



Impact Cold Crack

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. Determine the resistance of topcoat cracking (leather) and topcoat/top skin cracking (plastic roll goods) due to impact at -30 °C.

1.2 Applicability. Passenger vehicle interior part components.

1.3 Remarks. None.

2 References

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

2.1 External Standards/Specifications.

ASTM D3574

2.2 GM Standards/Specifications.

GMW3221

2.3 Additional References.

- Fiber Converters, 15514 South Telegraph, Monroe, MI 48161
- FXI Corporation, 2211 South Wayne, Auburn, IN 46706
- Ontario Die International, 2735 20th Street, Port Huron, MI 48060

3 Resources

3.1 Facilities. Not applicable.

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.

3.2.1 Drop Impact Tester.

3.2.1.1 Part A. A Drop Impact Tester capable of producing 4 J on impact. The impact head must be of the dimensions specified in Appendix A, Figure A1.

3.2.1.2 Part B: A Drop Impact Tester capable of producing 1.5 J or 2.5 J on impact. The impact head must be as specified in Appendix A, Figure A1.

3.2.2 Cold Chamber.

3.2.2.1 Parts A and B. Cold chamber with port holes capable of maintaining $-30\text{ °C} \pm 2\text{ °C}$. The impact tester shall be inside of the cold chamber for all impact tests (Part A and Part B). Test may also be performed in a cold room capable of maintaining $-30\text{ °C} \pm 2\text{ °C}$.

3.2.3 Hardwood Block.

3.2.3.1 Part A. Two (2) hardwood blocks with dimensions of 100 mm $\pm$ 3 mm (length) $\times$ 100 mm $\pm$ 3 mm (width) $\times$ 25 mm $\pm$ 3 mm (thick). At the geometric center of each of the four (4) narrow sides of the hardwood block, a #8-15 round head wood screw shall be driven to such a depth that the top of the head remains approximately 3 mm above the surface of the block. The hardwood block shall be adhesively bonded to a foam block 100 mm $\pm$ 3 mm (length) $\times$ 100 mm $\pm$ 3 mm (width) $\times$ 50 mm $\pm$ 3 mm (thick). Any suitable adhesive is acceptable. See Appendix A, Figure A2. The foam block shall be made from high resilient polyurethane foam, polyether type. Upon receipt, the foam must be certified to have a density of 32 kg/m³ to 42 kg/m³. Upon receipt, the load value at 25% deflection shall be 1.24 Pa to 1.72 Pa. The load value shall be determined in accordance with ASTM D3574, Test C. The foam may be used until there is a visual sign of physical distortion (permanent indentation, crumbling, etc.)

3.2.3.2 Part B. Three (3) specimen holders as specified in Appendix A, Figures A5 and A6.

3.2.4 Cutting Dies.

3.2.4.1 Part A use Appendix A, Figure A3, and Part B use Appendix A, Figure A4. Cutting dies can be purchased from Ontario Die International, see 2.3.

3.2.4.2 The foam may be purchased from FXI Corporation, see 2.3.

3.3 Test Vehicle/Test Piece.

3.3.1 Standard Foundation Board Number 21929X. The fiberboard can be purchased from Fiber Converters.

3.4 Test Time.

Calendar time: 3 days

Test time: 4.5 hours

Coordination time: 24 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Personnel trained in accordance with the laboratory accreditation and Standard Operating Procedure requirements.

4 Procedure

Part A. Specimens are mounted on a fixture over a foam block. A drop impact tester and the mounted specimens are placed in a cold chamber for a minimum of 4 h at -30 °C. The specimens are impacted at 4 J and evaluated for cracks in the topcoat/top skin.

Part B. Specimens are mounted in a fixture over fiberboard. The drop impact tester and the mounted specimens are placed in a cold chamber for a minimum of 4 h at -3 °C. The specimens are impacted at the required impact level (see the applicable material specification) and evaluated for cracks in the topcoat/top skin.

4.1 Preparation.

4.1.1 Part A. Cut all specimens following the guidelines in the material specification. The specimen dimensions are included in Appendix A, Figure A3.

4.1.2 Part B. Cut all specimens following the guidelines in the material specification. The dimensions are included in Appendix A, Figure A4. Follow all conditioning and aging requirements in the material specification prior to testing.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

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

4.3 Instructions.

4.3.1 Part A.

4.3.1.1 Install one (1) of the test specimens (appearance side up) over the foam block. Secure the specimen to the block by putting each of the four (4) holes over the heads of the screws in the wooden block.

4.3.1.2 Make all required adjustments so that the impact tester will produce 4 J on impact before placing it in the cold chamber.

Note: To determine the required height, measure from the tip of the indenter (Appendix A, Figure A1) to the surface of the specimen. $(\text{Kg})(9.80665)(\text{M}) = \text{J}$.

Note: The design of some drop impact testers is such that frost may compromise their function. If frost is known to be a problem, the chamber should be started at room temperature and be cooled with the impact tester inside during the cooling process. Once the chamber has started cooling, do not open the cold chamber door before all testing has been completed. All tests should be conducted through the port holes.

4.3.1.3 Periodically check the temperature of the cold chamber until the temperature remains stable at -30 °C. Start timing the exposure so that the drop impact tester and all specimens remain at -30 °C for a minimum of 4 h prior to testing.

Note: When handling test specimens in the cold chamber, always wear gloves to protect your skin from the cold. It is also important to wear gloves to prevent heat transfer from your hands to the test specimens during handling.

4.3.1.4 After a minimum of 4 h, reach through a port hole and install the specimen under the impact head.

4.3.1.5 Raise the impact head to the correct height and allow it to drop.

4.3.1.6 Lift the impact head and remove the specimen (while still in the specimen holder). Install the next specimen and continue until all specimens have been tested. Examine each tested specimen for cracks that may be immediately visible in the topcoat/top skin. Allow the tested specimen to remain for a minimum of 24 h in a room conditioned to the requirements of GMW3221, Code A. Examine the topcoat/top skin again to ensure that no cracks in the topcoat/top skin are visible that may have been hidden by moisture and condensation.

4.3.1.7 After 24 h of conditioning, remove the tested specimen from the foam block. While holding the specimen with both hands at opposite edges and pulling gently, place one (1) finger under the impacted area from the non-appearance side to stretch it gently. Examine the impacted area for cracks in the topcoat/top skin.

4.3.2 Part B.

4.3.2.1 Cut one (1) piece of fiberboard to the dimensions shown in Appendix A, Figure A4. Place one (1) fiberboard piece on the bottom retaining ring of the specimen mounting fixture. See Appendix A, Figure A5 and Figure A6 for retaining ring dimensions. Install one (1) test specimen (appearance side up) over the fiberboard on the bottom retaining ring. Align the holes on the top retaining ring to fit over the four (4) threaded bolts on the bottom retaining ring. Secure the top retaining ring to the bottom one using four (4) winged nuts (finger tight).

4.3.2.2 Make all required adjustments so that the impact tester will produce either 1.5 J or 2.5 J. See the material specification for the correct impact level.

Note: To determine the required height, measure from the tip of the indenter to the surface of the specimen. $(\text{Kg})(9.80665)(\text{M}) = \text{J}$.

Note: The design of some drop impact testers is such that frost may compromise their function. If frost is known to be a problem, the chamber should be started at room temperature and be cooled with the impact tester inside during the cooling process. Once the chamber has started cooling, do not open the cold chamber door before all testing has been completed. All tests should be conducted through the port holes.

4.3.2.3 Periodically check the temperature of the cold chamber until the temperature remains stable at -30 °C. Start timing the exposure so that the drop impact tester and all specimens remain at -30 °C for a minimum of 4 h prior to testing.

Note: When handling test specimens in the cold chamber, always wear gloves to protect your skin from the cold. It is also important to wear gloves to prevent heat transfer from your hands to the test specimens.

4.3.2.4 Reach through the port holes and install the specimen holder (with the specimen) in the impact tester. Raise the impact head to the required height to produce the required impact energy.

4.3.2.5 Release the impact head.

4.3.2.6 Raise the impact head and remove the specimen after it has been impacted. Examine the specimen for cracks in the topcoat/top skin. Allow the specimen to remain for a minimum of 24 h in a room conditioned to the requirements of GMW3221, Code A. Examine the topcoat/top skin again to ensure that no cracks in the topcoat/top skin are visible that may have been hidden by moisture and condensation. Examine the specimen while holding it with both hands at opposite sides while pulling gently. Place one (1) finger under the impacted area from the non-appearance side to stretch it gently.