

The explanatory statement on proposed amendments to GTR 6 by KOREA

24. Feb. 2016

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1. Introduction

- The members of IWG PSG reached an agreement to make an amendment of GTR 6 for CPA(ceramic printed area) limitation of vulnerable strength during 3rd PSG meeting in February 2016.
- Therefore, The Korea is conducting the study for the decision about the methods and the specific value for CPA limitation, too.
 - The Korea attempted to find the optimal size of CPA to consider both the minimum size for installing and the breakage prevention during driving.
 - So the Korea made a plan for review about the current status of CPA application in Korea.

1. Introduction

- Of course, it happens the breakage of toughened glass in panoramic sunroof according to various causes.
- In order to minimize glass breakage possibility of panoramic sunroof, the Korea first is reviewing by following factors for limitation about the CPA of vulnerable strength that we already found.
 - The purpose of 227g ball drop test about toughened glass
 - The current status about the CPA application in Panoramic sunroof

2. The purpose of 227g ball drop test

○ The purpose of 227g ball drop test

- Toughened glass and laminated glass have a difference in the purpose to be used for application to automotive because of the differences in strength and fracture properties due to the difference in the manufacturing process.
- Therefore, Toughened glass and laminated glass have different in the purpose of the 227g ball drop test such as the follows, too.
 - Toughened-glass : Mechanical Strength for resisting to breakage.
 - Laminated-glass : Adhesion of interlayer for resisting to penetration.



<The fracture characteristic between toughened glass and laminated glass>

2. The purpose of 227g ball drop test

The purpose of 227g ball drop test

- Reference

- GTR 6 : To describe the test purpose about the mechanical property between toughened glass and laminated glass.
 - Toughened-glass is that first of all must have the specific strength for resistance to breakage. Nevertheless, in the event of breakage, it shatters into small piece for minimizing the injury of occupants into the vehicle.
 - Laminated-glass is that first of all must have the specific strength for resistance to penetration.

(c) Mechanical properties

20. There are basically two types of glass-based glazing used in automotive applications, the toughened (also known as tempered) and the laminated. There are differences between them in the manufacturing process, weight, cost, strength and fracture properties.

21. Toughened glass is produced using a manufacturing method (heat tempering) that introduces internal stresses in glass. Heat tempering increases the mechanical strength of the glass, so it resists to breakage. In the event that the glass does break, it shatters into numerous small, blunt-edged pieces rather than large and/or sharp fragments, reducing the risk of injury to an occupant struck by the broken glazing.

22. Laminated glazing consists of two glass panes sandwiching a plastic interlayer, which is inserted after the glass panes have been bent to the desired shape. The total assembly is highly resistant to penetration, and in the case of breakage, many small, fragments are held in place by the interlayer. This reduces the risk of head injury. In the case of an impact with a foreign object, emergency visibility is maintained. For these reasons this gtr only specifies requirements for laminated glazing windscreens, using laminated glass or glass-plastics.

2. The purpose of 227g ball drop test

○ The purpose of 227g ball drop test

● Reference(con't)

- UN R43 : To describe the test purpose about mechanical strength between toughened glass and laminated glass.
 - Toughened-glass is the evaluation of the mechanical strength.
 - Laminated-glass is the evaluation of the adhesion between the glass and interlayer.

8.1.2.	Mechanical strength test
8.1.2.1.	Ball-impact test There are two forms of tests, one using a 227 g ball and one using a 2,260 g ball.
8.1.2.1.1.	<u>227 g ball test: The purpose of this test is to assess the adhesion of the interlayer of laminated glass and the mechanical strength of uniformly-toughened glass and plastic glazings.</u>
8.1.2.1.2.	2,260 g ball test: The purpose of this test is to assess ball-penetration resistance of laminated glass.

2. The purpose of 227g ball drop test

○ The purpose of 227g ball drop test

● Conclusion

- As described the GTR 6 and UN R 43, Toughened glass and laminated glass are different from the purpose of use to automotive according to the differences in strength and fracture properties. Therefore, the purpose of 227g ball drop test is also established by the different evaluation standards considering each glass advantages of use.
- In the case of using toughened glass in panoramic sunroof, the purpose of the 227g ball drop test means to evaluate the resistance strength to breakage in terms of an external impact by flying objects.

3. Status of CPA application in Korea

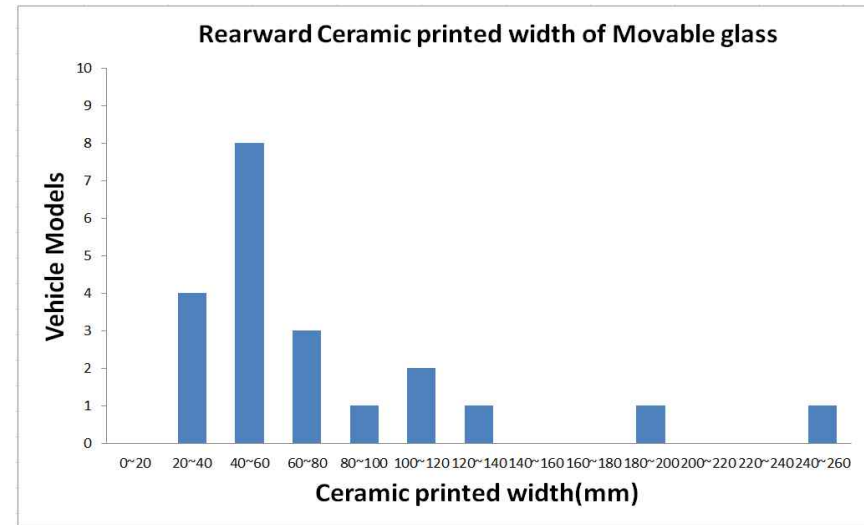
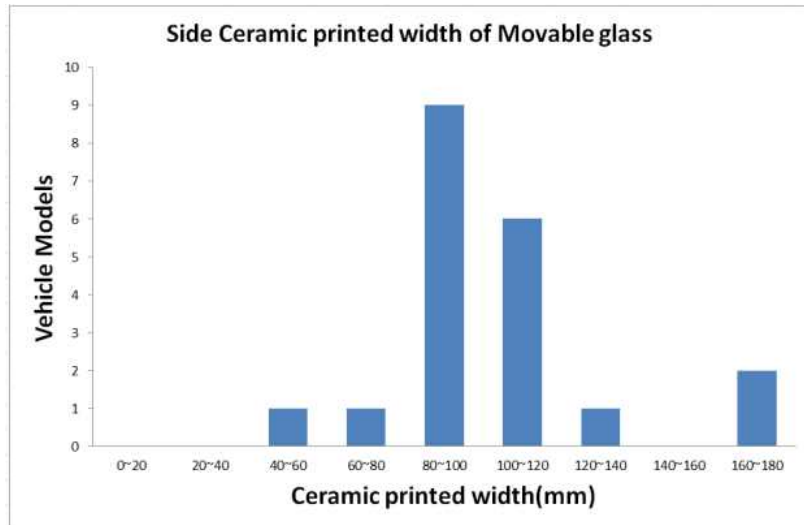
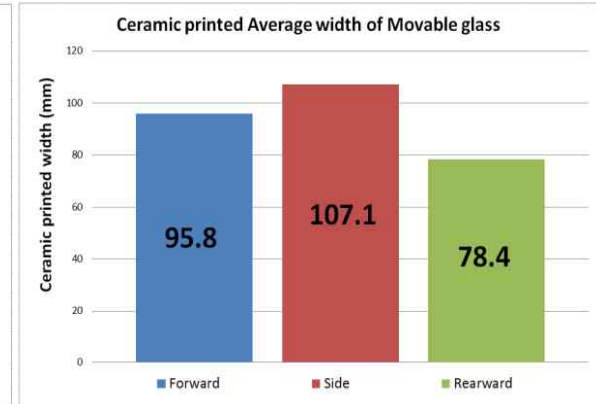
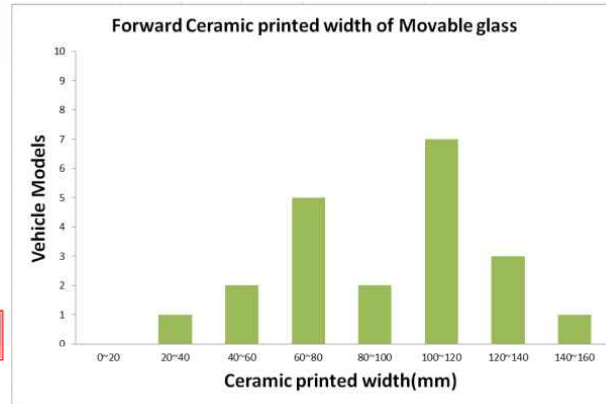
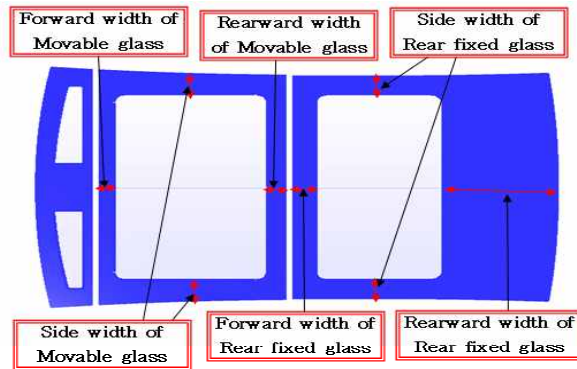
- **Survey on CPA status of PSG(Panoramic sunroof grazing)**
 - Toughened glass of panoramic sunroof mounting on the vehicles sold in 2015 Korea market from the Korea vehicle manufacturer : Panoramic sunroof : 20 models(All Top-Loading type)
 - Because Panoramic sunroofs of Top-loading type are placed on about 95% of panoramic sunroof models mounting on vehicles and about 99% of sales volume in Korea



3. Status of CPA application in Korea

Survey on CPA status of PSG(Panoramic sunroof grazing)

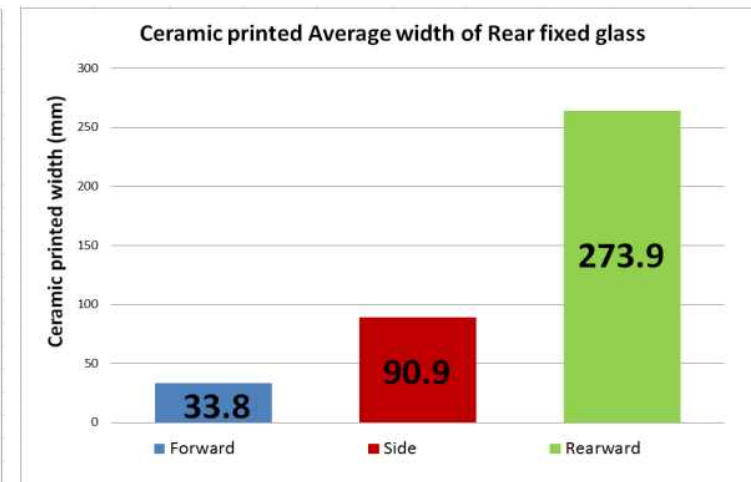
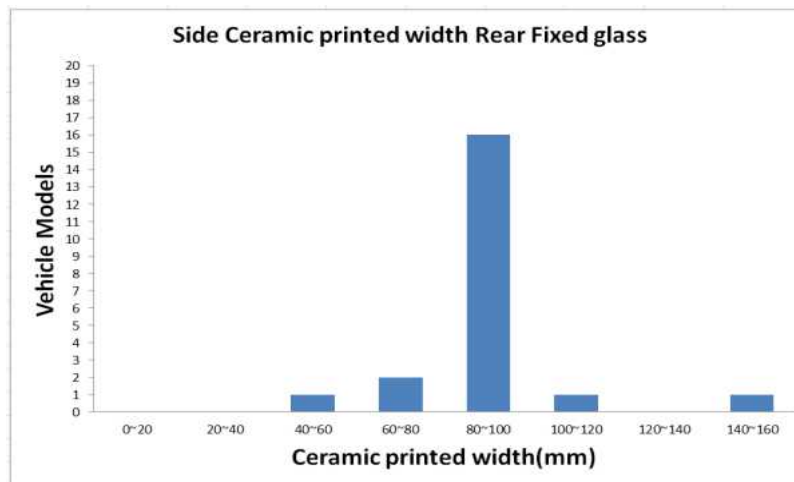
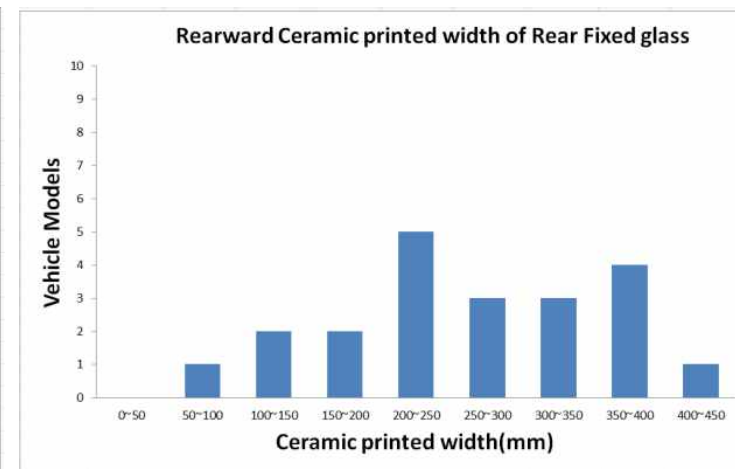
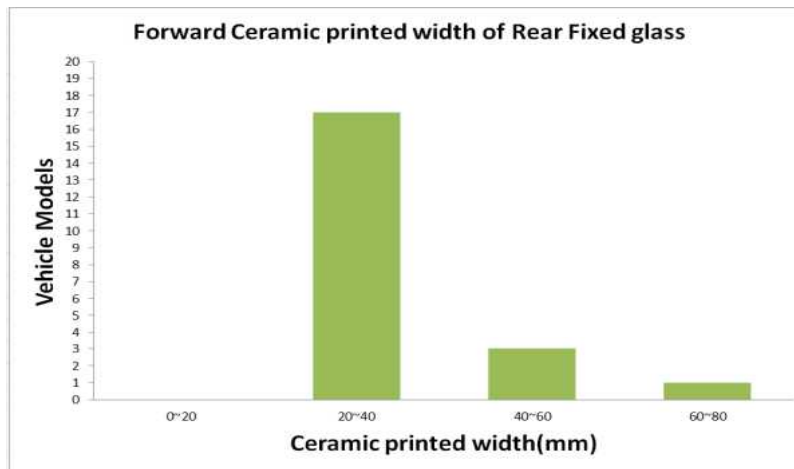
Width of CPA at each location in movable glass



3. Status of CPA application in Korea

- Survey on CPA status of PSG(Panoramic sunroof grazing)

- Width of CPA at each location in Rear fixed glass



3. Status of CPA application in Korea

- Survey on CPA status of PSG(Panoramic sunroof grazing)

- Width of CPA at each location of PSG

	Ceramic printed Location of Movable glass			
	Forward width(mm)	Rearward width(mm)	Side width(mm)	Total width(mm)
50 % ¹⁾	95	55	99	95
75 % ²⁾	116	98	110	110

	Ceramic printed Location of Rear Fixed glass			
	Forward width(mm)	Rearward width(mm)	Side width(mm)	Total width(mm)
50 % ¹⁾	30	245	89	87
75 % ²⁾	37	343	94	186

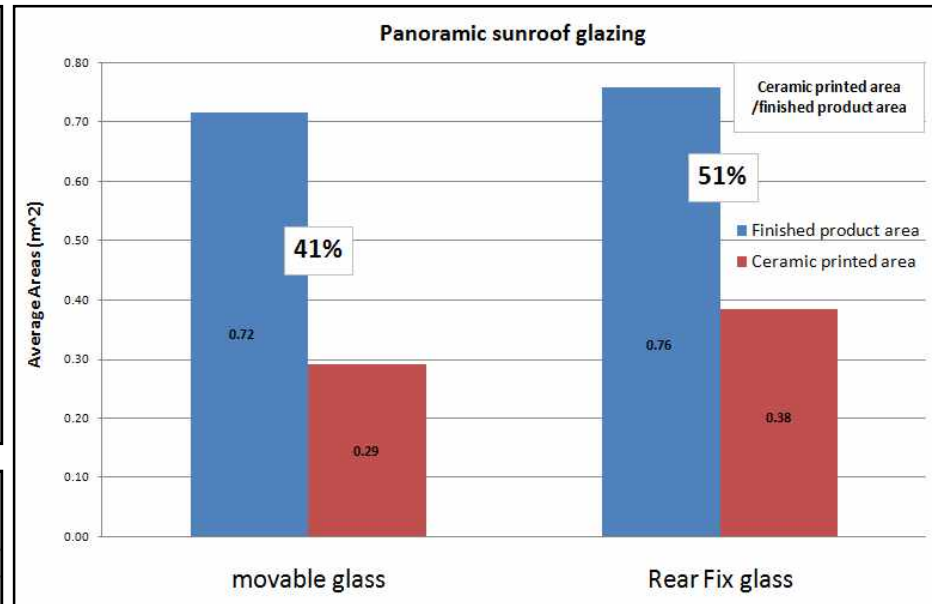
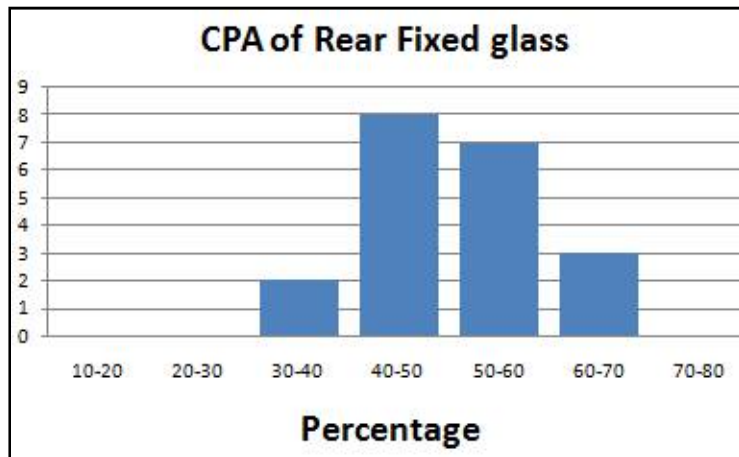
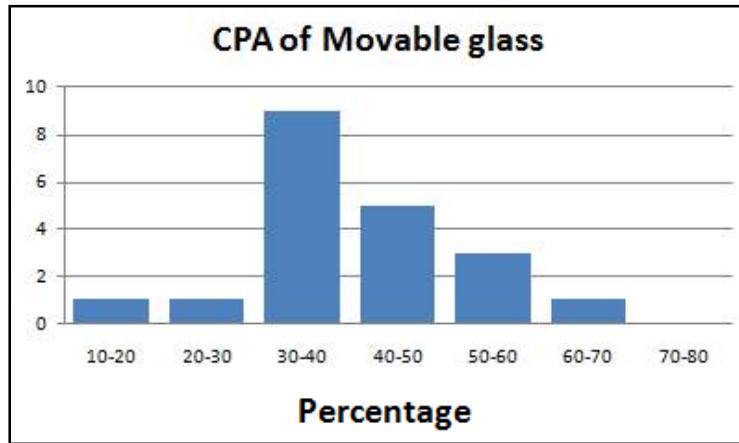
- 1) This ceramic width of movable glass can be applied to the middle quartiles of Panoramic sunroofs mounting on total vehicle models
- 2) This ceramic width of movable glass can be applied to the upper quartiles of panoramic sunroofs mounting on total vehicle models

- In the case of the width limitation to the ceramic printed area from the edge of finished product outline, it is difficult to apply both the front moving glass and the rear fixed glass with same CPA limit(because those difference occurs more than 4 times.)
- However there are no reasonable bases in terms of safety sides about the application of different CPA width limit between the front moving glass and the rear fixed glass.
- In addition, it is difficult to apply same CPA width limit due to various toughened glass sizes according to the panoramic sunroofs.

3. Status of CPA application in Korea

Survey on CPA status of PSG(Panoramic sunroof grazing)

Percentage of CPA in PSG



	CPA percentage of PSG location	
	Movable glass(%)	Rear Fixed glass(%)
50 % ¹⁾	39	48
75 % ²⁾	48	58

3. Status of CPA application in Korea

○ The CPA limit methods in terms of current CPA application.

● Conclusion

- Considering the current CPA application of the panoramic sunroof, the CPA limit method is reasonable to limit the CPA application size ratio per the finished product because it is difficult to limit the CPA application width.
- Current Korea CPA status applies to average 41 % at the front moving glass and average 51 % at the rear fixed glass.
- Toughened glass applied to over 50% CPA shall be able to represent the strength property of CPA because that looks like ceramic printed toughened glass.
- The CPA application to less than 50% is not technically impossible because more than half of the Top Loading-type of the panoramic sunroof are applied with less than 50% CPA.

➡ **If the toughened glass applied to over 70 % CPA in panoramic sunroof be reduced to less than 50 % CPA, the potential breakage probability due to external object impact will be also reduced.**

4. Summary

- 227g ball drop test of GTR 6 is the test method for evaluating about the resistance strength to breakage due to external impact.
- The CPA limit method is reasonable to limit the CPA application ratio per the finished product because it is difficult to limit the CPA application width
 - However, the CPA size shown inside of the vehicle shall be limited to the minimum width for preventing excessive use from only specific areas(sides) according to the CPA ratio limit on total area of the finished product.
- Consequentially the Korea propose **to limit less than 50% to the CPA ratio** of the total finished product according to both current CPA application status and test representativeness reflecting the finished product.
 - In addition, **to limit less than 25 mm to the CPA width from the edge of area shown inside** of the vehicle.

5. GTR 6 amendment proposed by the KOREA

○ The scope of toughened glass which would be subject to the amendment of GTR 6

- GTR 6 amendment will be applied to the minimum coverage of toughened glass which may negatively affect safe driving in the case of sudden breakage while driving.

Paragraph 6.3.4.1., amend to read:

“6.3.4.1 The test piece shall be 300 x 300 mm flat sample, specially made or cut from the flattest part of a windscreen or pane. The test piece shall be as defined in paragraph 7.2. in the case that the following toughened glass of vehicles is exposed to the inside of vehicle:

- (a) Sunroofs and panoramic sunroofs
- (b) The roof of vehicle

5. GTR 6 amendment proposed by the KOREA

- Test methods depending on the range of CPA. (In the case of conducting test on non-ceramic printed sample.)

- Conduct the ball drop test on non-ceramic printed sample if CPA is less than minimum allowable range.

Annex 7, Insert new paragraph 7.2., to read:

“7.2 Annex 7.2. Procedures for determining test pieces for toughened glass

7.2.1 Test pieces shall be determined as follows:

7.2.1.1 Determination of test pieces which does not have opaque obscuration area

7.2.1.1.1 Test pieces shall be 300 x 300 mm flat samples which is specially manufactured not to have any opaque obscuration area, if paragraphs 7.2.1.1.2. and 7.2.1.1.3. of this annex are met.

7.2.1.1.2 For mounting the glass to vehicle, toughened glass shall incorporate opaque obscuration area no larger than **50%** to the surface area of the finished product.

7.2.1.1.3 If toughened glass is exposed to the inside of vehicle, the width of opaque obscuration area shall be no longer than **25mm** from the edge of the designed glass outline.

5. GTR 6 amendment proposed by the KOREA

- Test methods depending on the range of CPA. (In the case of conducting test with 100%-ceramic printed sample.)

- Conduct the ball drop test on 100% ceramic printed sample if CPA exceeds minimum allowable range.

7.2.1.2 Determination of opaque obscuration test pieces

7.2.1.2.1 If a finished product does not comply with the requirements of paragraphs 7.2.1.1.2. and 7.2.1.1.3, test pieces shall be 300 x 300 mm flat samples, specially manufactured to have opaque obscuration area printed inside.



Thank you for your attention !

MOLIT

Ministry of Land, Infrastructure and Transport

KATRI

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