12.1 New Part Approval Process (Supersedes CAPA QSM Sections 3.3.1 – 3.3.9)

12.1.1 Product Development

12.1.1.1 Obtaining OEM Service Part Samples

12.1.1.2 Choosing the OEM Master Part and OEM Material Test Part(s)

12.1.1.3 Storage and Replacement of the OEM Master Part, Related Auxiliary Equipment and Accessories

12.1.1.4 Patent Infringement

12.1.1.5 New Part Approval (NPA) Tests and Inspections

12.1.1.6 Family of Parts

12.1.1.7 Car Company Logos

12.1.1.8 Utility Patents on Car Company Service Parts

12.1.1.9 Lamp Redesign In Order to Achieve Compliance to FMVSS 108 or CAPA QSM Section 12.1.2

12.1.2 FMVSS 108 Requirements or Other, If Not Covered Under FMVSS 108

12.1.2.1 SAE J583 Requirements – Fog Lamps

12.1.2.2 SAE J852 Requirements – Front Cornering Lamps

12.1.2.3 SAE J581 Requirements – Auxiliary Upper Beam Lamps (Driving Lamps)

12.1.2.4 SAE J914 Requirements – Side Turn Signal Lamps and Side Repeater Lamps

12.1.2.5 Thermal Stabilization Requirement – Light Emitting Diodes (LEDs)

12.1.3 Dimensional Verification

12.1.4 Physical Dimensions and Effective Projected Luminous Lens Area

12.1.5 Electrical and Power Requirements

12.1.5.1 Electric Motors and Actuators

12.1.5.1.1 Electric Motor and Actuator Dimensional Requirements

12.1.5.1.2 Electric Motor and Actuator Construction Features

12.1.5.1.3 Electric Motor and Actuator Retaining Features

12.1.5.1.4 Electric Motor and Actuator Operational Characteristics

12.1.5.1.5 Electric Motor and Actuator Performance Tests

12.1.5.1.6 Electric Motor and Actuator Electromagnetic Compatibility – Emissions

12.1.5.1.7 Electric Motor and Actuator Electromagnetic Compatibility – Immunity

12.1.5.1.8 Electric Motor and Actuator Immunity to Electrostatic Discharge (ESD)

12.1.5.1.9 Electric Motor and Actuator Safety or Handling Labels or Markings

12.1.5.1.10 Electric Motor and Actuator Function Following FMVSS 108 Tests

12.1.5.2 High Intensity Discharge (HID) Lamp Assemblies

12.1.5.2.1 High Intensity Discharge (HID) Lamp Components and Ballast Dimensional Requirements
12.1.5.2.2 High Intensity Discharge (HID) Lamp Components and Ballast Construction Features .................................................. 19
12.1.5.2.3 High Intensity Discharge (HID) Lamp Components and Ballast Retaining Features ......................................................... 20
12.1.5.2.4 High Intensity Discharge (HID) Lamp Components and Ballast Performance Tests.................................................................................................................. 20
12.1.5.2.5 High Intensity Discharge (HID) Lamp Components and Ballast Electromagnetic Compatibility – Emissions...................................................... 22
12.1.5.2.6 High Intensity Discharge (HID) Lamp Components and Ballast Electromagnetic Compatibility – Immunity ................................................................. 22
12.1.5.2.7 High Intensity Discharge (HID) Lamp Components and Ballast Immunity to Electrostatic Discharge (ESD)....................................................... 23
12.1.5.2.8 High Intensity Discharge (HID) Lamp Components and Ballast Safety or Handling Labels or Markings.................................................... 23
12.1.6 Illumination, Photometry, and Color Requirements................................. 24
12.1.7 Life and Durability Requirements ............................................................ 24
12.1.7.1 Lens Materials and Molded Lens Performance ........................................ 24
12.1.7.2 Headlamp Assembly Deflection ............................................................ 25
12.1.8 Gaskets, Adhesives, Sealants, and Auxiliary Equipment ............................ 25
12.1.9 Aiming Devices ...................................................................................... 25
12.1.10 Material Requirements............................................................................. 26
12.1.10.1 Metal Components and Fasteners ...................................................... 26
12.1.10.2 Plastic Components, Rubber, and Fasteners ....................................... 26
12.1.10.3 Marking of Plastic Parts and Components ......................................... 27
12.1.10.4 Reflective and Protective Coatings ..................................................... 28
12.1.11 Appearance Inspections ........................................................................... 28
12.1.11.1 Appearance Attribute Definitions ..................................................... 29
12.1.11.2 Part Class Surface Definitions .......................................................... 29
12.1.11.3 Appearance Attribute Acceptance Criteria ........................................ 30
12.1.11.4 Appearance Inspection Comparison Chart – Density of Inclusions in Reflective Surfaces .......................................................... 31
12.1.11.5 Appearance Inspection Comparison Chart – Density of Inclusions in Linear Surfaces .......................................................... 32
12.1.11.6 Appearance Inspection Comparison Chart – Density of Scratches in Reflective or Non-Reflective Surfaces .................................................. 32
12.1.12 Markings and Indicators ........................................................................... 33
12.1.13 Quality Records Inspection......................................................................... 33
12.1.14 Functional, Dimensional, and Appearance Inspection ................................. 33
12.1.15 New Part Approval (NPA) Vehicle Test Fit (VTF) B .............................. 33
12.1.16 Notice of Part Approval ............................................................................ 34
12.2 Maintaining Part Certification .......................................................................... 35
12.2.1 Participant Inspection Requirements (Supersedes CAPA QSM Section 5.2) .......................................................... 37
12.2.2 Validator Verification (Supersedes CAPA QSM Section 5.3) ....................... 37
12.2.3 Random Vehicle Test Fit (RDM VTF)......................................................... 37
12.2.4 Random Material and Functional Testing.................................................. 37
12.2.5 Warehouse Inspections ................................................................. 37
12.3 FMVSS Regulations ................................................................. 38
12  CAPA 301 – Specifications for the Production of Automotive Lighting Parts

This specification outlines CAPA compliance requirements for automobile lighting parts including, but not limited to: fog lamps, front cornering lamps, auxiliary upper beam lamps (driving lamps), headlamps, taillamps, stoplamps, high-mounted stoplamps, license plate lamps, parking lamps, reflex reflectors, intermediate side reflex reflectors, side marker lamps, intermediate side marker lamps, backup lamps, turn signal lamps, turn signal operating units, turn signal flashers, vehicular hazard warning signal operating unit, and vehicular hazard warning signal flashers. All lighting parts must meet these specifications in order to obtain CAPA approval. Included are the specifications for dimensional checks (form and fit), appearance, composition, coating performance, mechanical properties, adhesives, fasteners, hardware, photometric performance, electrical performance, and aiming performance. The criteria for producing lighting parts for certification shall be identified as CAPA Specification 301 or CAPA 301.

This specification does not replace or alleviate any obligation for conformance to:

TITLE 49--TRANSPORTATION

CHAPTER V--NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, DEPARTMENT OF TRANSPORTATION

PART 571--FEDERAL MOTOR VEHICLE SAFETY STANDARDS--Table of Contents

Subpart B--Federal Motor Vehicle Safety Standards

Sec. 571.108  Standard No.  108; Lamps, reflective devices, and associated equipment.
Revised as of October 1st 2002

or any other relevant United States Federal Law. When applicable, Title 49, Part 571 Sect 108 will be referred to in this document as FMVSS 108 or FMVSS requirements. Sections referenced in this document from FMVSS 108 are preceded by “S” (example S5.6.2 refers to Title 49, Part 571 Sect 108, S5.6.2).

Failure to document compliance with FMVSS 108 will render a candidate part ineligible for CAPA certification.

The manufacturer must demonstrate appropriate processes and controls to ensure ongoing compliance with FMVSS 108.
12.1 New Part Approval Process (Supersedes CAPA QSM Sections 3.3.1 – 3.3.9)

12.1.1 Product Development

Full Participants may develop new parts utilizing their method of choice in order to meet the requirements of this standard. CAPA has no requirements regarding a Participant’s technical product development processes, except as they may relate to a part’s meeting specific CAPA new part approval requirements.

12.1.1.1 Obtaining OEM Service Part Samples

CAPA recommends that the Participant begin their product development processes by obtaining OEM service part samples. The Participant may obtain the OEM service part samples by one of the following three methods:

- Purchase the parts from an OEM dealership in the United States. The Participant must keep records for all parts that include a sales receipt with purchase date and the car company part number for the purchased parts.
- Request an optional Vehicle Test Fit A.
- Document and present OEM service parts that they have manufactured for an OEM customer to be used for CAPA certification activities, if they are a supplier of that part to the OEM.

12.1.1.2 Choosing the OEM Master Part and OEM Material Test Part(s)

The Participant must obtain and designate an OEM Appearance/Dimensional/Functional Master Part (OEM Master Part) as an inspection reference standard. This OEM Master Part is to be verified and clearly marked by the Validator, and will be used by the Participant and the Validator during inspections. In addition, the Participant must obtain an OEM Material Test Part(s) which will be tested by a CAPA-approved laboratory to obtain test values and part information upon which CAPA certification shall be based.

12.1.1.3 Storage and Replacement of the OEM Master Part, Related Auxiliary Equipment and Accessories

The OEM Master Part and related auxiliary equipment and accessories must be carefully stored in a manner that preserves their original condition while keeping them readily available for use during inspections. If an OEM Master Part becomes lost or damaged, the Participant must replace it with a new OEM Master Part before the next production run of the part. The replacement OEM Master Part will be verified and clearly marked by the Validator.
12.1.1.4 Patent Infringement

It is the sole responsibility of the Participant to ensure that any part submitted for CAPA certification in no way infringes upon any applicable patent(s).

12.1.1.5 New Part Approval (NPA) Tests and Inspections

Once the Participant has completed tooling, an initial production run of at least 30 pieces shall be produced from which samples will be taken to perform all tests and inspections. The parts must meet the following requirements to qualify for CAPA certification.

<table>
<thead>
<tr>
<th>Test/Inspection</th>
<th>Test/Inspection Party</th>
<th>QSM Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMVSS 108 Requirements;</td>
<td>CAPA-approved laboratory or the Participant in their factory if witnessed by the Validator</td>
<td>12.1.2</td>
</tr>
<tr>
<td>Or as specified by CAPA 301 if no FMVSS 108 Requirements exist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensional Verification</td>
<td>Participant</td>
<td>12.1.3</td>
</tr>
<tr>
<td>Physical Dimensions and Effective Projected Luminous Lens Area</td>
<td>CAPA-approved laboratory or the Participant in their factory if witnessed by the Validator</td>
<td>12.1.4</td>
</tr>
<tr>
<td>Electrical and Power Requirements</td>
<td>CAPA-approved laboratory or the Participant in their factory if witnessed by the Validator</td>
<td>12.1.5</td>
</tr>
<tr>
<td>Illumination, Photometry, and Color Requirements</td>
<td>CAPA-approved laboratory or the Participant in their factory if witnessed by the Validator</td>
<td>12.1.6</td>
</tr>
<tr>
<td>Life and Durability Requirements</td>
<td>CAPA-approved laboratory or the Participant in their factory if witnessed by the Validator</td>
<td>12.1.7</td>
</tr>
<tr>
<td>Gaskets, Adhesives, Sealants, and Auxiliary Equipment</td>
<td>CAPA-approved laboratory or the Participant in their factory if witnessed by the Validator</td>
<td>12.1.8</td>
</tr>
<tr>
<td>Aiming Devices</td>
<td>CAPA-approved laboratory or the Participant in their factory if witnessed by the Validator</td>
<td>12.1.9</td>
</tr>
<tr>
<td>Material Requirements</td>
<td>CAPA-approved laboratory</td>
<td>12.1.10</td>
</tr>
<tr>
<td>Appearance Inspections</td>
<td>Participant</td>
<td>12.1.11</td>
</tr>
<tr>
<td>Markings and Indicators</td>
<td>Participant</td>
<td>12.1.12</td>
</tr>
<tr>
<td>Quality Records Inspection</td>
<td>Validator</td>
<td>12.1.13</td>
</tr>
<tr>
<td>Functional, Dimensional and Appearance Inspection</td>
<td>Validator</td>
<td>12.1.14</td>
</tr>
<tr>
<td>New Part Approval (NPA)</td>
<td>Validator</td>
<td>12.1.15</td>
</tr>
<tr>
<td>Vehicle Test Fit (VTF) B</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
12.1.1.6 Family of Parts

Unique part numbers certified to CAPA 301 that share the same lens, with at least one half of the lens mold being same; the same housing; the same mounting points and/or mounting bracket and fasteners; and are intended for the same vehicle application(s) are identified as being of the same “family” of parts. Differences between part number members of the same family may include lens color and/or prisms; reflector color; bezel color; presence or lack of presence of features such as wire harnesses or bulb shields. The Participant shall complete and submit the CAPA 301 Intent to Certify a Family of Parts Form to the Validator.

Once the proposed Family of Parts is approved by the Validator, only the material testing requirements may be waived on all but one part number family member. If the family is determined to include a part number where one part has a feature such as a wire harness or bulb shield, then the material test must be performed on that part number, i.e. the most complex part number in the family.

12.1.1.7 Car Company Logos

CAPA will certify lighting parts whose car company service counterparts have a logo or trademark identifying the car company brand on a Class A surface of the lamp, providing the CAPA candidate part leaves the corresponding area where the car company logo or trademark appears “blank,” i.e. the corresponding area of the CAPA candidate part would be visually continuous with the surrounding area with regard to facets, smoothness, positioning, color, etc.

12.1.1.8 Utility Patents on Car Company Service Parts

As stated in section 12.1.1.4 Patent Infringement, it is the sole responsibility of the Participant to ensure that any part submitted for CAPA certification in no way infringes upon any applicable patent(s). In the event that a Participant encounters a car company service part with a utility patent and chooses to continue the certification process, the following steps are necessary:

1. The Participant attempts to purchase the patented item or obtain a license to manufacture the item. This is the preferred course of action.

2. If the patent owner refuses to permit a Participant to buy, use, and resell the patented item on commercially reasonable terms, then the Participant may submit a comparable, changed part to CAPA for certification consideration. The part must complete the new part process, including any additional testing as identified by CAPA.

3. The Participant must obtain a legal patent avoidance opinion indicating that the part does not violate the patent from an attorney-at-law (U.S.) who
is also registered with the U.S. Patent and Trademark Office and appears on its roster of registered attorneys.

4. The Participant must submit the changed lamp, with its CCS counterpart, to CAPA, who will then coordinate a review of the lamp by the CAPA Technical Committee. The CAPA Technical Committee will assess the extent of visual deviation from the car company service part for acceptability to users of the part. The changed part should be as similar to the car company version as reasonably possible while not violating the patent. The CAPA Technical Committee may approve or deny the change at its sole discretion.\(^1\) If the CAPA Technical Committee does not approve the change, the part may be changed again and re-submitted for review. All applicable fees apply.

5. If approved by the TC, the Participant submits its attorney’s patent avoidance opinion (in writing with detailed rationale) to CAPA for review by CAPA patent counsel. CAPA’s patent counsel will review the manufacturer’s attorney’s opinion. An evaluation fee per patent number will be charged to the manufacturer to conduct the CAPA evaluation. Participants may contact CAPA for the current evaluation fee.

CAPA shall provide the Participant with the results of its legal counsel’s review. If the result of the review is that the change successfully avoids patent infringement, then the part may continue the certification process. If the result of the review is that the change does not successfully avoid patent infringement, then certification of the part will halt. The Participant may choose to further change the part and resubmit it for another legal opinion, and Technical Committee review. If the Participant chooses not to continue with certification, then CAPA will refund any unused NPA testing fees to the Participant.

12.1.1.9 Lamp Redesign In Order to Achieve Compliance to FMVSS 108 or CAPA QSM Section 12.1.2

All CAPA parts must comply with FMVSS 108 or other applicable specifications and/or compliance tests identified in Section 12.1.2, as appropriate. In the event that a CCS part does not comply with FMVSS 108 or other applicable specification, the Participant must document that the noncompliance is due to a design defect and is not a manufacturing or quality defect observed on a single part. If the only way to comply with FMVSS 108 or other applicable specification is to change the appearance of the part, then the following steps must be followed:

---

\(^1\) If CAPA has approved a part having design elements that result in the part avoiding infringement, CAPA may, at its sole discretion, waive TC review under this procedure for other parts incorporating those same design elements.
1. Document that the demonstrated noncompliance of the CCS part to FMVSS 108 or other applicable specification is design-based, and not specific to the test results of a single part. This will require the documented purchase and testing of multiple CCS parts, at a minimum three parts from different part lots.

2. Notify the Validator, who shall review the Participant’s assertion regarding the CCS part’s noncompliances. This review shall include witness testing.

3. Participant changes the part in order to meet the requirements of FMVSS 108 or other applicable specification.

4. If the part is changed solely to meet the requirements of FMVSS 108 or other applicable specification, the Participant will be required to submit the changed lamp, with its CCS counterpart, to CAPA, who will then coordinate a review of the lamp by the CAPA Technical Committee. The CAPA Technical Committee will assess the extent of visual deviation from the car company service part for acceptability to users of the part. If the CAPA Technical Committee does not approve the change, the part may not proceed with the certification process.

5. If the CAPA Technical Committee approves the change, the Participant may proceed with the certification process. The Validator shall review the change with the Participant and identify any testing that may have to be re-performed, based on the changes made to the part, as well as any additional testing due to the change.

NOTE: A changed lamp must still pass all aspects of CAPA 301 testing including the VTF. Compliance to FMVSS 108 or other applicable specification is only a portion of the CAPA 301 certification process.

12.1.2 FMVSS 108 Requirements or Other, If Not Covered Under FMVSS 108

The Participant must document compliance with FMVSS 108. Failure to do so will render a part ineligible for CAPA certification. In addition, the Participant must demonstrate appropriate processes and controls to ensure ongoing compliance with FMVSS 108.

The CAPA Sample Part must demonstrate and document compliance with FMVSS 108 requirements regardless of any FMVSS 108 non-compliances that the OEM Master Part may demonstrate.

In the event that a lighting part type is not covered under the FMVSS 108 requirements, the Participant must notify the CAPA Validator in writing of the part type
prior to registering the part for certification. The CAPA Validator will research the part type and identify appropriate requirements in lieu of FMVSS 108. The part type and proposed requirements will then be presented to the CAPA Technical Committee for review and approval.

12.1.2.1 SAE J583 Requirements – Fog Lamps

As fog lamps are not covered under FMVSS 108, the Participant must document compliance with SAE J583. Failure to do so will render a fog lamp ineligible for CAPA certification. In addition, the Participant must demonstrate appropriate processes and controls to ensure ongoing compliance with SAE J583.

The CAPA Sample Part must demonstrate and document compliance with SAE J583 requirements regardless of any SAE J583 non-compliances that the OEM Master Part may demonstrate.

12.1.2.2 SAE J852 Requirements – Front Cornering Lamps

As front cornering lamps are not covered under FVMSS 108, the Participant must document compliance with SAE J852. Failure to do so will render a front cornering lamp ineligible for CAPA certification. In addition, the Participant must demonstrate appropriate processes and controls to ensure ongoing compliance with SAE J852.

The CAPA Sample Part must demonstrate and document compliance with SAE J852 requirements regardless of any SAE J852 non-compliances that the OEM Master Part may demonstrate.

12.1.2.3 SAE J581 Requirements – Auxiliary Upper Beam Lamps (Driving Lamps)

As auxiliary upper beam lamps (driving lamps) are not covered under FVMSS 108, the Participant must document compliance with SAE J581. Failure to do so will render an auxiliary upper beam lamps (driving lamps) lamp ineligible for CAPA certification. In addition, the Participant must demonstrate appropriate processes and controls to ensure ongoing compliance with SAE J581.

The CAPA Sample Part must demonstrate and document compliance with SAE J581 requirements regardless of any SAE J581 non-compliances that the OEM Master Part may demonstrate.

12.1.2.4 SAE J914 Requirements – Side Turn Signal Lamps and Side Repeater Lamps

As side turn signal lamps and side repeater lamps are not covered under FMVSS 108, the Participant must document compliance to SAE J914. Failure to do so will render
side turn signal lamps and side repeater lamps ineligible for CAPA certification. In addition, the Participant must demonstrate appropriate processes and controls to ensure ongoing compliance with SAE J914.

The CAPA Sample Part must demonstrate and document compliance with SAE J914 requirements regardless of any SAE J914 non-compliances that the OEM Master Part may demonstrate.

12.1.2.5 Thermal Stabilization Requirement – Light Emitting Diodes (LEDs)

The CAPA Sample Part must undergo a thirty minute thermal stabilization period immediately preceding photometric testing.

12.1.3 Dimensional Verification

The dimensional inspections may utilize a checking fixture, an undamaged vehicle, an appropriate section of an undamaged vehicle, or part staging device and coordinate measuring machine (CMM) to verify dimensions and locations of attachment points. Dimensions of all mounting holes or slots must be compared to the OEM Master Part. The CAPA Sample Parts shall be dimensionally within ±1.50 mm of the OEM Master Part, unless the New Part Approval (NPA) Vehicle Test Fit (VTF) B indicates the necessity for an adjusted tolerance, which may be greater or less than the stated tolerance. The sampling plan shall follow an acceptable industry standard on sampling procedures such as those contained in ANSI/ASQC Z1.4-1993.

The Participant must purchase the appropriate adjacent component part accessories such as trim pieces, name decals, ornaments, and side lighting to determine or verify attachment points, slots, or mounting holes. During the VTF, the Validator will confirm the Participant’s choice of mating parts.

12.1.4 Physical Dimensions and Effective Projected Luminous Lens Area

Corresponding sections of an OEM Material Test Part and CAPA Sample Part shall be compared for thickness. The CAPA Sample Part shall be at least as thick as the minimum thickness of comparable structural areas of the OEM Material Test Part as determined by the CAPA Validator during the New Part Approval Process. Measurements shall be made in accordance with the CAPA Quality Standards Manual, Section 10.1.4 for metal parts and 11.1.9 for plastic parts.

An alternative to the thickness requirement stated above would be for lens thickness to be dictated by performance test such as photometrics (FMVSS 108); impact and inward force such as those cited in SAE-J1383 (December 1996) Sections 5.9 and 5.11 respectively, regardless of part type.
Provided that the OEM Master Part meets the FMVSS requirements, the average effective projected luminous lens area of the CAPA Sample Part must be comparable to the OEM Master Part, except that deviations from the OEM Master Part cannot violate the FMVSS requirements.

12.1.5 Electrical and Power Requirements

The following paragraphs of the CAPA Quality Standards Manual, Section 12.1.5, are applicable only if the CAPA Sample Part includes wiring, circuitry, connectors, or filaments.

Any wire harness, wiring, electrical contact, or other device designed to provide electrical insulation, conductivity, or electrical control will be comparable to the OEM Master Part in wire gauge, material type, insulation properties, conductivity properties, plating characteristics (material, thickness, abrasion, corrosion), spring forces of clips and retainers, or pull forces of clips and retainers. These characteristics must be demonstrated to be comparable by appropriate test methods. In addition, all fasteners, retainers, clips, strain reliefs, guides, adhesives, and foams must be comparable in function, coverage, and strength. Comparable tools and actions are required to manipulate any retainers, clips, strain reliefs, guides, etc., on the CAPA Sample Part as on the OEM Master Part.

The CAPA Sample Part must function in the same manner as the OEM Master Part when performing the same timing/lighting combinations, and when changing between all switch settings. For example, if the OEM Master Part low beam headlights stay on for a moment while the high beams are being switched on, then the CAPA Sample Part low beam headlights must demonstrate a similar action.

12.1.5.1 Electric Motors and Actuators

If the CCS Material Test Part contains electric motors or actuators that provide rotational or linear motion to activate a lamp function, the CAPA Sample Part must provide corresponding electric motors or actuators with comparable dimensions, construction features, retaining features, functions, and performance.

12.1.5.1.1 Electric Motor and Actuator Dimensional Requirements

The dimensions of a CAPA Sample Part electric motor or actuator shall be comparable to the dimensions of the CCS Material Test Part electric motor or actuator to avoid interferences with adjacent vehicle components. The New Part Approval (NPA) Vehicle Test Fit (VTF) B shall verify that the electric motor or actuator do not interfere with adjacent vehicle components.
12.1.5.1.2 Electric Motor and Actuator Construction Features

Construction features of a CAPA Sample Part electric motor or actuator shall be visually comparable to the construction features of the CCS Material Test Part electric motor or actuator.

12.1.5.1.3 Electric Motor and Actuator Retaining Features

Retaining features for a CAPA Sample Part electric motor or actuator shall be visually and functionally comparable to the retaining features for the CCS Material Test Part electric motor or actuator.

12.1.5.1.4 Electric Motor and Actuator Operational Characteristics

The CAPA Sample Part electric motor or actuator shall exhibit operational characteristics that are comparable to the CCS Material Test Part electric motor or actuator at the applicable operating conditions. Operating conditions are dependent on the vehicle application and may include a voltage range, or pulse width modulation (PWM) signals. If it is determined that a range of operating conditions is applicable, then the operational characteristics will be determined for the range that represents the minimum, maximum, and mid-range conditions. A minimum of one CAPA Sample Part electric motor or actuator, and one CCS Material Test Part electric motor or actuator shall be evaluated for operational characteristics. The operational characteristics and associated acceptance criteria guidelines are the following:

<table>
<thead>
<tr>
<th>Electric Motor and Actuator Operational Characteristics</th>
<th>Acceptance Criteria Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of Motion (e.g. Rotational Speed or Linear Speed)</td>
<td>The CAPA Sample Part exhibits a rate of motion that is within ±10% of the CCS Material Test Part rate of motion with the applicable vehicle operating conditions.</td>
</tr>
<tr>
<td>Torque (Nm) or Force (N)</td>
<td>The CAPA Sample Part exhibits a torque or force that is within ±10% of the CCS Material Test Part torque or force with the applicable vehicle operating conditions.</td>
</tr>
<tr>
<td>Power Consumption (Watts)</td>
<td>The CAPA Sample Part exhibits a power consumption that is within ±10% of the CCS Material Test Part power consumption with the applicable vehicle operating conditions.</td>
</tr>
</tbody>
</table>

The operational characteristics of the electric motor or actuator are typically evaluated independent of the lamp assembly; however, if the electric motor or actuator cannot be removed from the lamp assembly without damage, then the Validator may determine that the operational characteristics may be evaluated in the lamp assembly to the extent feasible. If operational characteristics cannot be evaluated in the lamp assembly, then the manufacturer shall identify an alternate method to evaluate the operational characteristics.
assembly, then functional tests may be evaluated in the lamp assembly. Functional tests are distinguished by responses of the lamp assembly components as a result of the motion applied by the electric motor or actuator (e.g. the rotation of an electric motor shaft resulting in movement of a light source). Comparison testing of functional tests may require alternative parameters for determining comparability such as timed responses.

If the Participant or the supplier of the electric motor or actuator has calibrated equipment that can provide operational characteristic data for both a CAPA Sample Part and a CCS Material Test Part, then that data may be submitted to the Validator. It is recognized that operational characteristics in excess of ±10% of the CCS Material Test Part may still be suitable for the application since the actual function provided by an electric motor or actuator may be tolerant of a wider range. CAPA Sample Parts that exhibit operational characteristics in excess of ±10% of the CCS Material Test Part may still proceed with the NPA process, but may require additional evaluations to determine that the variation in the electric motor or actuator does not adversely affect the lamp functions, or lamp components.

12.1.5.1.5 Electric Motor and Actuator Performance Tests

The CAPA Sample Part electric motor or actuator shall remain functional throughout the performance tests, or perform in a manner that is comparable to the CCS Material Test Part electric motor or actuator. The performance tests shall be evaluated with the electric motor or actuator in the lamp assembly, and the lamp assembly positioned in the vehicle orientation. Where applicable for the test, the lamp assembly shall be mounted to a metal fixture using the vehicle mounting positions and appropriate fasteners. A minimum of one CAPA Sample Part and one CCS Material Test Part shall be evaluated for the performance tests. The performance tests are the following:

<table>
<thead>
<tr>
<th>Performance Test</th>
<th>Description</th>
</tr>
</thead>
</table>
| Thermal Cycle with Humidity and Power Cycling | Ten (10) day thermal cycle with humidity profile, with a continuous cycling of the nominal operating voltage to the electric motor or actuator of one (1) hour ON followed by one (1) hour OFF, unless the function of the electric motor or actuator indicates an alternative power cycle frequency. The power cycling may be periodically interrupted for functional tests. The ten (10) day thermal cycle with humidity profile is executed by repeating the 48 hour sequence illustrated in Figure 1 a total of five (5) times. The temperature and humidity extremes, tolerances, dwell times, and ramp rates during the profile are:  
  • High temperature limit of 70 °C ± 3 °C and 4.0 hour dwell time. |
• Low temperature limit of -40 °C ± 3 °C and 3.0 hour dwell time.

• Mid-temperature limit of 25 °C ± 3 °C with variable dwell times based on Figure 1.

• Relative Humidity of 90±5%RH stabilized during the 70 °C ± 3 °C and 25 °C ± 3 °C dwell times. The relative humidity is expected to vary during the thermal transitions, and is uncontrolled at -40 °C ± 3 °C.

• Ramp rates nominally 0.5 °C/minute as indicated in Figure 1. Ramp rates may be varied between 0.5 °C/minute and 1.0 °C/minute if the dwell times are maintained as 4.0 hours for 70 °C ± 3 °C and 3.0 hours for -40 °C ± 3 °C, and the 48 hour profile is maintained by adjusting each 25 °C ± 3 °C dwell period to compensate for the ramp rate.

The maximum number of light sources that could be activated simultaneously in the vehicle shall be powered during the final 30 minutes of each 70 °C ± 3 °C and -40 °C ± 3 °C dwell period. The lamps shall be powered at nominal voltage and in a mode that would be considered worst case conditions for maximum temperature (e.g. high beam rather than low beam if high beam is expected to provide the maximum temperature increase).

Electric motor or actuator functional tests shall be conducted during the final 70 °C ± 3 °C exposure and -40 °C ± 3 °C exposure of each 48 hour sequence as cited in Figure 1. If feasible the functional tests shall be conducted during the dwell times with the lamps unpowered and powered.

Random Vibration with Thermal Cycle and Power Cycling

Random Vibration shall be conducted in accordance with the instrumentation cited in SAE J575 APR2010 Section 4.2.2.b. and operated with the following parameters:

- Frequency range from 10 Hz to 250 Hz.

- Power Spectral Density as cited in SAE J575 APR2010 Figure 2 (includes values of 0.1 g²/Hz at 10 Hz and 0.00408 g²/Hz at 250 Hz).

- Direction of vibration consisting of three (3) independent mutually perpendicular axes as referenced to the vehicle (i.e. vertical, lateral, and longitudinal).
• Test duration of six (6) hours in each independent axis (total of 18 hours of vibration).

• Value of Grms of 1.81.

The SAE J575 APR2010 parameters above have been revised to include the lateral and longitudinal axes. Each axis is executed independently.

During the random vibration provide continuous cycling of the nominal operating voltage to the electric motor or actuator of fifteen (15) minutes ON followed by fifteen (15) minutes OFF, unless the function of the electric motor or actuator indicates an alternative power cycle frequency.

During each six (6) hour test duration in each axis provide the following temperature conditions:
• Initiate the random vibration at a temperature of 20 °C ± 3 °C.

• After 100 minutes of random vibration at 20 °C ± 3 °C decrease the temperature to -30 °C ± 3 °C at a rate of 1 °C/minute.

• Dwell at -30 °C ± 3 °C for 30 minutes.

• Increase the temperature to 65 °C ± 3 °C at a rate of 1 °C/minute.

• Dwell at 65 °C ± 3 °C for 30 minutes.

• Decrease the temperature to 20 °C ± 3 °C at a rate of 1 °C/minute.

During the 30 minute at 65 °C ± 3 °C dwell period for each axis, the maximum number of light sources that could be activated simultaneously in the vehicle shall be powered. The lamps shall be powered at nominal voltage and in a mode that would be considered worst case conditions for maximum temperature (e.g. high beam rather than low beam if high beam is expected to provide the maximum temperature increase).

Electric motor or actuator functional tests shall be conducted at the conclusion of each test axis.
The acceptance criteria for all performance tests is the CAPA Sample Part electric motor or actuator shall maintain its lamp assembly functions throughout the performance tests, or perform in a manner that is comparable to the CCS Material Test Part electric motor or actuator.

![Thermal Cycle with Humidity Profile](image)

**Figure 1. Thermal Cycle with Humidity Profile**

12.1.5.1.6 Electric Motor and Actuator Electromagnetic Compatibility – Emissions

Electromagnetic emissions of electric motors or actuators shall be assessed at the appropriate operating voltages using Conducted Emission (CE) and Radiated Emission (RE) evaluations in accordance with IEC CISPR 25 methods where applicable. The IEC CISPR 25 standard is the International Special Committee on Radio Interference – Vehicles, boats, and internal combustion engines – Radio disturbance characteristics – Limits and methods of measurement for the protection of on-board receivers.

At the applicable frequency ranges the CAPA Sample Part electric motor or actuator shall not exhibit emission amplitudes in excess of the CCS Material Test Part electric motor or actuator. Deviations from the CCS Material Test Part may be applicable in discrete frequency ranges if it can be clearly demonstrated that the amplitudes in the frequency ranges of interest do not exceed the limits cited in relevant published standards.
12.1.5.1.7 Electric Motor and Actuator Electromagnetic Compatibility – Immunity

Electromagnetic immunity of electric motors or actuators shall be assessed at the appropriate operating voltages using applicable evaluations such as:

- SAE J1113-3 – Conducted Immunity, 250 kHz to 400 MHz, Direct Injection of Radio Frequency (RF) Power.

At the applicable frequency ranges the CAPA Sample Part electric motor or actuator shall not exhibit degradation in performance in excess of the CCS Material Test Part electric motor or actuator.

12.1.5.1.8 Electric Motor and Actuator Immunity to Electrostatic Discharge (ESD)

Immunity to electrostatic discharge (ESD) shall be assessed using applicable evaluations such as ISO 10605 – Road vehicles - Test methods for electrical disturbances from electrostatic discharge; evaluation for “Electronic module sensitivity classification for packaging and handling (unpowered test).” The CAPA Sample Part must demonstrate that it is comparable to the CCS Material Test Part’s immunity to electrostatic discharge (ESD).

If the Participant’s electric motor or actuator has been evaluated by a recognized laboratory or agency and demonstrated appropriate electromagnetic compatibility (EMC) and electrostatic discharge (ESD) performance for an automotive application utilizing test standards comparable to those cited in Section 12.1.5.1.6, Section 12.1.5.1.7, and Section 12.1.5.1.8, then the Participant may submit that applicable documentation to satisfy the EMC and ESD requirements. The testing must include all applicable wires, cables and shielding that will be utilized in the vehicle application.

If a vehicle application utilizes the same components, wires, cables, and shielding for both the driver side and passenger side lighting assemblies, then the EMC and ESD tests cited in Section 12.1.5.1.6, Section 12.1.5.1.7, and Section 12.1.5.1.8 are only required on either the driver side or passenger side lighting assemblies. The Participant must submit both the driver side and the passenger side lighting assemblies to allow the Validator or CAPA-approved laboratory to independently verify that the components, wires, cables, and shielding are the same for both the driver side and the passenger side.
12.1.5.1.9 Electric Motor and Actuator Safety or Handling Labels or Markings

In the event that the addition of an electric motor or actuator prompts the CCS Material Test Part to provide associated safety or handling labels or markings, the CAPA Sample Part must provide safety and handling labels and markings that are comparable in color, graphical display, legibility, font format, font size, and durability.

12.1.5.1.10 Electric Motor and Actuator Function Following FMVSS 108 Tests

The CAPA Sample Part electric motor or actuator shall remain functional throughout all tests and environmental exposures cited in FMVSS 108 tests or other applicable SAE standards. During all FMVSS 108 or SAE tests the electric motor or actuator shall remain in the lamp assembly.

12.1.5.2 High Intensity Discharge (HID) Lamp Assemblies

If the CCS Material Test Part is an HID lamp with a ballast, and other associated components, the CAPA Sample Part must provide an HID lamp and ballast, and other associated components with comparable dimensions, construction features, retaining features, functions, and performance.

The CAPA Sample Part HID lamp must comply with applicable requirements of FMVSS 108. Compliance to this requirement may be satisfied by submission of certifications from the HID supplier indicating compliance to FMVSS 108 and/or DOT approval.

12.1.5.2.1 High Intensity Discharge (HID) Lamp Components and Ballast Dimensional Requirements

The dimensions of the CAPA Sample Part HID lamp components and ballast shall be comparable to the dimensions of the CCS Material Test Part HID lamp components and ballast to avoid interferences with adjacent vehicle components. The New Part Approval (NPA) Vehicle Test Fit (VTF) B shall verify that the HID lamp components and ballast do not interfere with adjacent vehicle components.

12.1.5.2.2 High Intensity Discharge (HID) Lamp Components and Ballast Construction Features

Construction features of the CAPA Sample Part HID lamp components and ballast shall be visually comparable to the construction features of the CCS Material Test Part HID lamp components and ballast.
12.1.5.2.3 **High Intensity Discharge (HID) Lamp Components and Ballast Retaining Features**

Retaining features for the CAPA Sample Part HID lamp components and ballast shall be visually and functionally comparable to the retaining features for the CCS Material Test Part HID lamp components and ballast.

12.1.5.2.4 **High Intensity Discharge (HID) Lamp Components and Ballast Performance Tests**

The CAPA Sample Part HID lamp components and ballast shall remain functional throughout the performance tests, or perform in a manner that is comparable to the CCS Material Test Part HID lamp components and ballast. The performance tests shall be evaluated with the lamp assembly positioned in the vehicle orientation. Where applicable for the test, the lamp assembly shall be mounted to a metal fixture using the vehicle mounting positions and appropriate fasteners. A minimum of one CAPA Sample Part and one CCS Material Test Part shall be evaluated for the performance tests. The performance tests are the following:

<table>
<thead>
<tr>
<th>Performance Test</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Cycle with Humidity and Power Cycling</td>
<td>Ten (10) day thermal cycle with humidity profile.</td>
</tr>
<tr>
<td></td>
<td>The ten (10) day thermal cycle with humidity profile is executed by repeating the 48 hour sequence illustrates in Figure 1 a total of five (5) times.</td>
</tr>
<tr>
<td></td>
<td>The temperature and humidity extremes, tolerances, dwell times, and ramp rates during the profile are:</td>
</tr>
<tr>
<td></td>
<td>• High temperature limit of 70 °C ± 3 °C and 4.0 hour dwell time.</td>
</tr>
<tr>
<td></td>
<td>• Low temperature limit of -40 °C ± 3 °C and 3.0 hour dwell time.</td>
</tr>
<tr>
<td></td>
<td>• Mid-temperature limit of 25 °C ± 3 °C with variable dwell times based on Figure 1.</td>
</tr>
<tr>
<td></td>
<td>• Relative Humidity of 90±5%RH stabilized during the 70 °C ± 3 °C and 25 °C ± 3 °C dwell times. The relative humidity is expected to vary during the thermal transitions, and is uncontrolled at -40 °C ± 3 °C.</td>
</tr>
<tr>
<td></td>
<td>• Ramp rates nominally 0.5 °C/minute as indicated in Figure 1. Ramp rates may be varied between 0.5 °C/minute and 1.0 °C/minute if the dwell times are maintained as 4.0 hours for</td>
</tr>
</tbody>
</table>
70 °C ± 3 °C and 3.0 hours for-40 °C ± 3 °C, and the 48 hour profile is maintained by adjusting each 25 °C ± 3 °C dwell period to compensate for the ramp rate.

The maximum number of light sources that could be activated simultaneously in the vehicle shall be powered during the final 30 minutes of each 70 °C ± 3 °C and -40 °C ± 3 °C dwell period. The lamps shall be powered at nominal voltage and in a mode that would be considered worst case conditions for maximum temperature (e.g. high beam rather than low beam if high beam is expected to provide the maximum temperature increase).

<table>
<thead>
<tr>
<th>Random Vibration with Thermal Cycle and Power Cycling</th>
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<tr>
<td>Random Vibration shall be conducted in accordance with the instrumentation cited in SAE J575 APR2010 Section 4.2.2.b. and operated with the following parameters:</td>
</tr>
<tr>
<td>• Frequency range from 10 Hz to 250 Hz.</td>
</tr>
<tr>
<td>• Power Spectral Density as cited in SAE J575 APR2010 Figure 2 (includes values of 0.1 g²/Hz at 10 Hz and 0.00408 g²/Hz at 250 Hz).</td>
</tr>
<tr>
<td>• Direction of vibration consisting of three (3) independent mutually perpendicular axes as referenced to the vehicle (i.e. vertical, lateral, and longitudinal).</td>
</tr>
<tr>
<td>• Test duration of six (6) hours in each independent axis (total of 18 hours of vibration).</td>
</tr>
<tr>
<td>• Value of Grms of 1.81.</td>
</tr>
</tbody>
</table>

The SAE J575 APR2010 parameters above have been revised to include the lateral and longitudinal axes. Each axis is executed independently.

During each six (6) hour test duration in each axis provide the following temperature conditions:
• Initiate the random vibration at a temperature of 20 °C ± 3 °C.
• After 100 minutes of random vibration at 20 °C ± 3 °C decrease the temperature to -30 °C ± 3 °C at a rate of 1 °C/minute.
• Dwell at -30 °C ± 3 °C for 30 minutes.
• Increase the temperature to 65 °C ± 3 °C at a rate of 1 °C/minute.
- Dwell at 65 °C ± 3 °C for 30 minutes.
- Decrease the temperature to 20 °C ± 3 °C at a rate of 1 °C/minute.

During the 30 minute at 65 °C ± 3 °C dwell period for each axis, the maximum number of light sources that could be activated simultaneously in the vehicle shall be powered. The lamps shall be powered at nominal voltage and in a mode that would be considered worst case conditions for maximum temperature (e.g. high beam rather than low beam if high beam is expected to provide the maximum temperature increase).

The acceptance criteria for all performance tests is the CAPA Sample Part shall maintain its lamp assembly functions throughout the performance tests, or perform in a manner that is comparable to the CCS Material Test Part.

12.1.5.2.5 High Intensity Discharge (HID) Lamp Components and Ballast Electromagnetic Compatibility – Emissions

Electromagnetic emissions of the HID lamp components and ballast shall be assessed at the appropriate operating voltages using Conducted Emission (CE) and Radiated Emission (RE) evaluations in accordance with IEC CISPR 25 methods where applicable. The IEC CISPR 25 standard is the International Special Committee on Radio Interference – Vehicles, boats, and internal combustion engines – Radio disturbance characteristics – Limits and methods of measurement for the protection of on-board receivers.

At the applicable frequency ranges the CAPA Sample Part HID lamp components and ballast shall not exhibit emission amplitudes in excess of the CCS Material Test Part HID lamp components and ballast. Deviations from the CCS Material Test Part may be applicable in discrete frequency ranges if it can be clearly demonstrated that the amplitudes in the frequency ranges of interest do not exceed the limits cited in relevant published standards.

12.1.5.2.6 High Intensity Discharge (HID) Lamp Components and Ballast Electromagnetic Compatibility – Immunity

Electromagnetic immunity of the HID components and ballast shall be assessed at the appropriate operating voltages using evaluations such as:

- SAE J1113-3 – Conducted Immunity, 250 kHz to 400 MHz, Direct Injection of Radio Frequency (RF) Power.


At the applicable frequency ranges the CAPA Sample Part HID components and ballast shall not exhibit degradation in performance in excess of the CCS Material Test Part HID components and ballast.

12.1.5.2.7 High Intensity Discharge (HID) Lamp Components and Ballast Immunity to Electrostatic Discharge (ESD)

Immunity to electrostatic discharge (ESD) shall be assessed using applicable evaluations such as ISO 10605 – Road vehicles - Test methods for electrical disturbances from electrostatic discharge; evaluation for “Electronic module sensitivity classification for packaging and handling (unpowered test).” The CAPA Sample Part must demonstrate that it is comparable to the CCS Material Test Part’s immunity to electrostatic discharge (ESD).

If the Participant’s HID components have been evaluated by a recognized laboratory or agency and demonstrated appropriate electromagnetic compatibility (EMC) and electrostatic discharge (ESD) performance for an automotive application utilizing test standards comparable to those cited in Section 12.1.5.2.5, Section 12.1.5.2.6, and Section 12.1.5.2.7, then the Participant may submit that applicable documentation to satisfy the EMC and ESD requirements. The testing must include all applicable wires, cables and shielding that will be utilized in the vehicle application.

If a vehicle application utilizes the same components, wires, cables, and shielding for both the driver side and passenger side lighting assemblies, then the EMC and ESD tests cited in Section 12.1.5.2.5, Section 12.1.5.2.6, and Section 12.1.5.2.7 are only required on either the driver side or passenger side lighting assemblies. The Participant must submit both the driver side and the passenger side lighting assemblies to allow the Validator or CAPA-approved laboratory to independently verify that the components, wires, cables, and shielding are the same for both the driver side and the passenger side.

12.1.5.2.8 High Intensity Discharge (HID) Lamp Components and Ballast Safety or Handling Labels or Markings

In the event that the addition of HID components and ballast prompts the CCS Material Test Part to provide associated safety or handling labels or markings, the CAPA Sample Part must provide safety and handling labels and markings that are comparable in color, graphical display, legibility, font format, font size, and durability.
12.1.6 Illumination, Photometry, and Color Requirements

The CAPA Sample Part must satisfy FMVSS 108 by using the same combination of illumination devices as the OEM Master Part. For example, if the OEM Master Part uses three (3) bulbs in a taillamp assembly to meet the requirements of FMVSS 108, the CAPA Sample Part must use the same number of bulbs.

The CAPA Sample Part must satisfy the FMVSS requirements using equipment combinations and associated hardware that are comparable to the OEM Master Part including, but not limited to: number and type of light sources, number and type of reflectors, number and type of lenses, and number and type of mounting/alignment holes. The lens of the CAPA Sample Part and the OEM Master Part must have comparable reflector or lens patterns including: grooves, bumps, lines, etches, prisms, any other visible effect in the lens, or on the light emitted from the lens.

Provided that the OEM Master Part meets the FMVSS requirements, the luminous intensity of the CAPA Sample Part must be comparable to the OEM Master Part, except that deviations from the OEM Master Part cannot violate the FMVSS requirements.

The CAPA Sample Part must meet all requirements while using the OEM Master Part specified bulb.

The CAPA Sample Part shall not have any protrusions, obstructions, reflective devices, or opaque material that is not dimensionally, photometrically, or aesthetically comparable to the OEM Master Part within the tolerances set in this standard.

Provided that the OEM Master Part meets the FMVSS requirements, the chromaticity of the CAPA Sample Part must be comparable the OEM Master Part, except that deviations from the OEM Master Part cannot violate the FMVSS requirements.

The CAPA Sample Part shall not change the location, visibility, photometric qualities, or aesthetics of the lighting device when compared to the OEM Master Part. The position of the CAPA Sample Part on the vehicle will be comparable to the OEM Master Part.

Provided that the OEM Master Part meets the FMVSS requirements, the CAPA Sample Part vertical and horizontal angles of adjustment must be comparable to the OEM Master Part. Deviations from the OEM Master Part angle of adjustment cannot violate the FMVSS requirements.

12.1.7 Life and Durability Requirements

12.1.7.1 Lens Materials and Molded Lens Performance

When applicable, the CAPA Sample Part molded lens may be compared to an OEM Material Test Part molded lens using appropriate weathering techniques. The
CAPA Sample Part molded lens shall exhibit comparable results to the OEM Material Test Part molded lens.

The manufacturer must be capable of demonstrating that the CAPA Sample Part molded lens does not exhibit a magnitude of “molded-in stress” that may affect the long-term performance of the lens. The manufacturer must utilize an appropriate method for evaluating lenses for “molded-in stress,” and incorporate processing techniques for relieving excessive “molded-in stress.” The manufacturer shall maintain records of the method used for evaluating “molded-in stress” as well as the processing techniques employed for relieving excessive “molded-in stress.” The records shall be made available to the Validator for review during routine inspections and facility assessments.

12.1.7.2 Headlamp Assembly Deflection

In order to demonstrate the rigidity and integrity of the mounting points, the CAPA Sample Part deflection must be comparable to the OEM Master Part deflection when a non-damaging load is applied to the headlamp assembly while installed in a vehicle.

12.1.8 Gaskets, Adhesives, Sealants, and Auxiliary Equipment

The CAPA Sample Part gaskets, adhesives, and sealant materials must be comparable to the OEM Material Test Part, and demonstrate comparable performance using an appropriate test such as the SAE J575 Moisture Test. Instructions for use and installation of gaskets, seals, or other auxiliary equipment must be clear, easy to follow, and viable.

Access to the CAPA Sample Part bulb must be comparable to the OEM Master Part. Comparable tools and actions are required to replace the bulb on the CAPA Sample Part as the OEM Master Part. The time required to replace the bulb on the CAPA Sample Part must be comparable to the time required to replace the bulb on the OEM Master Part. The dimensions, color, and texture of the lamp housing and auxiliary equipment must be comparable.

The CAPA Sample Part must replicate the OEM Master Part’s auxiliary equipment and accessories. Any auxiliary equipment and accessories included with the CAPA Sample Part must meet all applicable FVMSS 108 requirements and be comparable to the OEM Master Part, provided that the OEM part meets FMVSS 108. The Participant must notify the CAPA Validator of any changes to the auxiliary equipment to allow for re-verification of compliance with CAPA standards.

12.1.9 Aiming Devices

The CAPA Sample Part must be comparable to the OEM Master Part’s materials, dimensions, fasteners, coatings, fastener types, retention forces, mounting points, and alignment hardware. The tools and actions necessary to install and aim the CAPA
Sample Part must be comparable to the tools and actions required for the OEM Master Part. The time required to aim the CAPA Sample Part must be comparable to the time required to aim the OEM Master Part.

12.1.10 Material Requirements

12.1.10.1 Metal Components and Fasteners

Where applicable, metal components and fasteners of the CAPA Sample Part must meet the appropriate sections of the CAPA Quality Standards Manual, Section 10.0, or demonstrate comparable performance to the OEM Material Test Part by appropriate test methods.

Fasteners used for mounting lamps to the vehicle shall have the fastener-to-lamp connection tested for strength. Where possible, this test may be conducted using a torque wrench to measure the torque strength of the fastener. For torque testing, the final load to be used is that where the fastener breaks free and spins in the housing. If the fastener is not threaded or impractical to testing using a torque test, then an axial tensile test will be performed. For an axial tensile test, fasteners shall be evaluated for strength and retention on a universal testing machine at a speed of 5 mm/min. For both torque and retention testing, the maximum deviation of the components accompanying the CAPA Sample Part from those accompanying the OEM Material Test Part is -10% of the average OEM value.

Metal components of the CAPA Sample Part must meet the appropriate visual inspection requirements of the CAPA Quality Standards Manual, Section 10.2.

When applicable, the CAPA Sample Part shall demonstrate comparable decorative coating performance to the OEM Material Test Part using appropriate test methods.

When applicable, the CAPA Sample Part shall demonstrate comparable primer performance to the OEM Material Test Part using appropriate test methods.

12.1.10.2 Plastic Components, Rubber, and Fasteners

Plastic components, rubber, and fasteners of the CAPA Sample Part must meet the appropriate sections of the CAPA Quality Standards Manual, Section 11.0, or demonstrate comparable performance to the OEM Material Test Part by appropriate test methods.

CAPA Quality Standards Manual sections that may be applicable include, but are not limited to the following (refer to CAPA QSM Section 11.0):
11.2 Visual Non-Conformance Classifications

11.4.3.1 Plastic substrates shall be evaluated for material identification using Infrared Spectroscopy (IR)

11.5.1 Adhesive Location and Coverage

11.8 Fastener and Hardware Evaluation

When applicable, the CAPA Sample Part shall demonstrate comparable decorative coating performance to the OEM Material Test Part using appropriate test methods.

When applicable, the CAPA Sample Part shall demonstrate comparable primer performance to the OEM Material Test Part using appropriate test methods.

The CAPA Sample Part shall demonstrate comparable impact resistance to the OEM Material Test Part at conditions of 23°C (±3°C), and –30°C (±3°C).

12.1.10.3 Marking of Plastic Parts and Components

Plastic parts and components that weigh more than 50 grams must be permanently marked with the appropriate SAE J1344 plastic material or blend standard symbol. Since it may not be practical to permanently mark all the individual components of a lamp assembly, it is acceptable to identify multiple components on the rear lamp housing or appropriate visible location if there is adequate space available.

An example of multiple components identified on the rear lamp housing using a description or abbreviation of the component and the appropriate SAE J1344 standard symbols would be the following:

<table>
<thead>
<tr>
<th>Example of Lamp Assembly Components and Corresponding Plastic Material</th>
<th>Description of Component and the SAE J1344 Standard Symbols that May Be Identified on the Rear Housing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear Lamp Housing</td>
<td>Housing &gt;PA66&lt;</td>
</tr>
<tr>
<td>Nylon 66</td>
<td></td>
</tr>
<tr>
<td>Lens</td>
<td>Lens &gt;PC&lt;</td>
</tr>
<tr>
<td>Polycarbonate</td>
<td></td>
</tr>
<tr>
<td>Reflex Lens</td>
<td>Reflex &gt;PMMA&lt;</td>
</tr>
<tr>
<td>Poly (methyl methacrylate)</td>
<td></td>
</tr>
</tbody>
</table>

The requirement is only applicable to components that are in excess of 50 grams; however, Participants are encouraged to identify all components if feasible.
The dimensions of the standard symbols shall follow the guidelines of SAE J1344 that implies 3 mm high letters, but acknowledges that the dimensions may be proportional to the part size.

The Participant may select the location of the markings, with consideration of structural integrity, appearance, and function.

Integrally molded-in markings are required unless the Participant determines that molded-in marking adversely affects structural integrity, appearance, or function. If the Participant determines that molded-in marking may adversely affect structural integrity, appearance, or function, they shall notify the Validator and present an alternative method of marking the parts. The Validator shall approve all alternatives to molded-in marking.

If the Participant determines that any marking of the plastic part or component may adversely affect structural integrity, appearance, or function, they shall notify the Validator and present the rationale for justifying the absence of markings. The Validator shall approve all exceptions to marking plastic parts and components.

Elastomer parts and components that weigh more than 50 grams must be permanently marked with the appropriate SAE J1344 elastomer standard symbol except for seals and gaskets that might be adversely affected by any surface markings.

Excluding gaskets and seals, integrally molded-in markings of elastomers is preferred, but alternative methods may be used if the identification is legible and designed to be permanent.

12.1.10.4 Reflective and Protective Coatings

The material identification and material thickness of all reflective and protective coatings shall be documented for all CAPA Sample Parts. Modifications to the materials or coating thickness will require a re-verification of the appropriate performance tests.

12.1.11 Appearance Inspections

The general appearance and shape of the CAPA Sample Part must match the OEM Master Part. This includes, but is not limited to, mounting alignment areas, aiming devices, protective/watertight seals, and lenses. In the case of a dispute over general shape factors, a detailed dimensional study may be performed to compare the CAPA Sample Parts with the OEM Master Part. As a minimum for acceptance, the CAPA parts shall be dimensionally within ±1.50 mm of the OEM Master Part.

The Participant shall perform 100% inspections for appearance attributes on final product as detailed below, as well as those identified in CAPA 101 and CAPA 201, as applicable. All appearance inspections for the attributes below (following) shall be conducted in a well-lit area. When held by hand, parts shall be inspected with the range of the inspector’s arm length, approximately 30-100 cm. Parts with potentially non-
conforming attributes may be brought within a closer range to more adequately assess the attribute(s).

12.1.11.1 Appearance Attribute Definitions

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhesive</td>
<td>Material used to hold one surface to another.</td>
</tr>
<tr>
<td>Blisters</td>
<td>Raised or layered patches of material on the surface of a component.</td>
</tr>
<tr>
<td>Burrs</td>
<td>Sharp teeth-like protrusions at the edge of the part.</td>
</tr>
<tr>
<td>Color</td>
<td>The sensation, determined by wavelength, that is generated by light in the visible spectrum.</td>
</tr>
<tr>
<td>Contamination/Foreign Material</td>
<td>Any substance such as dirt or grease visible to the unaided eye.</td>
</tr>
<tr>
<td>Crack</td>
<td>A separation of material.</td>
</tr>
<tr>
<td>Crazing</td>
<td>Small cracks near or on the surface of a component.</td>
</tr>
<tr>
<td>Flash/Sharp/Rough Edges</td>
<td>Any excess material that is formed with and attached to the component along a seam or parting line. Any hole that is partially or completely blocked.</td>
</tr>
<tr>
<td>Haze</td>
<td>The cloudy appearance of an otherwise transparent material.</td>
</tr>
<tr>
<td>Orange Peel</td>
<td>Rippling appearance on the surface of a component.</td>
</tr>
<tr>
<td>Pits</td>
<td>Small craters in the surface.</td>
</tr>
<tr>
<td>Porosity</td>
<td>Air bubbles under the surface of transparent material.</td>
</tr>
<tr>
<td>Production Marks</td>
<td>Attributes such as a Parting Line (a mark indicating where sections of the mold met in closing); Gate Mark (a surface discontinuity where material entered the mold); Ejection Pin Marks (marks left by the pins that pushed the part out of the mold).</td>
</tr>
<tr>
<td>Scratches</td>
<td>Visible marks penetrating a surface.</td>
</tr>
<tr>
<td>Shrinkage</td>
<td>The relative change in dimension from the length measured on the mold when it is cold to the length of the molded object after it has been taken out of the mold.</td>
</tr>
<tr>
<td>Sink</td>
<td>A surface depression.</td>
</tr>
<tr>
<td>Splay</td>
<td>An off-colored streaking, often appearing as silver streaks.</td>
</tr>
<tr>
<td>Warp</td>
<td>Bowed or skewed components on assembly.</td>
</tr>
</tbody>
</table>

12.1.11.2 Part Class Surface Definitions

<table>
<thead>
<tr>
<th>Class</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A</td>
<td>The surface that is visible when the part is installed on the vehicle.</td>
</tr>
<tr>
<td>Class B</td>
<td>The surface that may be partly visible when the part is installed on the vehicle.</td>
</tr>
<tr>
<td>Class C</td>
<td>The surface that is not visible when the part is installed on the vehicle.</td>
</tr>
</tbody>
</table>
### 12.11.3 Appearance Attribute Acceptance Criteria

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Class A Surface</th>
<th>Class B Surface</th>
<th>Class C Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhesive</td>
<td>Any extrusion of adhesive must present a uniform appearance.</td>
<td>Any extrusion of adhesive must present a uniform appearance.</td>
<td>Any extrusion of adhesive must present a uniform appearance.</td>
</tr>
<tr>
<td>Blisters</td>
<td>None allowed on a polycarbonate, acrylic, or glass lens.</td>
<td>None allowed on a polycarbonate, acrylic, or glass lens.</td>
<td>None allowed.</td>
</tr>
<tr>
<td>Burrs</td>
<td>None allowed.</td>
<td>Allowable, if not severe enough to potentially lacerate the skin under normal handling conditions.</td>
<td>Allowable, if not severe enough to potentially lacerate the skin under normal handling conditions.</td>
</tr>
<tr>
<td>Cracks</td>
<td>None allowed.</td>
<td>None allowed.</td>
<td>None allowed.</td>
</tr>
<tr>
<td>Color</td>
<td>The color of the CAPA part, including lens, housing and reflective surfaces, must be comparable to the CCS Master Part.</td>
<td>Subtle differences in shade within the same color allowed.</td>
<td>Differences in shade within the same color allowed.</td>
</tr>
<tr>
<td>Contamination/Foreign Material</td>
<td>9 inclusions or less/5 cm² (12.1.11.4); or 4 inclusions or less/5 cm linear distance (12.1.11.5).</td>
<td>9 inclusions or less/5 cm² (12.1.11.4); or 4 inclusions or less/5 cm linear distance (12.1.11.5).</td>
<td>9 inclusions or less/5 cm² (12.1.11.4); or 4 inclusions or less/5 cm linear distance (12.1.11.5).</td>
</tr>
<tr>
<td>Crazing</td>
<td>None allowed.</td>
<td>None allowed.</td>
<td>None allowed.</td>
</tr>
<tr>
<td>Flash/Sharp/Rough Edges</td>
<td>None allowed.</td>
<td>Allowable, if not severe enough to potentially lacerate the skin under normal handling conditions.</td>
<td>Allowable, if not severe enough to potentially lacerate the skin under normal handling conditions.</td>
</tr>
<tr>
<td>Haze</td>
<td>None allowed.</td>
<td>None allowed.</td>
<td>None allowed.</td>
</tr>
<tr>
<td>Orange Peel</td>
<td>None allowed.</td>
<td>None allowed.</td>
<td>None allowed.</td>
</tr>
<tr>
<td>Pits</td>
<td>9 inclusions or less/5 cm² (12.1.11.4); or 4 inclusions or less/5 cm linear distance (12.1.11.5).</td>
<td>9 inclusions or less/5 cm³ (12.1.11.4); or 4 inclusions or less/5 cm linear distance (12.1.11.5).</td>
<td>9 inclusions or less/5 cm³ (12.1.11.4); or 4 inclusions or less/5 cm linear distance (12.1.11.5).</td>
</tr>
<tr>
<td>Porosity</td>
<td>None allowed.</td>
<td>None allowed.</td>
<td>None allowed.</td>
</tr>
<tr>
<td>Production Marks</td>
<td>Allowable, if exhibited by CCS</td>
<td>Allowable. If visible on CCS Master Part, may</td>
<td>Allowable. If visible on CCS Master Part,</td>
</tr>
</tbody>
</table>
### Acceptance Criteria

<table>
<thead>
<tr>
<th>Acceptance Criteria</th>
<th>Master Part, in which case CAPA Sample Parts may emulate but may not be more pronounced than CCS Master Part’s production marks. None allowed if not exhibited by CCS Master Part.</th>
<th>not be more pronounced than CCS Master Part.</th>
<th>may not be more pronounced than CCS Master Part.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scratches</td>
<td>None allowed.</td>
<td>None allowed.</td>
<td>4 or less/5 cm² (12.1.11.6).</td>
</tr>
<tr>
<td>Shrinkage</td>
<td>None allowed.</td>
<td>None allowed.</td>
<td>None allowed.</td>
</tr>
<tr>
<td>Sink</td>
<td>None allowed.</td>
<td>None allowed.</td>
<td>None allowed.</td>
</tr>
<tr>
<td>Splay</td>
<td>None allowed.</td>
<td>None allowed.</td>
<td>Allowed.</td>
</tr>
<tr>
<td>Warp</td>
<td>None allowed.</td>
<td>None allowed.</td>
<td>None allowed.</td>
</tr>
</tbody>
</table>

#### 12.1.11.4 Appearance Inspection Comparison Chart – Density of Inclusions in Reflective Surfaces

Comparison chart for density of Contamination/Foreign Material and Pits. Typically used during the visual assessment of reflectors and/or bezels. Note: Drawing is representative of scale only.

```
  . . .
  . . .
  . . .

9 Inclusions in 5 cm²```

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12.1.11.5 Appearance Inspection Comparison Chart – Density of Inclusions in Linear Surfaces

Comparison chart for density of Contamination/Foreign Material and Pits. Typically used during the visual assessment of edges of reflectors facets and styling lines. Note: Drawing is representative of scale only.

4 Inclusions per 5 cm linear space

12.1.11.6 Appearance Inspection Comparison Chart – Density of Scratches in Reflective or Non-Reflective Surfaces

Note: Drawing is representative of scale only.

4 Scratches in 5cm²

Marked samples representing appearance attributes shall be developed by the Participant with input from the Validator. The Participant is responsible for maintaining these samples in their original condition. These samples shall be made readily available during appearance inspections by the Participant and the Validator.
12.1.12 Markings and Indicators

All FMVSS 108 mandated markings are required.

Every production lot of every certified part must be identified by a numbering system that indicates when the final assembly lot was manufactured as per CAPA Quality Standards Manual requirements. The lot number must be permanently indicated by a standardized, repeatable method on the final assembly.

12.1.13 Quality Records Inspection

During inspections, the Validator may review the Participant’s Quality Records. The Quality Records shall include, but are not limited to the following:

- Dimensional Inspections
- Appearance Inspections
- Material Test Data and Certifications
- Photometric Tests
- Bulb Function Tests (where applicable)
- Leakage and Immersion Tests (where applicable)
- Corrective Actions

12.1.14 Functional, Dimensional, and Appearance Inspection

Before the Participant submits the request for a New Part Approval (NPA) Vehicle Test Fit (VTF) B, the Validator performs function, dimensional and appearance inspections on the CAPA Sample Parts at the Participant’s facility. If the CAPA Sample Parts pass the inspection, the Participant may submit the request for the NPA VTF B.

12.1.15 New Part Approval (NPA) Vehicle Test Fit (VTF) B

The NPA VTF B is a mandatory test, performed on production run samples identified by the Validator.

The Participant’s parts are evaluated on the vehicle for the following:

<table>
<thead>
<tr>
<th>Evaluation Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Fit, including fit to adjacent parts</td>
</tr>
<tr>
<td>Gap and Flush</td>
</tr>
<tr>
<td>Hole Locations</td>
</tr>
<tr>
<td>Attachment Points</td>
</tr>
<tr>
<td>Ease of Mounting</td>
</tr>
<tr>
<td>Appearance</td>
</tr>
<tr>
<td>Color</td>
</tr>
</tbody>
</table>
Aiming

Functionality

Evaluation of Light Pattern at low and high beam for headlamps

Headlamp Assembly Deflection

The tools, actions, and time necessary to install and aim the CAPA Sample Part must be comparable to the tools, actions, and time required for the OEM Master Part. The part cannot become CAPA certified until it has passed the NPA VTF B.

After the CAPA Sample Part passes the NPA VTF B, the Validator will provide specific placement instruction for the application of the CAPA seal.

After the CAPA Sample Part passes the NPA VTF B, it is mandatory that the Participant have one (1) CAPA Sample Part returned to them to be used as the CAPA Master Sample Part. This CAPA Master Sample Part is to be verified and clearly marked by the Validator, and will be used by the Participant and the Validator during inspections.

The CAPA Master Sample Part and related auxiliary equipment and accessories must be carefully stored in a manner that preserves their original condition while keeping them readily available for use during inspections. If it becomes lost or damaged, the Participant must notify the Validator before the next production run to determine and verify a replacement CAPA Master Sample Part.

ONCE COMPLIANCE WITH THIS SPECIFICATION HAS BEEN ACHIEVED, THE PARTICIPANT MUST NOTIFY THE CAPA VALIDATOR OF ANY CHANGES TO THE TOOLING, PROCESSES OR MATERIALS TO ALLOW FOR REVERIFICATION OF COMPLIANCE WITH CAPA STANDARDS.

12.1.16 Notice of Part Approval

Once all inspection and testing requirements are met, CAPA will issue to the Participant a Notice of Part Status. This form is used to notify the Participant of new part approval and also of any status change to a certified part number resulting from inspection or testing activity.

The Participant may apply seals to specific part numbers only after receiving CAPA’s notice of part approval.
12.2 Maintaining Part Certification

The following tests and inspections will be performed on certified parts.

<table>
<thead>
<tr>
<th>Test/Inspection</th>
<th>Test/Inspection Party</th>
<th>QSM Section</th>
<th>Test Frequency</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensional</td>
<td>Participant</td>
<td>12.1.3</td>
<td>Each production lot</td>
<td>Sample plan shall follow an acceptable industry standard such as those contained in ANSI/ASQC Z1.4-1993.</td>
</tr>
<tr>
<td>Functional: Bulb Function, Immersion Test and Leakage Test (where applicable)</td>
<td>Participant</td>
<td>12.1.2</td>
<td>Each production lot</td>
<td>Sample plan shall follow an acceptable industry standard such as those contained in ANSI/ASQC Z1.4-1993.</td>
</tr>
<tr>
<td>Functional: Illumination, Photometry</td>
<td>Participant</td>
<td>12.1.2</td>
<td>Each production lot</td>
<td>1 part per production lot, or Participant may demonstrate an alternative Sample Size to assure ongoing compliance.</td>
</tr>
<tr>
<td>Appearance</td>
<td>Participant</td>
<td>12.1.11</td>
<td>Each production lot</td>
<td>100%</td>
</tr>
<tr>
<td>Functional/ Appearance: Aiming Devices, Markings and Indicators,</td>
<td>Validator</td>
<td>12.1.2</td>
<td>Minimum of 1 lot per year per part. (See note below.)</td>
<td>Lot size &lt;1000, then 5 pcs. Lot size ≥1000, then 10 pcs.</td>
</tr>
<tr>
<td>Test/Inspection</td>
<td>Test/Inspection Party</td>
<td>QSM Section</td>
<td>Test Frequency</td>
<td>Sample Size</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------</td>
<td>-------------</td>
<td>----------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Auxiliary Equipment and Accessories, Mounting Area Check, Mounting Location Check, Appearance and Quality Records</td>
<td>Validator</td>
<td>12.2.3</td>
<td>Random</td>
<td>1 part from any CAPA certified lot.</td>
</tr>
<tr>
<td>Random Vehicle Test Fit (RDM VTF)</td>
<td>Validator</td>
<td>12.2.4</td>
<td>Random</td>
<td>Random</td>
</tr>
<tr>
<td>Random Material and Function Testing</td>
<td>Validator</td>
<td>3.1.1</td>
<td>1 Time per Year</td>
<td>N/A</td>
</tr>
<tr>
<td>Document Review</td>
<td>Validator</td>
<td>3.2.1</td>
<td>2 Times per Year</td>
<td>N/A</td>
</tr>
<tr>
<td>Facility Assessment</td>
<td>Validator</td>
<td>12.2.5</td>
<td>Minimum 4 Times per Year</td>
<td>Minimum of 3 certified parts.</td>
</tr>
</tbody>
</table>

Note: CAPA retains the right to determine the number of on-site inspections. This may be determined by the number of years in the program, history vs. complaints, and results of inspections throughout those years.

The Participant shall maintain material certifications for each shipment of raw materials or components as well as any additional specification data provided by the supplier. The Participant shall maintain records of appropriate process settings and materials used in the manufacturing of CAPA parts. These records shall be made available to the Validator upon request.

All test and inspection records shall clearly note their outcome (Pass/Fail, Accept/Reject). The Participant is solely responsible for the quality of all certified parts, therefore, if the Participant discovers noncompliances in the parts during inspection, it shall take action to correct the noncompliance. The Participant shall notify the Validator within 48 hours of discovering the noncompliance. The corrective action taken by the Participant shall be recorded on the Participant’s corrective action form as indicated in the Participant’s QCM. If the Participant is unable to correct the noncompliance on the current lot produced, the lot will be decertified and CAPA Quality Seals cannot be placed on those parts.
CAPA parts must demonstrate and document ongoing compliance with FMVSS 108 requirements regardless of any FMVSS 108 non-compliances that an OEM part may demonstrate.

12.2.1 Participant Inspection Requirements (Supersedes CAPA QSM Section 5.2)

The Participant must keep records of all tests and inspections performed on each production lot. These records will be made available to the Validator. The data for each test or inspection shall be recorded on the appropriate forms. Participants are allowed to utilize formats that suit their specific system needs as long as the following information is contained on each form: Participant name, part number, application, date, lot number, applicable inspection and acceptance criteria.

12.2.2 Validator Verification (Supersedes CAPA QSM Section 5.3)

The Validator will conduct inspections to ensure that CAPA’s quality standards are being met. The Validator will coordinate inspections with the Participant’s production schedules. CAPA reserves the right to have the Validator inspect all production lots of CAPA certified part numbers, and associated documentation.

12.2.3 Random Vehicle Test Fit (RDM VTF)

The Validator randomly obtains the Participant’s parts from certified lots. The Participant’s parts are evaluated on the vehicle for the items listed in Section 12.1.15.

12.2.4 Random Material and Functional Testing

The Validator randomly obtains the Participant’s parts from certified lots, and performs tests and inspections to ensure that the parts meet the appropriate requirements.

12.2.5 Warehouse Inspections

The Validator routinely performs inspections on certified lots stored in the Participant’s warehouse to check appearance attributes, conformance to CAPA packaging requirements, seal log records, and to ensure that all auxiliary equipment and accessories supplied with the OEM Master Part are supplied with the corresponding CAPA part, if applicable.

If the Validator detects noncompliances during any test or inspection, an 8-Step Corrective Action Request will be issued and the lot (and in certain cases, the part number) may be decertified.
12.3 FMVSS Regulations

The manufacturer must demonstrate a corrective action plan involving the appropriate notification of the United States National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT) if product is found to be in noncompliance with FMVSS requirements. The manufacturer is responsible for adhering to all legal requirements.

National Highway Traffic Safety Administration
Office of Crash Avoidance Standards
400 7th Street, SW
Washington, DC 20590