



Windshield Glass Abrasion Stress Test

1 Introduction

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

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

1.1 Purpose. This test will simulate scratches (damage sites/flaws) on the windshield, which will result in breakage if excessive residual stresses exist in the glass sample. By simulating these scratches/defects in the glass, an evaluation of the residual manufacturing stresses (thus, susceptibility for breakage) is possible. Performing this evaluation will help ensure the final product will not exhibit these concerns.

1.2 Applicability. All GM windshields worldwide.

1.3 Remarks. Due to varying residual stresses developed within the glass during the forming process, windshield breakage can result if the stresses are excessive or not counterbalanced by inherent compressive stresses. These excessive or unbalanced stresses are due to insufficient heating or cooling of localized regions within the glass during the bending process (improper annealing). The design and geometry of bending rings or oven parameters are often the root cause for these residual stresses. Breakage can occur after delivery of the vehicle to the customer, typically when a small or minor scratch occurs, (e.g., stone chip). Glass breakage results in undesirable warranty costs and customer dissatisfaction. A method has been developed that can identify susceptible parts and then help pinpoint the root cause so resolution can be sought. This methodology is described and should be followed by all GM windshield suppliers.

Note that another common cause or contributor to windshield breakage is installation or applied stresses, but the effect of these stresses cannot be evaluated using this test procedure. Also note that a combination of installation and residual manufacturing stresses may lead to windshield breakage, further confounding and obscuring the root-cause for a glass breakage concern as installed in a vehicle.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- CG180 5-Phase Document
- GM Security Guidelines. <https://gmweb.gm.com/HR/Security/Pages/FutureGuide.aspx>

3 Resources

3.1 Facilities. Windshield supplier's test lab/facility.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment. The following equipment (or equivalent) is required:

3.2.1 Glass checking fixture or equivalent peripheral support device for the windshield tested.

3.2.2 Racks capable of holding all glass test samples in a vertical orientation.

3.2.3 Picture or sample of an abraded piece of glass (see Figure 1).

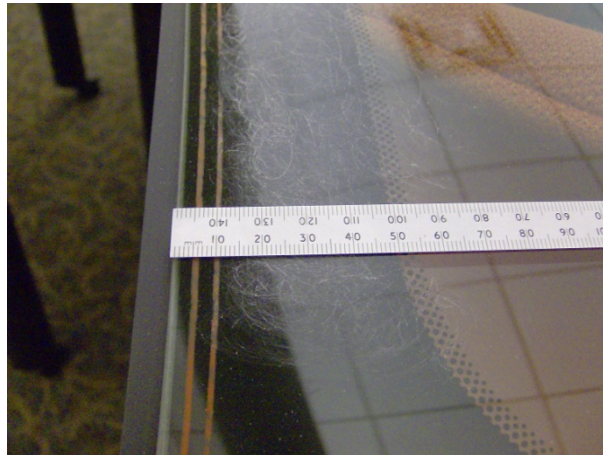


Figure 1: Image of an Abraded Piece of Glass for Reference in Creating Other Samples

3.2.4 Sandpaper Belt. Aluminum Oxide seaming belt sandpaper 100-Y grit long enough to cut into 100 mm squares. One (1) square will be needed for each windshield tested.

3.2.5 Paint Pen.

3.2.6 Digital Camera.

3.3 Test Vehicle/Test Piece. Quantity of test specimens required will depend on the manufacturing processes and other design variables, but evaluating three (3) windshields per bending ring for a gravity-sag process is an acceptable starting point.

For parts produced on a press-bend process, a minimum of 30 windshields shall be tested. These 30 samples must be randomly selected throughout the whole glass run (at minimum, every tenth part). Test samples shall be representative of final production windshields.

3.3.1 Material. The required material quality of the windshields are also designated by the relevant material specifications in the drawing.

3.3.2 Unless otherwise specified, three (3) samples of components, or systems, shall be tested.

3.3.3 All components/systems used in testing shall be within drawing specifications and have supporting data prior to start of test.

3.4 Test Time.

Calendar time: ~2 d

Test hours: 12 h to 24 h

Coordination hours: 4 h

3.5 Test Required Information.

3.5.1 GM Validation is to be notified of test failures within a 24 h period of occurrence.

3.5.1.1 Supplier to develop a 5-Phase Document (CG180) for all test failures.

3.5.2 Product Security. Security protocol for the test vehicle must be followed per GM Security Guidelines.

3.6 Personnel/Skills. A lab test technician or engineer should conduct these tests. At a minimum, the Subsystem Validation Engineer (SVE) and Design Engineer (DE) shall review the results of the test by implementing the Design Review Based on Failure Modes (DRBFM) process.

4 Procedure

4.1 Preparation.

4.1.1 Each bending ring shall be labeled with its own unique identification plate or marking system.

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