

## NHTSA Questions on Failures of Panoramic Sunroofs and Proposed Amendments to GTR 6:

### Data on Existing Panoramic Sunroofs:

- During the 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> IWG sessions NHTSA requested additional information on the panoramic sunroofs experiencing breakage. We thank the Korean Delegation and the members of OICA and CLEPA for providing information on the dimensions of glazing and CPA (see PSG-04-06 and PSG-04-07), but have additional questions for which we request answers as follows:
  - We note from the KATRI data that 33 cases were reported in 2013, of which 5 were on imported vehicles. Can KATRI provide more detailed information on the vehicle models from these cases? We would like to compare this data against the data collected by NHTSA on breakages.
  - Data collected during NHTSA's defects investigation of the Kia Sorrento panoramic sunroof glazing indicates a similar split between Korean manufacturers and other manufacturers' vehicles. What is different about the Korean products and the rest of the world?
  - What models were measured in development of the CPA data from KATRI and CLEPA? Can this be provided in spreadsheet format with the model information for additional analysis?
  - Can KATRI, OICA, and CLEPA provide information on the thickness of sunroof glazing and thickness of the ceramic paint used in manufacture of panoramic sunroofs?
    - How do these thicknesses compare with the glazing exhibiting sudden breakage?
  - Can KATRI, OICA, and CLEPA provide additional information on the glazing and ceramic paint compositions used in manufacture of panoramic sunroofs?
    - How do these compositions compare with the glazing exhibiting sudden breakage?
  - What insight can the glazing and CPA manufacturers provide?
    - Chemical composition of the frit?
    - Coefficients of thermal expansions for frit and glass?
    - Processing parameters of glazing?
    - Heat treatment process for tempering?

### Questions about proposed test methods and amendments to GTR:

- During the 3<sup>rd</sup> and 4<sup>th</sup> IWG meetings, limiting application of the proposed tests to overhead glazing was discussed. While NHTSA agrees that overhead glazing presents some unique issues, we remain unconvinced that similar failures could not occur in other glazing locations. From this standpoint, what is the technical justification for excluding other glazing locations? Should we not expect all toughened glazing with ceramic printed areas to perform as expected?

- Korean data from the 2<sup>nd</sup> IWG meeting (PSG-02-04) indicates that temperature (pg 3), vehicular velocity (pg 3), vehicle mileage (pg 4), self-explosion (pg 4), impact (pg 4), and speed bumps (pg 7) all were likely to affect the rate with which failures occur. It was later clarified in the 3<sup>rd</sup> IWG session that impacts from small objects were likely the cause. These impacts, however, do not explain the possible correlations with temperature, velocity, and age. Can Korea provide any additional information on these three correlations?
  - Should the test methods be performed at an elevated temperature to simulate the failure conditions?
  - Are there vibratory effects from vehicle velocity that are inducing bending moments that increase the likelihood of failure? Should bending or vibration be included as a parameter for testing?
  - We find the age of the failed glazing suspicious. There appears to be some correlation to recently manufactured glazing. Can Korea provide any additional information on the age of the failed glazing? Was this an issue of a particular batch of materials used? Is this indicative of a design flaw rather than a regulatory issue?
  - It has been proposed during the 3<sup>rd</sup> and 4<sup>th</sup> IWG meetings to limit testing to glazing with CPAs in excess of specific percentages of areas or widths. We understand the theory is that with larger CPA covered areas, the probability of striking an area with ceramic paint is higher, therefore the probability of breaking the glazing is higher given the potential for ceramic paint to affect the heat treatment of toughened glazing. What is the technical justification for the percentages and widths selected?
    - What analyses have been performed to determine the sensitivity of printed area versus glazing strength?
    - What analyses have been performed to determine sensitivity of glazing strength to thickness of the ceramic paint layer, or relation between thickness of glazing and thickness of CPA, or relationship between full coverage CPA versus dot matrix CPA and glazing strength?
    - Can KATRI provide any additional information on the cases of breakage in Korea to correlate where failures have occurred and the CPAs of the affected and unaffected panoramic roofs? Specifically, what are the percentages of CPA coverage, widths of CPA side banding, and type of CPA coverages (full paint or dot matrix?) for both the models where failures are predominant and models where failures were less likely?
  - In each of the IWG meetings, it has been proposed to conduct a 227g ball drop test on both toughened and CPA glazing to ensure that the glazing meets certain performance requirements. We note that the proposed language does not actually specify separate performance requirements, rather it specifies where specimens may be drawn from or equate to on panoramic roofs to determine performance. We also note that comparisons of various drop heights were discussed (PSG04-07, page 5), but not fully considered during previous IWG sessions.

- Why has the IWG not considered the 3 meter drop height in NHTSA's FMVSS No. 205 as an alternative to the drop height specified in GTR 6 and R.43? What is the technical justification for not harmonizing with the US standard?
- We note that the shot bag test incorporated in the US standard induces bending loads on glazing that may indicate resistance to fracture from micro-cracks on the surface of CPAs. Given that bending loads may increase the propensity for failures to occur, specifically when vibratory loads are introduced during vehicle movement or flexion from traversing road hazards such as speed bumps, what analyses have been performed to determine if such a shot bag test, or equivalent, would be more appropriate for determination of strength degradation due to CPA applications?
- What is the status of the areas of research proposed by Korea during the 3<sup>rd</sup> IWG under document number PSG-03-08?