Panoramic Sunroof Issue

OICA/CLEPA-comment on the national defect investigation and the proposed amendments to toughened glazing by the Republic of Korea
Motivation

• At last GRSG-106, the Republic of Korea presented the results of a national defect investigation on panorama sunroofs which are made from toughened glazing (GRSG-106-21).
• As a consequence, the Republic of Korea proposed amendments to GTR No. 6 on safety glazing (GRSG-106-10) and ECE-R 43 (GRSG-107-06).
• During the discussion at GRSG-106, OICA, CLEPA and also other experts raised concerns that the proposed amendments to the ball drop test were not justified and appropriate.
• All experts were invited to prepare further comments.
• The aim of these OICA/CLEPA-slides is to present the industry position on this topic and to give more detailed background information on toughened glazing panoramic sunroofs to all involved stakeholders.
Introduction

• Vehicle manufacturers currently provide optional panoramic sunroofs for all limousine/station wagons/SUVs to the markets worldwide.
• The glass panes are made of safety glazing (especially toughened glazing).
• The technology of toughened glazing has been used successfully for more than 20 years for sunroof applications.
• As the principle technology has not been changed over the past years, we cannot identify a direct link to the reported increase of alleged sunroof occurrences.
Market Situation

- The Republic of Korea reported a “sharp increase in consumer complaints (33 cases in 2013)”

**Market situation in Korea (2013)**

Vehicles with panorama glass roofs: ~ 650,000

They are produced by:

- National manufacturers: ~ 520,000
- Imported vehicles: ~ 130,000

**Conclusion**

- The occurrence rate in the field is extremely low: 0.00005 → a general, systematic or design issue can not be concluded based on this figure.
- No harmful injuries were reported.
- There are no known concerns for panoramic sunroofs outside Korea
Specifications Sunroof

- Legal Standards and safety requirements (Certification Tests)

- Additional OEM specific requirements include e.g.
  - Acoustics (e.g. operating noise, rattling)
  - Endurance tests (e.g. climate, wind)
  - Water management (e.g. no water entry during shower tests)
  - Temperature and climate tests (e.g. high temperature tests)
  - Specifications on ceramic coating include anti stick, shade, high opacity, chemical resistance, perfect bonding properties, etc.

Conclusion
- Due to high complexity of sunroofs including its toughened glazing with ceramic coating, all OEMs demand extensive specs beyond legal requirements to assure best product quality and high passenger safety.

Certification Tests

Certification Tests to be passed by toughened glass according to ECE-R 43 and other international regulations:

1. Fragmentation test → to avoid injuries by sharp edges of a broken glass
2. Light Transmission
3. Mechanical strength (227 g ball-impact test) → to ensure that objects (e.g. stone chipping) do not penetrate into the occupant compartment

ECE-certification approval process

- Glazing manufacturer: Submit test pieces and apply for approval
- Technical Service: Conduct certification tests, issue test report
- Authority: Issue approval for a type of safety glazing
- Vehicle manufacturer: Apply for installation at a type of vehicle

Conclusion:
Tests are conducted by independent labs to ensure reliable procedures.
Conformity of Production

- General requirement: Glazing manufacturer must implement procedures to guarantee effective control of the conformity of the produced glazing with respect to the approved type.
- Special provisions for toughened glass according to ECE-R 43:
  1. Fragmentation test (permanent records of fragmentation are required)
  2. Light transmission
  3. Mechanical strength (227 g ball-impact test)

Conclusion
- Since every glass will break if a certain stress is applied, the most important safety aspect is to avoid any sharp edges of the broken glass.
- Relevant in terms of safety is the fracture pattern after breakage which is not impacted by the ceramic inks.
- This aspect is verified by the fragmentation test which is required both for approval-tests and for Conformity of Production.
Technology of Toughened Glazing and Ceramics

• Figure 01 shows a typical glazing structure. Underneath the glass pane (inner face) a ceramic layer is located.

• Figure 01 is typical for each glazing element and not only for sunroofs. It is also representative for backlites, sidelites, etc.

Figure 01: structure of a printed glass
Advantages Ceramic Area

- The ceramic area has both a design and a protection function.

**Design Character**
- Ceramic area covers and hides hardware behind the glass such as parts of the vehicle body and assembled trim parts.

**Ceramic protects**
- Protects against UV Radiation: Important for organic materials like polyurethanes (encapsulation material) and the adhesive bead/glue which connects the glazing with the roof frame.

**Conclusion**
- Ceramic protects adhesives and therefore are an important safety feature to guarantee the strength of the whole passenger compartment.
- Therefore, the use of ceramics is essential.
Advantages Ceramic Area

Size:
• Design aim is to keep the ceramic area as small as possible to provide customers a maximum large transparent area.
• Ceramic area is limited to cover hardware such as vehicle body and interior trim parts.

Conclusion
• Objects which impact the coated area cannot intrude into the vehicle cabin, because hardware such as vehicle body and interior trim parts are covered.
• If the glass breaks, it fragments into small harmless pieces.
The ball drop test which is foreseen in UNECE, Japan, USA and GTR6 and KMVSS (revised in 2010 to include GTR requirements) is **based on ISO 3537 (since 1975)**.

Excerpt from GTR 6 (Statement of Technical Rationale and Justification):

- ISO 3537 has been revised recently in August 2014 by all ISO members of ISO/TC 22/ SC 11 “Safety glazing materials”. There are no changes concerning the ball drop test!
227 g Ball Point of Impact

ISO 3537: „The point of impact shall be within 25 mm of the geometric center of the test piece”

UNECE: Geometric center of the test piece or Geometric center of the finished product

FMVSS: (Geometric) Center of the Test Piece

GTR 6: As UNECE Center of supported area (error on Page 34 → wording needs to be corrected)

KOR Proposal: Center of the supported Area (GRSG 106-10, GRSG 107-06)

Conclusion:
• According to international standards, the point of impact is the geometric center of the test piece
• The Korean proposal includes the typing error from GTR 6
The proposals to GTR No. 6 (GRSG-106-10) and ECE-R 43 (GRSG 107-06) concern the 227 g ball impact test which is internationally standardized by ISO 3537.

**Key points:** Both proposals address the point of impact: Aim to replace “geometric centre of the test piece” by “centre of the supported area” which is the wording error from GTR No. 6.

**Consequence:** These proposals would lead to a ban of printed toughened glass, roof lights and all other toughened glazing, with ceramic area of more than approx. 120 mm width and therefore be more design restrictive.

**OICA/CLEPA position:**

- There is no reasonable indication given to get the regulations changed as proposed by the Republic of Korea (especially other glazing).
- The Korean proposal is not a standardized test and is not included in ISO 3537.
- There is no added value in modifying this well-established worldwide test procedure.
Proposal of OICA/CLEPA

1. The wording error on #6 of GTR 6 should be amended:

→ Replace “centre of the supported area” by “geometric centre of the test piece”.

→ Justification: Corrigendum of GTR 6 with respect to the technical rationale of GTR6 (impact test procedure same as ISO 3537/UNECE).

2. Industry is ready to discuss on any clarification in UNECE regarding the application of ceramic coating for toughened sunroof glazing, if needed.
Summary

• OICA/CLEPA support the approach to align GTR 6 and UNECE No. 43.

• From OICA/CLEPA perspective, it’s important to avoid any design restrictive requirements which may ban certain technologies that are well performing today.

• OICA/CLEPA therefore support the approach to remain performance based requirements based on standardized procedures (ISO).