirror glass must provide vision. Generally, each mirror assembly is designed new and the housing is developed around the mirror glass envelope.

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