



Exterior Plastic Lens Quality Appearance Requirements

1 Scope

1.1 Material Description. This standard describes the surface appearance and quality requirements for exterior plastic lenses. The requirements are described in terms of appearance attributes and surface blemishes for each zone within a part. The purpose of these requirements is to ensure that the level of final finish on GM vehicles meets or exceeds the level expected by our customers.

1.2 Symbols. Not applicable.

1.3 Applicability. Exterior lighting plastic lenses, such as, outer lenses, inner lenses, reflex lenses, light guide or light pipe components. This specification does not cover glass lenses or transparent, translucent, opaque or metalized decorative components such as bezels, covers, accent blades or rings. This specification is only intended for applications where light intentionally passes through the component to meet regulated lighting device output.

1.4 Remarks. GM Perceptual Quality Best Practices should be observed. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.

1.4.1 Deviations. Deviations accepted by GM require, in every case, GM signed boundary samples that are stored by the supplier and accepted by both GM Design Appearance Quality and the respective assembly plant. The visual comparison to accepted boundary samples is always the most decisive method. For evaluating appearances that are subject to interpretation, pick master and boundary samples that are acceptable to all parties involved through assembly. The supplier and GM assembly plant should agree on target, upper limit, and lower limit boundary samples. Appearance Approval Report (AAR) samples should be used for standard reference and initial part submissions.

2 References

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

2.1 External Standards/Specifications.

SAE J361

2.2 GM Standards/Specifications.

GMW3059

GMW3221

GMW15424

2.3 Additional References.

- ACT Laboratories, Hillsdale, MI 49242, Phone (517) 439-1485
- BYK-Gardner, 9104 Guilford Road, Columbia, MD 21046, Phone (800) 343-7721, or at www.byk.com
- GM Perceptual Quality Best Practices

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221.

3.1.1 Sample Conditioning. All samples are to be conditioned prior to each requirement test to GMW3221, Code D or Code B for moisture sensitive materials.

3.2 Physical Requirements. Exterior lighting lenses are divided into different type designation to allow different quality standards depending on physical features or final assembly location of the components. Special Appearance Zones may be defined on the design record (print). In the absence of that, and if zones have not been otherwise specified by Customer Supplier Quality or Engineering, the guidelines in Table 1 should be used.

3.2.1 Completed Vehicle or Part Inspection. For on-vehicle and lamp assembly audits or component review, all exterior lighting lenses shall be inspected in lamp assembly position. Inspection shall be approximate vehicle position, straight-on sight (normal to outer lens surface) and at various angles, at a viewing distance of 600 mm from the observer (as a reference, a business card placed next to the part should be readable by the inspector or at other distances as specified in SAE J361). It is expected and common practice for the inspector to hold the lamp assembly at arms-length for ease of the visual inspection at various angles, however, the final assessment shall be made at the minimum viewing distance criteria as described.

Table 1: Appearance Zones

Zone	Description
A: High Visibility Smooth Surfaces	Visible when viewed normal to outer lens surface from a standing position to lamp assembly, in car position. Typically, the front view of the lamp, but could include side and top wall areas depending on the type of lamp.
B: High Visibility with texture or optical features, including but not limited to reflex optics, pillow optics.	Visible when viewed normal to outer lens surface from a standing position to lamp assembly, in car position. Typically, the front view of the lamp, but could include side and top wall areas depending on the type of lamp.
C: Moderately Visible	Visible from eye level positions and angles other than straight on view of the defect or visible when vehicle closers (hood, deck lid, tail gate) are open.
D: Low Visibility	This zone is selected when the condition of the surface cannot be easily seen in the lamp assembly when observed from various angles at various heights. Low Visibility zones are considered hidden from view while in lamp assembly position

3.3 Inspection Conditions and Work Areas.

3.3.1 Lens inspection shall be conducted in a clean and well organized work environment, free of dust, dirt and adverse influences.

3.3.2 The work areas shall be well lit to support consistent identification of appearance defects. It is recommended that lighting intensity be at least 100 candela. Indirect lighting is preferred to eliminate glare and reflections that can distort or mask conditions.

Note: The American Society for Non-Destructive Testing recommends a minimum of 160 lx (15 foot candles) for general visual inspection and 500 lx (46 foot candles) for critical visual inspection.

Note: In some instances, it is good practice to evaluate materials under natural daylight. There is, however, little control over standard practices due to the natural variability in day-to-day weather conditions, global latitude of the viewing location, time of day during evaluation and the time of the year of the evaluation. As a general rule of thumb, limit outside evaluations to midday hours and view the specimens at waist level.

3.3.3 It is recommended for inspection work areas to have a marked and/or approved part sample showing the appearance zones. These samples, along with Boundary Samples and Operator Instructions, are to be made readily available at the work area and used in training.

3.3.4 The inspection time to identify any imperfection(s) is not limited for exterior lighting lenses. This is to allow thorough review of the complete lamp assembly at various angles.

3.4 Requirements on Delivery.

3.4.1 The appearance must pass all engineering performance specifications for each specific lamp design.

3.4.2 The quality criteria under which appearance can be based upon the different appearance zones are found in Appendix A, Table A1 for uncoated plastic lens components and Appendix A, Table A2 for coated plastic lens components. Sample audits shall be inspected per 3.2.1.

3.5 Orange Peel Measurement. Orange peel is defined as rough or wavy appearance of a coated surface, resembling the skin of an orange. See Appendix A, Table A2 for minimum Orange Peel values for lenses with hardcoat. The following methods for orange peel evaluation can be used:

- BYK-Gardner Wavescan Dual Models AW-4840 (part radius > 0.5 m), see 3.5.1
- BYK-Gardner Micro-wave-scan AW-4824 (part radius > 0.30 m), see 3.5.1
- ACT Laboratories Orange Peel Visual Plaques, see 3.5.2

3.5.1 Equipment is available from BYK-Gardner at 9104 Guilford Road, Columbia, MD 21046, Phone (800) 343-7721, or at www.byk.com. Technical specifications for equipment, including footprint and scan length are available at this same website.

3.5.2 For parts that cannot be measured by the BYK-Gardner Wavescan Dual or Micro-wave-scan meters due to size or shape, visual Orange Peel standards may be used. They can be obtained from ACT Laboratories, Hillsdale, MI 49242, Phone (517) 439-1485. Only purchase GM Orange Peel Standards.

3.6 Parting Lines. Parting Lines are created by design where the tool cavity meets the core, or where the slide is placed in the tool to make the part. The executions of parting lines are critical for good Perceived Quality (PQ) appearance and tactile acceptability. The design shall ensure that outer lens component parting lines will be flush or sub flush to the surrounding body or hood, reference GM Perceptual Quality Best Practices. All parting line locations must be approved by GM Engineering and Design Staff. All tool witness lines (retractor lines and parting lines) must be represented in the lamp math files.

3.6.1 Unless otherwise specified, parting lines for all exterior lighting components shall comply with GMW15424, Procedure for Evaluating Parting Lines.

4 Manufacturing Process

Not applicable.

5 Rules and Regulations

5.1 Legal Regulations. All materials must satisfy applicable laws, rules, regulations and recommendations valid in the country of usage.

5.2 Language. In the event of conflict between the English and domestic language, the English language shall take precedence.

5.3 Inspection and Rejection. Samples of components or materials released to a GM material specification shall be tested for conformity with the requirements of this material specification and approved by the responsible Engineering department prior to commencement of delivery of production level components or materials.

A new approval must be received for any changes, e.g., properties, manufacturing process, location of manufacture, etc. If not otherwise agreed, all testing and documentation normally required for initial release must be completed.

It is the responsibility of the supplier to inform the customer in a timely manner, without solicitation, and to include documentation of all modifications of materials and/or processes and to apply for a new release.

5.4 All materials supplied to this standard must comply with the requirements of GMW3059, **Restricted and Reportable Substances**.

6 Approved Sources

Materials supplied to this specification must be approved by General Motors.

Approved materials and coating system materials are listed in MATSPC. Only systems listed in MATSPC may be utilized to meet the appearance requirements outlined in this specification.