

**Draft proposal for amendments to Regulation No. 43
(safety glazing)**

This document was prepared by the informal group on the introduction of plastic glazing for windscreens and laminated plastic panes other than windscreens in Regulation No. 43 (IGPG). It supersedes the informal document GRSG-104-43. The modifications to the current text of the Regulation are marked in bold or strikethrough characters.

A. PROPOSAL

The content, insert new Annexes 17 and 18, to read:

"Annex 17 Rigid plastic windscreens

Annex 18 Laminated rigid plastic panes"

Annexes 17 (former) to 21, renumber as Annexes 19 to 23

The text of the Regulation,

Insert a new paragraph 2.6.3., to read:

"2.6.3. "Laminated – rigid plastic pane" means a plastic pane consisting in two or more layers of plastic held together by one or more interlayers of plastic material."

Paragraph 2.18., replace the reference to "Annex 17" by "Annex 19":

Paragraph 2.19., amend to read:

"2.19. "Type of safety glazing material" means a glazing as defined in paragraphs 2.1. to 2.7. not exhibiting any essential differences, with respect, in particular, to the principal and secondary characteristics defined in Annexes 4 to 12 and ~~14 to 16~~ **to 18**; "

Paragraph 2.26., replace the reference to "Annex 18" by "Annex 20"

Paragraph 5.2, amend to read:

"5.2. An approval number shall be assigned to each type as defined in Annexes 5, 7, 11, 12, 14, 15, **16 and 18** or, in the case of windscreens, to each group"

Paragraph 5.5.5., amend to read in /L and /M:

"5.5.5. VIII in the case

.....

/L for panes with a light scatter not exceeding 2 per cent after 1,000 cycles on the outer surface and 4 per cent after 100 cycles on the inner surface (see Annexes 14, ~~16~~ **and 18**, paragraph 6.1.3.1.).

/M for panes with a light scatter not exceeding 10 per cent after 500 cycles on the outer surface and 4 per cent after 100 cycles on the inner surface (see Annexes 14, ~~16~~ **and 18**, paragraph 6.1.3.2.)."

Insert new paragraphs 5.5.11. and 5.5.12., to read:

"5.5.11. XIII in the case of rigid plastic windscreens.

5.5.12. XIV in the case of laminated rigid plastic panes with the signification as described in paragraph 5.5.5."

Paragraph 5.8., replace the reference to "Annex 21" by "Annex 23"

Insert new paragraphs 7.13. and 7.14., to read:

"7.13. as regards rigid plastic windscreens, the requirements contained in Annex 17.

7.14. as regards laminated rigid plastic panes, the requirements contained in Annex 18."

Paragraph 8.2.1.2., amend to read:

"8.2.1.2. Plastic glazing materials shall be subjected to the tests listed in the following table:

Test	Windscreens	Plastics other than windscreens						
	Rigid plastics	Rigid plastics		Laminated rigid plastics		Multiple glazing		
	Motorised vehicles	Motorised vehicles	Trailers and unoccupied vehicles	Motorised vehicles	Trailers and unoccupied vehicles	Motorised vehicles	Trailers and unoccupied vehicles	Flexible plastics
Flexibility	A3/12	A3/12	A3/12	A3/12	A3/12	A3/12	A3/12	A3/12
227 g ball	A17/5	A14/5	A14/5	A18/5	A14/5	A16/5	A16/5	A15/4
Headform ^{1/}	A17/4	A14/4	-	A18/4	A14/4	A16/4	-	-
Light transmission ^{2/}	A3/9.1	A3/9.1	-	A3/9.1	A3/9.1	A3/9.1	-	A3/9.1
Optical distortion	A3/9.2	-	-	-	-	-	-	-
Secondary image	A3/9.3	-	-	-	-	-	-	-
Fire resistance	A3/10	A3/10	A3/10	A3/10	A3/10	A3/10	A3/10	A3/10
Chemical resistance	A3/11	A3/11.2.1.	A3/11	A3/11	A3/11	A3/11	A3/11	A3/11.2.1.
Abrasion (<i>method TBD</i>)*	A17/6.1 Taber, sand drop, carwash	A14/6.1	-	A18/6.1 Taber, sand drop, carwash	A14/6.1	A16/6.1	-	A16/6.1
Weathering	A3/6.4	A3/6.4	A3/6.4	A3/6.4	A3/6.4	A3/6.4	A3/6.4	A3/6.4
Humidity	A17/6.4	A14/6.4	A14/6.4	A18/6.4	A14/6.4	A16/6.4	A16/6.4	-
Cross-cut ^{2/}	A3/13	A3/13	-	A3/13	A3/13	A3/13	-	-
Radiation resistance	-	-	-	A3/6	-	-	-	-
High temperature	-	-	-	A3/5	-	-	-	-

^{1/} Test requirements are dependant on the location of the glazing within the vehicle.

^{2/} Applies only if the glazing is to be used in a location requisite for driving visibility."

* *Note of the GRSG-IGPG Secretariat:* Decision about a proper abrasion (Taber Test, sand drop, car-wash, wiper test) test method is on-going within the informal group. This cell will be updated when relevant test method will be introduced.

Paragraph 10.2., replace reference to "Annex 20" by "Annex 22"

Annex 1,

Paragraph 2, amend to read:

"2. Description of the type of glazing: please refer to Appendices 1, 2, 3, 4, 5, 6, 7, 8 ~~and, 9, 10 and 11 2/~~, and in the case of windscreens, the list conforming to ~~Appendix 10~~ **Appendix 12."**

Appendices 1, 2, 3 and 5, the bottom line, replace the reference to "Appendix 10" by "Appendix 12".

Appendix 10, renumber as "Appendix 12" and insert new Appendices 10 and 11 to read:

"Annex 1 – Appendix 10

RIGID PLASTIC WINDSCREENS

(Principal and secondary characteristics as defined in Annex 17 to Regulation No. 43)

Approval No.

Extension No.

Principal characteristics:

The chemical designation of the material

Classification of the material by the manufacturer

Nominal thickness

Process of manufacture

Shape and dimensions

Colouring of the plastic product

Nature of the surface coating

Secondary characteristics:

Conductors incorporated (yes/no)

Obscuration incorporated (yes/no)

Remarks

Documents attached: list of windscreens (see Appendix 12)

Annex 1 – Appendix 11

LAMINATED RIGID PLASTIC PANES

(Principal and secondary characteristics as defined in Annex 18 to Regulation No. 43)

Approval No.

Extension No.

Principal characteristics:

- Number of layers of plastic
- Number of layers of interlayer
- Nominal thickness
- Nominal thickness of interlayer (s).....
- Nature and type of interlayer (s)
- Special treatment of plastic
- Colouring of plastic product
- Chemical designation of single sheet material
- Classification of the material
- Process of manufacture
- Shape and dimensions
- Nature of the surface coating

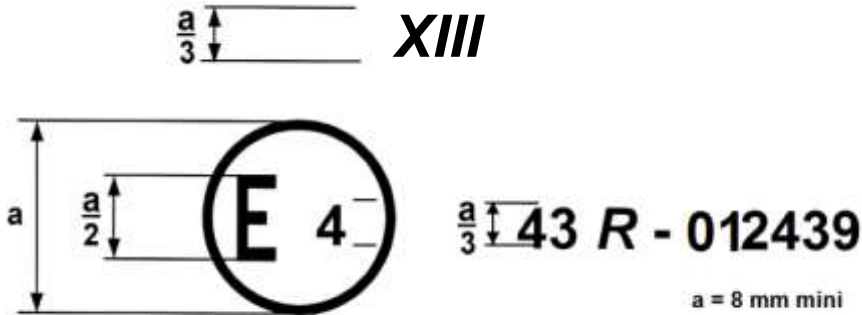
Secondary characteristics:

- Colouring of interlayer (total/partial)
- Conductors incorporated (yes/no)
- Opaque obscuration incorporated (yes/no)

Remarks"

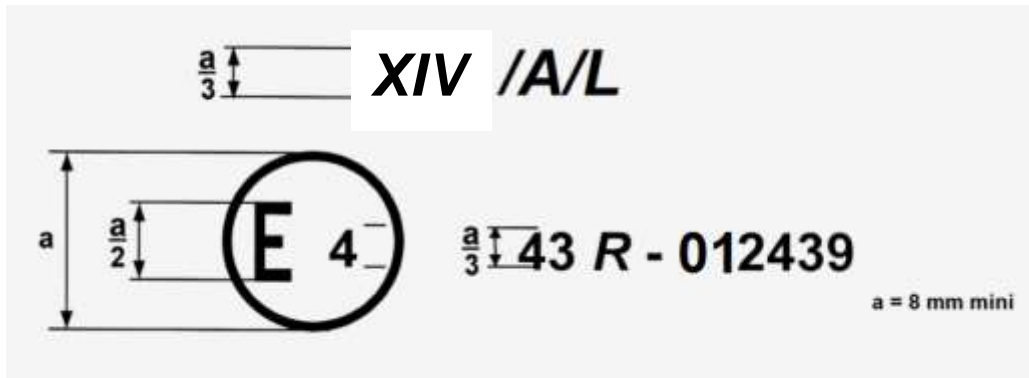
Annex 2, insert the following new paragraphs at the end of the Annex:

"Rigid plastic windscreens



The above approval mark affixed to a rigid plastic windscreen shows that the component concerned has been approved in the Netherlands (E 4) pursuant to Regulation No. 43 under approval No. 012439. The approval number indicates that the approval was granted in accordance with the requirements of Regulation No. 43, as amended by the 01 series of amendments.

Laminated rigid plastic panes



The above approval mark affixed to a laminated rigid plastic glazing pane for forward facing panels with a light scatter not exceeding 2 per cent after 1000 cycles on the outer surface and 4 per cent after 100 cycles on the inner surface shows that the component concerned has been approved in the Netherlands (E 4) pursuant to Regulation No. 43 under approval No. 012439. The approval number indicates that the approval was granted in accordance with the requirements of Regulation No. 43, as amended by the 01 series of amendments."

Annex 3,

Insert a new paragraph 4.7. and a new Figure 6, to read:

“4.7. Sand Drop Test

4.7.1. Apparatus

The sand drop test equipment consists essentially of that illustrated in Figure XX. The gravity tube consists of three separate rigid polyvinylchloride tubes (PVC hard) of the same diameter, with two polyamide sieves mounted in between. The sieves should have a mesh size of 1.6 mm. The speed of the turntable shall be 250 ± 10 rpm.

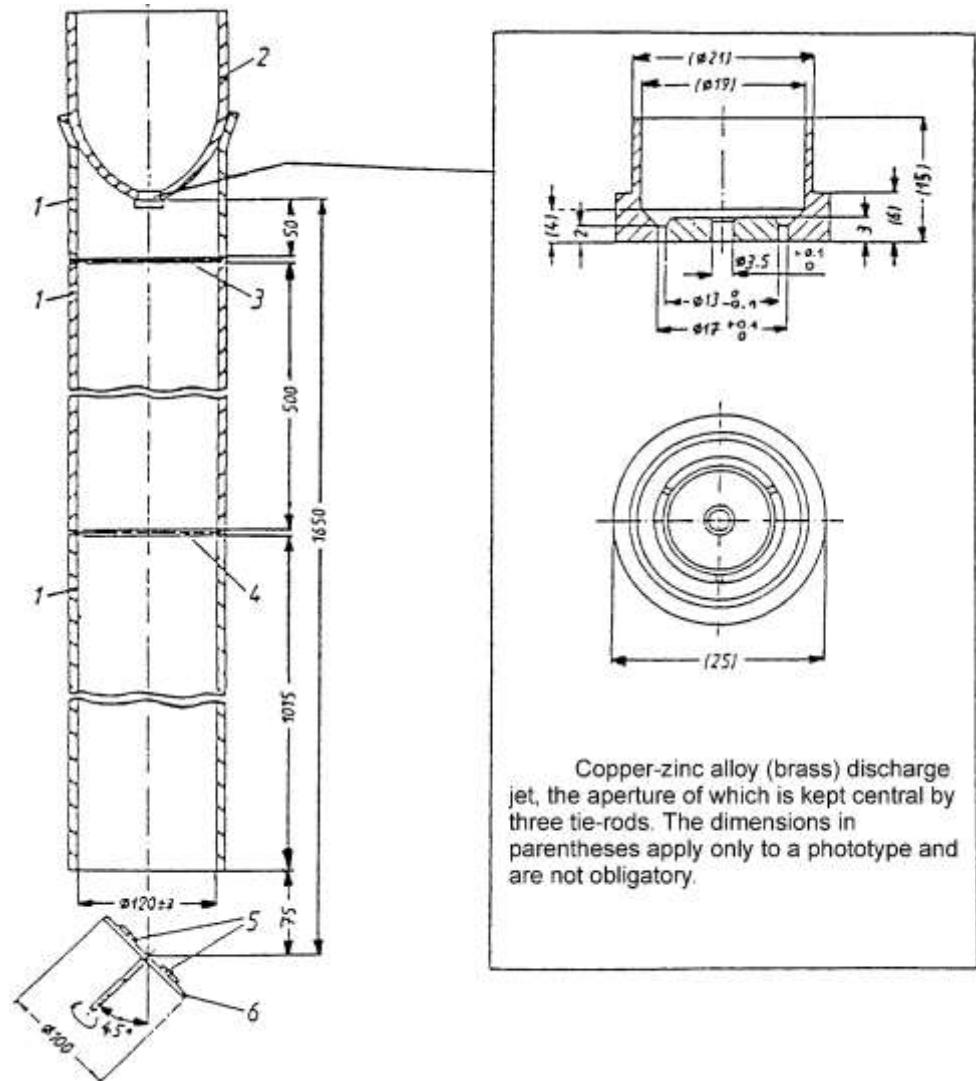


Figure 6 sand drop equipment

4.7.2. Abrasive material

Natural quartz sand of grain size of 0.50/0.7 mm, with no oversize, obtained by sieving on wire sieves complying with ISO 565 with a mesh size of 0.50 mm and 0,7 mm. The sand may be used up to 10 times.

4.7.3 Test pieces

Three square flat pieces 50mm x 50mm of each type shall be taken from the flattest part of the windscreen in the area specified in paragraph 2.2. of Annex 23 (test area A). The test shall be carried out on the face corresponding to the outside of the windscreen.

The test piece shall be conditioned to (23±2) °C and (50+-5) % rH for minimum 48 hours and subjected to testing at ambient temperature.

4.7.4 Test procedure

Three kilograms of 0.50/0.7 mm grain size quartz sand shall drop through a gravity tube from a height of 1.650 mm onto the sample to be tested. The test piece and, if necessary, a control-piece shall be mounted on a turntable, the axis of which is a 45° angle to the direction of the sand.

The test pieces shall be mounted on the turntable in such a way that the area to be measured does not extend beyond the turntable. One cycle of 3 kg sand drop shall be performed whilst the turntable is rotating.

The surface of the test piece shall be washed in water containing 1 per cent detergent and rinsed with distilled or demineralized water, then carefully dried with a grease-free and dust-free linen cloth.

Immediately after drying and before abrasion, the initial haze shall be measured according to Annex 3, Paragraph 4.4.3 of this regulation, and the haze shall be measured again immediately after abrasion. A hazemeter according to Annex 3, Paragraphs 4.1.3 to 4.1.5 of this regulation shall be used for measuring the haze.”

Insert a new paragraph 4.8., to read:

“4.8. Car Wash Test

4.8.1. Apparatus

The apparatus shall comprise at least the following individual components:

4.8.1.1. Washing brush:

diameter	(1 000 ± 40) mm
width	Minimum 300 mm
rotation speed	(127 ± 5) min ⁻¹
brush rotation	rotates in the opposite direction relative to the direction of travel of the test panel holder
material	polyethylene
bristle profile	x-shaped, spliced
bristle thickness	(0.8 ± 0.2) mm
bristle length	(440 ± 20) mm visible
penetration depth	(100 ± 20) mm (see figure XXX)

The state of the brushes shall be regularly controlled. At least one monitoring of the total amount of operating hours in use for the brush and an automatic replacement of the brush shall be conducted as soon as 30 operating hours are reached (30h equates around 300 test runs since one test takes around 6min). The amount of operating hours shall be reported with the haze increase result of the sample.

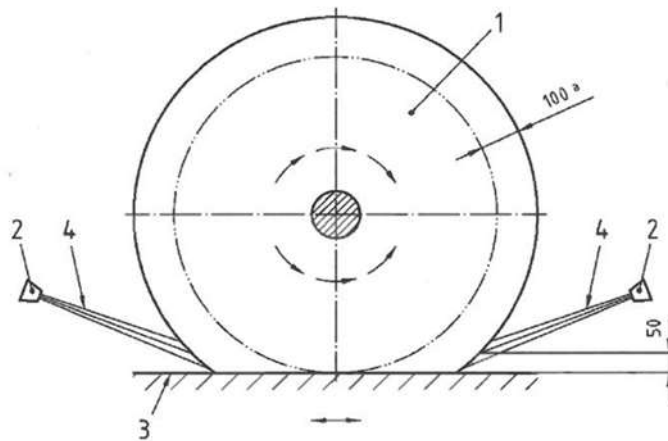
4.8.1.2. Spray nozzle:

number	2 (spray alternately and against the direction of travel of the test panel holder)
material	stainless steel
spread of jet	65°
water flow rate	(2.2 ± 0.1) l/min at (300 ± 50) kPa

The two nozzles shall spray alternately and against the direction of travel of the test panel holder. They shall produce the specified spray pattern (see instrument calibration XXX1).

4.8.1.3. Test panel holder

feed speed	(5 ± 0.2) m/min
pattern of movement	if the brush is rotating clockwise, the right nozzle is spraying and the test panel holder travels from the left side to the right side (and vice versa)



Dimensions in mm

Key

- 1 brush
- 2 spray nozzle
- 3 test panel holder
- 4 spray jet (horizontal middle of the jet strikes brush 50 mm above table directly in the brush)
- a penetration depth

Figure 7 - Movement pattern of washing brush and nozzle

4.8.2.

Spray suspension

Prepare a suspension consisting of $(1.5 \pm 0.05\text{g})$ of silica powder (silica micro-powder having a mean particle size of $24 \mu\text{m}$) per litre of tap water in a container, stirring vigorously. The water temperature shall be between 15°C and 30°C . The suspension shall be stirred continuously during the test procedure in such a way that the silica powder does not settle on the bottom of the container.

4.8.3.

Test samples

The size of the samples is $50\text{mm} \times 100\text{mm}$.

Prior to testing the samples shall be conditioned for at least 48 h at an ambient temperature $(23^\circ\text{C} \pm 2^\circ\text{C})$ and an ambient relative humidity $(50\% \pm 5\%)$.

4.8.4.

Procedure

4.8.4.1.

Prearrangements

4.8.4.1.1.

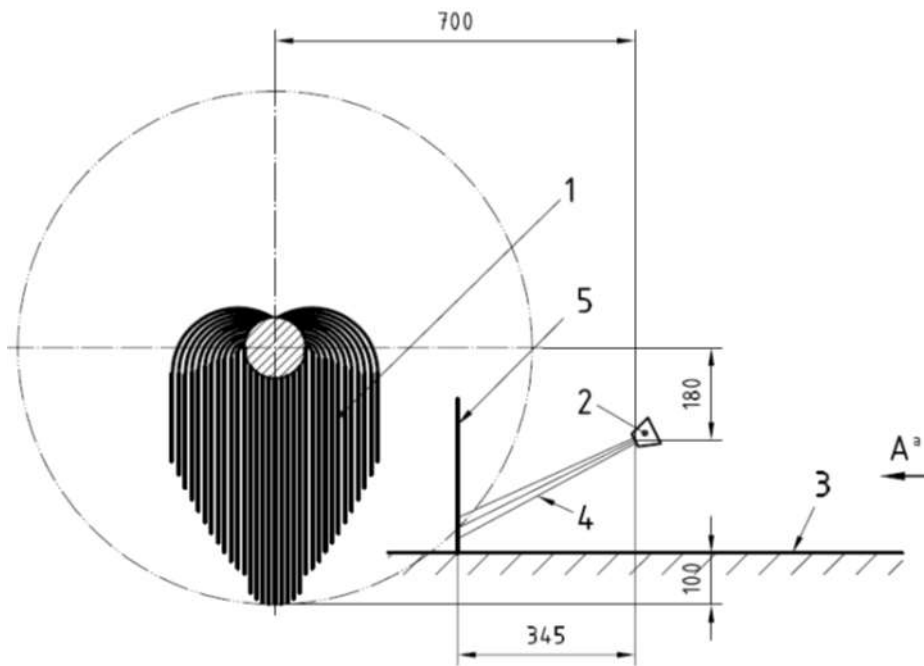
The abrasion test shall be carried out at room temperature and only on the outside surface of the plastic safety glazing material.

4.8.4.1.2.

Check the state of the polyethylene brushes as described in paragraph 4.8.1.1. of this annex and replace them if they have reached 30 operating hours in total.

4.8.4.1.3.

Do the instrument calibration as follows: Set up the equipment as shown in Figure 8. Fill with washing suspension (see paragraph 4.8.2. of this annex and wet the brush sufficiently. Determine the flow rate of the water, (2.2 ± 0.1) l/min, by measurement and adjust by altering the pressure, (300 ± 50) kPa. Check the spray pattern of the nozzles (see Figure 9) If the spray pattern cannot be achieved or if the pressure regulation exceeds the tolerances, check, and if necessary replace, the nozzles.



Dimensions in mm

Key:

1 brush

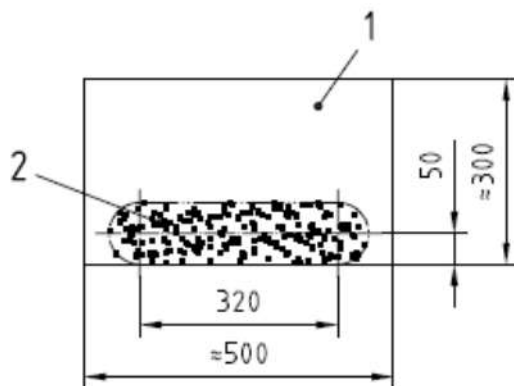
2 spray nozzle

3 test panel holder

4 spray jet

5 sheet of cardboard

Figure 8 – calibration arrangement



Dimensions in mm

Key:

1 sheet of cardboard

2 spray pattern

Figure 9 - View A of spray pattern

Furthermore perform a trial run without a test panel, carrying out 10 washing operations (10 double passes), to distribute the suspension evenly in the apparatus.

Determine the initial haze of the sample as in Annex 3, Paragraph 4.4.3 of this regulation.

4.8.4.2.

Test

- 4.8.4.2.1. Affix the samples with the outside surface face up onto a supporting plate by using a double-faced adhesive tape (Sample positioning on the test holder as shown in Figure 10).

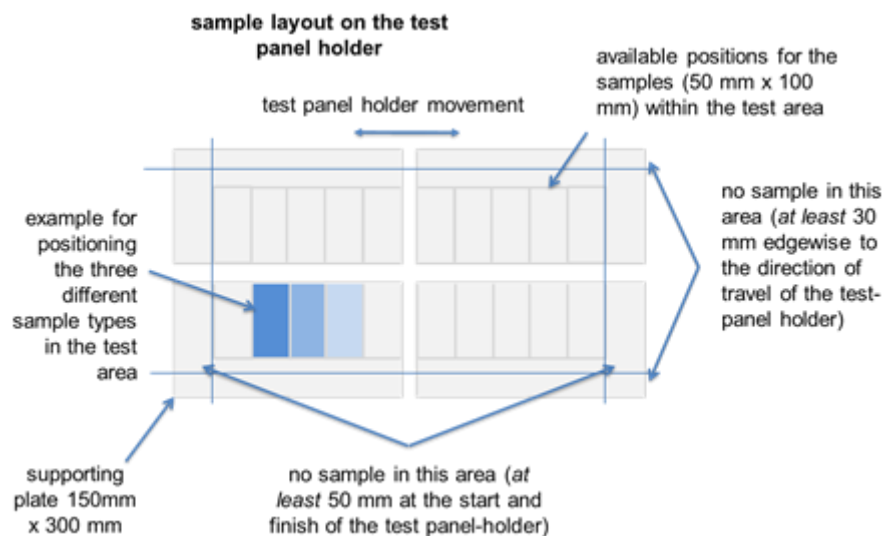


Figure 10: Description of sample positioning on the test holder

- 4.8.4.2.2. An area of at least 50 mm at the start and finish of the test-panel holder and of at least 30 mm edgewise to the direction of travel of the test-panel holder may not be used as testing area for the test specimen.
- 4.8.4.2.3. Carry out 10 washing operations (10 double passes) using the to-and-fro pattern of movement. Rinse the washed test samples after removing the adhesive tape with cold water, and then clean it with a suitable solvent, e.g. Isopropyl alcohol (IPA), using soft, non-scratching paper tissues and wiping in the direction of the scratches. Finally, leave for 30 min to dry off. In case of any inhomogeneous surface appearance of the sample repeat this cleaning process to ensure complete removal of any residue
- 4.8.4.2.4. After drying, take the final readings of haze, as described in Annex 3, Paragraph 4.4.3 of this regulation, of the test specimens across the direction of scratching.
- 4.8.4.3. Expression of the results
- Subtract the average initial haze from the average total light scattered, the difference representing the light scatter resulting from washing the test specimen. Report this difference for 10 washing operations (10 double strokes) for the outside surface of the test samples.”

Re-number the subsequent figures accordingly

Paragraph 9.1.2.2., replace the reference to "Annex 18" by "Annex 20"

Paragraph 9.1.4., replace the reference to "Annex 21" by "Annex 23"

Paragraph 9.2.2.1., replace the reference to "Annex 18" by "Annex 20"

Paragraph 9.2.6., in the first row of the table, replace the reference to "Annex 18" by "Annex 20"

Paragraph 9.2.6.5., replace the reference to "Annex 18" by "Annex 20"

Paragraph 9.3.5., in the first row of the table, replace the reference to "Annex 18" by "Annex 20"

Paragraph 9.3.5.5., replace the reference to "Annex 18" by "Annex 20"

Paragraph 11.2.4.1., amend to read:

“11.2.4.1. **The chemicals shall be applied to the side of the test piece which represents the outside face of the windscreen or safety glazing pane when mounted on the vehicle while this side is under tensile stress.**

The sample shall be simply supported as a horizontal level arm between a fixed supporting edge at one end in such a way that the entire width will rest on a cutting edge (fulcrum) which is 51 mm from the fixed end support. A load shall be suspended from the free end of the test specimen at a distance of 102 mm from the fulcrum as shown in Figure 21 below:

...”

Annex 4, paragraph 2.5, replace the reference to "Annex 17" by "Annex 19"

Annex 5, paragraphs 2.5. and 2.5.1., replace all the references to "Annex 17" by "Annex 19"

Annex 13, paragraph 6.1, replace the references to “Annexes 4, 6, 8, 9 and 10” by “Annexes 4, 6, 8, 9, 10 and 17”.

Insert new Annexes 17 and 18, to read:

"Annex 17

Rigid plastic windscreens

1. Definition of type

Rigid plastic windscreens shall be deemed to belong to different types if they differ in at least one of the following principal or secondary characteristics.

1.1 The principal characteristics are as follows:

1.1.1. Trade names or marks.

1.1.2. The chemical designation of the material.

1.1.3. The classification of the material by the manufacturer.

1.1.4. The process of manufacture.

1.1.5. The shape and dimensions.

Rigid plastic windscreens shall be deemed to belong to one group for the purposes of tests of mechanical properties and of resistance to the environment.

1.1.6. The nominal thickness. The thickness tolerance limit for extruded plastic products is ± 10 per cent of the nominal thickness. For plastic products produced by other techniques (e.g. cast acrylic sheet), the acceptable thickness tolerance is given by the equation (thickness tolerance limits (mm) = $\pm (0.4 + 0.1 e)$ where e is the nominal thickness in millimetres. Reference Standard is ISO 7823/1.

1.1.7. The colouring of the plastic product.

1.1.8. The nature of the surface coating.

1.2. The secondary characteristics are as follows:

1.2.1. The incorporation or otherwise of conductors.

1.2.2. The incorporation or otherwise of obscuration bands.

2. General

2.1. In the case of rigid plastic windscreens the tests shall be conducted either on flat test pieces rigorously representative of the finished product or on finished parts.

2.2. The test pieces must be freed from protecting masking and have to be cleaned carefully before the test.

2.2.1. They must be stored for 48 hours at a temperature of $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and a relative humidity of 50 per cent ± 5 per cent.

3. **Flexibility test**
 - 3.1. **Indices of difficulty of the secondary characteristics**
No secondary characteristic is involved.
 - 3.2. **Number of test pieces**
One flat test piece measuring 300 mm x 25 mm shall be subjected to testing.
 - 3.3. **Test method**
 - 3.3.1. **The method used shall be that described in Annex 3 paragraph 12.**
 - 3.4. **Interpretation of results**
For a test piece or sample to be considered rigid the vertical deflection of the test piece shall be less than or equal to 50 mm after 60 seconds.
4. **Headform test on a complete windscreen**
 - 4.1. **Indices of difficulty of the secondary characteristics**
No secondary characteristic is involved.
 - 4.2. **Number of windscreens**
Six complete windscreens from the smallest-developed-area series and six complete windscreens from the largest-developed-area series selected in accordance with the provisions of Annex 13, shall be tested.
 - 4.3. **Test method**
 - 4.3.1. **The method used shall be that described in Annex 3, paragraph 3.2.**
 - 4.3.2. **The drop height shall be 3 m. The HIC value is also to be measured.**
 - 4.4. **Interpretation of results**
The test shall be deemed to have given a satisfactory result if the following conditions are fulfilled:
 - 4.4.1. **The sample is not penetrated nor shall it break into fully separate large pieces.**
 - 4.4.2. **The HIC value shall be less than 1000.**
 - 4.4.3. **A set of samples submitted for approval shall be considered satisfactory from the point of view of the headform test if all the tests give satisfactory results,**
5. **Mechanical strength test – 227 g ball**
 - 5.1. **Indices of difficulty of the secondary characteristics:**
 - (a) **without conductors**
 - (b) **with conductors**
 - (c) **with and without obscuration**
 - 5.2. **Number of test pieces**
Ten flat square pieces 300 +10/-0 mm or ten substantially flat finished parts shall be subjected to testing.

- 5.3. Test method**
- 5.3.1. The method used shall be that prescribed in Annex 3, paragraph 2.1. the height of drop shall be 8.5 m at ambient temperature.**
- 5.4. Interpretation of results**
- 5.4.1. The ball test shall be considered to have given a satisfactory result if the following conditions are met:**
- (a) the ball does not penetrate the test piece**
 - (b) the test piece does not break into separate pieces**
- As a result of the impact, cracks and fissures in the sheet are however permissible.**
- 5.4.2. A set of test pieces submitted for approval shall be considered satisfactory from the point of view of the 227 g ball test if eight or more separate tests give a satisfactory result at the drop height.**
- 5.4.3. The ambient temperature ball drop test shall be only performed after the humidity test of paragraph 6.4.4. of this Annex.**
- 5.5. 227 g ball test at $-18^{\circ}\text{C} \pm 2^{\circ}\text{C}$.**
- 5.5.1. To minimize the temperature change of the test piece, the test shall be performed within 30 seconds of the removal of the test piece from the conditioning appliance.**
- 5.5.2. The test method shall be that described in paragraph 5.3. of this Annex, except that the test temperature shall be $-18^{\circ}\text{C} \pm 2^{\circ}\text{C}$.**
- 5.5.3. Interpretation of results**
- As in paragraph 5.4. of this Annex**
- 6. Test resistance to the environment**
- 6.1. Test of resistance to abrasion**
- Note of the GRSG IGPG Secretariat: For this purpose the following tests are going to be considered:
Either Taber test or as an equivalent alternative the package of Sand drop test, Car-wash test and Wiper test.
(Note: The Wiper test is currently under development and is planned to be finalized in 2014.)*
- 6.1.1. Taber test**
- 6.1.1.1. Indices of difficulty and test method**
- The requirements of Annex 3, paragraph 4 shall apply; the test is performed for 1000 cycles to measure abrasion of the surface of the product.**
- 6.1.1.2. Three flat square test pieces of 100 mm for each type of surface shall be subjected to testing.**

- 6.1.1.3. Interpretation of results**
- The safety glass pane shall be considered satisfactory with respect to abrasion resistance if the increase of haze as a result of abrasion of the test piece does not exceed 2 per cent.
- 6.1.1.4. A set of samples for approval shall be considered satisfactory if all samples meet the requirements.**
- 6.1.2 Sand Drop Test**
- 6.1.2.1 Indices of difficulty and test method**
- The requirements of Annex 3, paragraph 4.7. shall apply. Three kilograms of sand shall be used.
- 6.1.2.2. Interpretation of results**
- The safety glass pane shall be considered satisfactory if the increase of haze as a result of abrasion of the test piece does not exceed 5%.
- 6.1.2.3. A set of samples for approval shall be considered satisfactory if all samples meet the requirements.**
- 6.1.3. Car Wash Test**
- 6.1.3.1. Indices of difficulty and test method**
- A car wash equipment as described in paragraph 4.8.1. of Annex 3 to this regulation shall be used. 10 washing operations (10 double passes) shall be carried out
- Note of the GRSG-IGPG Secretariat:* The number of cycles seems not that important, rather the nature and quantity of abrasive sand. An additional round robin test would be needed to justify a change to this value.
- 6.1.3.2. Three flat pieces 50mm x 100mm of each type shall be taken from the flattest part of the windscreen in the area specified in paragraph 2.2. of Annex 21 (test area A). The test shall be carried out on the face corresponding to the outside of the windscreen.**
- 6.1.3.3. Interpretation of results**
- The safety glass pane shall be considered satisfactory if the increase of haze as a result of abrasion of the test piece does not exceed 2%.
- 6.1.3.4. A set of samples for approval shall be considered satisfactory if all samples meet the requirements.**
- 6.2. Test of resistance to simulated weathering**
- 6.2.1. Indices of difficulty and test method**
- The requirements of Annex 3, paragraph 6.4. shall apply. The total ultraviolet radiant exposure with the long arc xenon lamp shall be 500 MJ/m². During irradiation the test pieces shall be exposed to water spray in continuous cycles. During a cycle of 120 minutes the test pieces are exposed to light without water spray for 102 minutes, and to light with water spray for 18 minutes.
- 6.2.1.1. Other methods giving equivalent results shall be allowed.**
- 6.2.2. Number of test pieces**
- Three flat test pieces 130 x 40 mm cut from a flat sheet sample shall be subjected to testing.

- 6.2.3. Interpretation of results**
- 6.2.3.1. The resistance to the simulated weathering shall be considered to have given a satisfactory result if:**
- 6.2.3.1.1. The light transmittance measured in accordance with Annex 3, paragraph 9.1. does not fall below 95 per cent of the pre-weathering value. Additionally, for windows which are required for driver visibility the value shall not fall below 70 per cent.**
- 6.2.3.1.2. No bubbles or other visible decompositions, discolourations, milkiness or crazing shall occur during weathering.**
- 6. 2.4. A set of test pieces or samples submitted for approval shall be considered satisfactory from the point of view of the resistance to simulated weathering if all test pieces have given a satisfactory result.**
- 6.3. Cross-cut test**
- 6.3.1. Indices of difficulty and test method**
- The requirements of Annex 3, paragraph 13 shall apply only to coated rigid products.**
- 6.3.2. The cross-cut test shall be carried out on one of the test pieces from paragraph 6.2.**
- 6.3.3. Interpretation of results**
- 6.3.3.1 The cross-cut test shall be considered to have given a satisfactory result if at least the cross-cut value Gt1 is met.**
- 6.4. Resistance-to-humidity test**
- 6.4.1. Indices of difficulty and test method**
- The requirements of Annex 3, paragraph 7 shall apply.**
- 6.4.2. Ten flat square test pieces of 300 mm side or ten test pieces of same size cut from windscreens shall be subjected to testing.**
- 6.4.3. Interpretation of results**
- 6.4.3.1. The humidity test shall be considered to have given a satisfactory result if:**
- 6.4.3.1.1. No visible decompositions like bubbles or milkiness occur on any sample, and**
- 6.4.3.1.2. the light transmittance measured according to Annex 3, paragraph 9.1. shall not fall to less than 95 per cent of the pre-test value and additionally to no less than 70 per cent, on any sample.**
- 6.4.4. After testing the test pieces shall be stored for at least 48 hours at a temperature of 23°C ± 2°C and a relative humidity of 50 per cent ± 5 per cent, and then subjected to the 227 g ball drop test, under ambient temperature, described under paragraph 5.3. of this Annex.**
- 6.5. Fire resistance test**
- 6.5.1. Indices of difficulty and test method**
- The requirements of Annex 3, paragraph 10 shall apply.**
- 6.5.2. Interpretation of results**
- The fire-resistance test shall be considered to have given a satisfactory result if the burning rate is less than 110 mm/min.**

- 6.5.2.1.** For the purpose of approval a set of samples will be considered satisfactory if all samples give a satisfactory result.
- 6.6.** Resistance to chemicals
- 6.6.1.** Immersion test
- 6.6.1.1.** Indices of difficulty and test method
- The requirements of Annex 3, paragraph 11.2.1. shall apply.
- 6.6.1.2.** Interpretation of results
- A set of four samples for each chemical shall be tested; for each chemical, one of these samples shall be cross-cut according to paragraph 13 of Annex 3.
Three samples out of four, among which the cross-cut sample mentioned above, shall give satisfactory results for each chemical.
- 6.6.2.** Test under load
- 6.6.2.1.** Indices of difficulty and test method
- The requirements of Annex 3, paragraph 11.2.4. shall apply.
- 6.6.2.2.** Interpretation of results
- A set of four samples, not being the ones mentioned in paragraph 6.6.1. above, for each chemical shall be tested.
Three samples out of four shall give satisfactory results for each chemical.
- 7.** OPTICAL QUALITIES
- The requirements concerning optical qualities set out in Annex 3, paragraph 9. shall apply to every type of windscreen.
- 7.1** Interpretation of results
- A set of 4 samples shall be considered as satisfactory if all samples give satisfactory results.

Annex 18

Laminated rigid plastic panes

- 1.** Definition of type
- Laminated rigid plastic panes shall be deemed to belong to different types if they differ in at least one of the following principal or secondary characteristics.
- 1.1.** The principal characteristics are as follows:
- 1.1.1.** Trade names or marks.
- 1.1.2.** The chemical designation of the single sheet material.
- 1.1.3.** The classification of the material by the manufacturer.
- 1.1.4.** The process of manufacture.
- 1.1.5.** The shape and dimensions.
- 1.1.6.** The nominal thickness 'e' of the pane, a manufacturing tolerance of $\pm n \cdot x$ mm being

allowed ('n' being the number of layers of rigid plastic in the pane and x is the manufacturing tolerance of the single rigid plastic sheets in the pane, its value is depending on the process of manufacture and being given in Annex 14, paragraph 1.1.6.).

- 1.1.7. The nominal thickness of the interlayer or interlayers,
- 1.1.8. The nature and type of the interlayer or interlayers, e.g. PVB or other plastics-material interlayer or interlayers,
- 1.1.9. Any special treatment which one of the layers of plastic may have undergone.
- 1.1.10. The colouring of the plastic product.
- 1.1.11. The nature of the surface coating.
- 1.2. The secondary characteristics are as follows:
 - 1.2.1. The colouring (total or partial) of the interlayer or interlayers (colourless or tinted).
 - 1.2.2. The incorporation or otherwise of opaque obscuration.
 - 1.2.3. The presence or absence of conductors or heating elements.
- 2. General
 - 2.1. In the case of rigid plastic panes the tests shall be conducted either on flat test pieces rigorously representative of the finished product or on finished parts. All optical measurements shall be carried out on real parts.
 - 2.2. The test pieces must be freed from protecting masking and have to be cleaned carefully before the test.
 - 2.2.1. They must be stored for 48 hours at a temperature of $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and a relative humidity of 50 per cent \pm 5 per cent.
 - 2.3. To describe the breaking behaviour under dynamical stress, classes will be created depending on the application of the plastics. These classes are related to contact probabilities of the human head with the plastic glazing and they contain different requirements concerning the headform test.
- 3. Flexibility test
 - 3.1. Indices of difficulty of the secondary characteristics

No secondary characteristic is involved.
 - 3.2. Number of test pieces

One flat test piece measuring 300 mm x 25 mm shall be subjected to testing.
 - 3.3. Test method
 - 3.3.1. The method used shall be that described in Annex 3 paragraph 12.
 - 3.4. Interpretation of results

For a test piece or sample to be considered rigid the vertical deflection of the test piece shall be less than or equal to 50 mm after 60 seconds.
- 4. Headform test
 - 4.1. Indices of difficulty of the secondary characteristics

No secondary characteristic is involved.

4.2. Number of test pieces

Six flat test pieces (1170 x 570 +0/-2 mm) or six complete parts shall be subjected to testing.

The table below shows the type of samples subject to testing, in accordance with the dimensions of the glazing to be assessed.

Type of window	Characteristic of window	Dimensions of flat sample	Alternative
Small window	Diameter D of the circle capable to be scribed: D < 150 mm	No test	
Other than small window	Diameter D of the circle capable to be scribed: 150 < D < 400 mm	1170 x 570 (material type testing and standard support frame)	Other part of same material, production procedure, thickness, colour with dimensions bigger than those of the original part, into which a 400 mm diameter circle can be scribed, and with a developed surface area of less than 1170 x 570. (part type approval for the original part ³)
	Diameter D of the circle capable to be scribed: 400 mm < D	1170 x 570 (material type testing and standard support frame)	Real part (submitted for approval) (part type approval and dedicated support frame)

4.3. Test method

4.3.1. The method used shall be that described in Annex 3, paragraph 3.2.

4.3.2. For forward facing panes situated forward to an occupant and which have impact probability (classification XIV/A) the drop height shall be 3 m. The HIC value shall also be measured.

4.3.3. For side windows, back windows with limited impact possibilities (classification XIV /B) and sunroofs the drop height shall be 1.5 m. The HIC value shall be measured.

4.3.4. For panes which are not likely to be impacted as well as for small windows in motor vehicles and for all windows in trailers (classification XIV/C) the headform shall not be performed. A small window is a window into which a 150 mm diameter circle cannot be scribed.

4.4. Interpretation of results

The test shall be deemed to have given a satisfactory result if the following conditions are fulfilled:

4.4.1. The test piece or sample is not penetrated nor shall it break into fully separate large pieces.

4.4.2. The HIC value is less than 1000.

4.4.3. A set of test pieces submitted for approval shall be considered satisfactory from the point of view of the headform test if all the tests give satisfactory results.

³ Original part dimensions are too small for performing the test.

- 5. Mechanical strength test – 227 g ball test**
- 5.1. Indices of difficulty of the secondary characteristics:**
- (a) without conductors, obscuration(s) or heating elements
 - (b) with conductors, obscuration(s) or heating elements
- 5.2. Number of test pieces**
- Ten flat square pieces 300 +10/-0 mm or ten substantially flat finished parts shall be subjected to testing.
- 5.3. Test method**
- 5.3.1. The method used shall be that prescribed in Annex 3, paragraph 2.1.**
- 5.3.2. The height of drop shall be 6 m.**
- 5.4. Interpretation of results**
- 5.4.1. The ball test shall be considered to have given a satisfactory result if the following conditions are met:**
- (a) the ball does not penetrate the test piece
 - (b) the test piece does not break into separate pieces
- As a result of the impact, cracks and fissures in the test piece shall however be permitted.
- 5.4.2. A set of test pieces submitted for approval shall be considered satisfactory from the point of view of the 227 g ball test if eight or more separate tests give a satisfactory result at the drop height.**
- 5.5. 227 g ball test at $-18^{\circ}\text{C} \pm 2^{\circ}\text{C}$.**
- 5.5.1. To minimize the temperature change of the test piece, the test shall be performed within 30 seconds of the removal of the test piece from the conditioning appliance.**
- 5.5.2. The test method shall be that described in paragraph 5.3. of this Annex, except that the test temperature is $-18^{\circ}\text{C} \pm 2^{\circ}\text{C}$.**
- 5.5.3. Interpretation of results as in paragraph 5.4. of this Annex.**
- 6. Test resistance to the environment**
- 6.1. Test of resistance to abrasion**
- 6.1.1. Indices of difficulty and test method**
- The requirements of Annex 3, paragraph 4. shall apply; the test is performed for either 1000, 500 or 100 cycles to measure abrasion of the surface of the product.
- 6.1.2. Three flat square test pieces of 100 mm side for each type of surface shall be subjected to testing.**
- 6.1.3. Interpretation of results**
- 6.1.3.1. In the case of glazing of class L, the abrasion test shall be considered to have given a satisfactory result if the increase of haze after abrasion does not exceed 2 per cent after 1,000 cycles on the outer surface of the test sample and 4 per cent after 100 cycles on the inner surface of the test sample.**
- 6.1.3.2. In the case of glazing of class M, the abrasion test shall be considered to have given a satisfactory result if the increase of haze after abrasion does not exceed 10 per cent after**

- 500 cycles on the outer surface of the test sample and 4 per cent after 100 cycles on the inner surface of the test sample.
- 6.1.3.3. in the case of glazing of Class L for the abrasion on the outer surface of the test sample, either Taber or sand drop and carwash [and wiper] test shall apply as described in Annex 17 paragraphs 6.1.2. and 6.1.3.
- 6.1.3.4. For sun roofs no abrasion test is required.
- 6.1.4. A set of samples for approval shall be considered satisfactory if all samples meet the requirements
- 6.2. Test of resistance to simulated weathering
- 6.2.1. Indices of difficulty and test method
- The requirements of Annex 3, paragraph 6.4. shall apply. The total ultraviolet radiant exposure with the long arc xenon lamp shall be 500 MJ/m². During irradiation the test pieces shall be exposed to water spray in continuous cycles. During a cycle of 120 minutes the test pieces are exposed to light without water spray for 102 minutes and to light with water spray for 18 minutes.
- 6.2.1.1. Other methods giving equivalent results shall be allowed.
- 6.2.2. Number of test pieces
- Three flat test pieces 130 x 40 mm cut from a flat sheet sample shall be subjected to testing.
- 6.2.3. Interpretation of results
- 6.2.3.1. The resistance to the simulated weathering shall be considered to have given a satisfactory result if:
- 6.2.3.1.1. The light transmittance measured in accordance with Annex 3, paragraph 9.1. does not fall below 95 per cent of the pre-weathering value. Additionally, for windows which are required for driver visibility the value shall not fall below 70 per cent.
- 6.2.3.1.2. No bubbles or other visible decompositions, discolouration, milkiness or crazing shall occur during weathering.
- 6.2.4. A set of test pieces or samples submitted for approval shall be considered satisfactory from the point of view of the resistance to simulated weathering if all test pieces have given a satisfactory result.
- 6.3. Cross-cut test
- 6.3.1. Indices of difficulty and test method
- The requirements of Annex 3, paragraph 13 shall apply only to coated rigid products.
- 6.3.2. The cross-cut test shall be carried out on one of the test pieces from paragraph 6.2.
- 6.3.3. Interpretation of results
- 6.3.3.1 The cross-cut test shall be considered to have given a satisfactory result if:
- 6.3.3.1.1. At least the cross-cut value Gtl is met.
- 6.3.3.2. The test piece shall be considered satisfactory from the point of view of approval if the test has given satisfactory results.
- 6.4. Resistance-to-humidity test

- 6.4.1. Indices of difficulty and test method**
- The requirements of Annex 3, paragraph 7 shall apply.
- 6.4.2. Ten flat square test pieces of 300 mm side shall be subjected to testing.**
- 6.4.3. Interpretation of results**
- 6.4.3.1. The humidity test shall be considered to have given a satisfactory result if:**
- 6.4.3.1.1. no visible decompositions like bubbles or milkiness occur on any sample, and**
- 6.4.3.1.2 the light transmittance measured according to Annex 3, paragraph 9.1. shall not fall to less than 95 per cent of the pretest value and additionally to no less than 70 per cent, on any sample, for any window required for driver visibility.**
- 6.4.4. After testing the test pieces shall be stored for at least 48 hours at a temperature of 23°C ± 2°C and a relative humidity of 50 per cent ± 5 per cent, and then subjected to the 227 g ball drop test described under paragraph 5.3. of this Annex.**
- 6.5. Test of resistance to high temperature**
- 6.5.1. Indices of difficulty and test method**
- The requirements of Annex 3, paragraph 5 shall apply
- 6.5.2. Three square test pieces of at least 300 mm x 300 mm which have been cut from three panes, one edge of which corresponds to the upper edge of the glazing shall be subjected to testing.**
- 6.5.3 Interpretation of results**
- 6.5.3.1. The test for resistance to high temperature shall be considered to give a positive result if bubbles or other defects are not formed more than 15 mm from an uncut edge or 25 mm from a cut edge of the test piece or sample or more than 10 mm away of any cracks which may occur during the test.**
- 6.5.3.2. A set of test pieces or samples submitted for approval shall be considered satisfactory from the point of view of the test for resistance to high temperature if all the tests give a satisfactory result;**
- 6.6 Resistance-to-radiation test**
- This test has to be performed at the discretion of the laboratory conducting the tests.
- 6.6.1 Indices of difficulty and test method**
- The requirements of Annex 3, paragraph 6 shall apply.
- 6.6.2. Three test pieces of 76 mm x 300 mm shall be cut from the upper part of the pane in such a way that the upper edge of the test piece coincides with the upper edge of the pane. These test pieces shall be subjected to testing.**
- 6.6.3 Interpretation of results**
- 6.6.3.1. The test for resistance to radiation shall be deemed to have given a positive result if the following conditions are fulfilled:**
- 6.6.3.1.1. The total light transmittance when measured pursuant to paragraphs 9.1.1. and 9.1.2. of this Annex does not fall below 95 per cent of the original value before irradiation and in any event does not fall:**

- 6.6.3.1.1.1. below 70 per cent in the case of glass panes other than windscreens which are required to comply with the specifications regarding the driver's field of view in all directions;
- 6.6. 3.1.2. The test piece or sample may however show a slight coloration after irradiation when examined against a white background, but no other defect may be apparent.
- 6.6.3.2. A set of test pieces or samples submitted for approval shall be considered satisfactory from the point of view of the resistance-to-radiation test if one of the following conditions is fulfilled:
 - 6.6.3.2.1. All the tests give a satisfactory result;
- 7. **Optical qualities**

The requirements of Annex 3, paragraph 9.1. shall apply for products which are requisite for driver visibility.

 - 7.1 **Interpretation of results**

A set of 4 samples shall be considered as satisfactory if all samples give a satisfactory result.
- 8. **Fire resistance test**
 - 8.1. **Indices of difficulty and test method**

The requirements of Annex 3, paragraph 10 shall apply.
 - 8.2. **Interpretation of results**

The fire-resistance test shall be considered to have given a satisfactory result if the burning rate is less than 110 mm/min.

 - 8.2.1. For the purpose of approval a set of samples will be considered satisfactory if all samples give a satisfactory result.
- 9. **Resistance to chemicals**
 - 9.1. **Immersion test**
 - 9.1.1. **Indices of difficulty and test method**

The requirements of Annex 3, paragraph 11.2.1. shall apply.
 - 9.1.2. **Interpretation of results**

A set of four samples for each chemical shall be tested; for each chemical, in case of glazing of Class L, one of these samples shall be cross-cut according to paragraph 13. of Annex 3.
Three samples out of four, among which the cross-cut sample mentioned above when applicable, shall give satisfactory results for each chemical.
 - 9.2. **Test under load**
 - 9.2.1. **Indices of difficulty and test method**

The requirements of Annex 3, paragraph 11.2.4. shall apply.
 - 9.2.2. **Interpretation of results**

A set of four samples, not being the ones mentioned in paragraph 6.6.1. above, for each chemical shall be tested.

Three samples out of four shall give satisfactory results for each chemical.

Annexes 17 (former) to 21, renumber as Annexes 19 to 23

Annex 22 (former Annex 20), insert new paragraphs 2.11. to 2.12.5., to read:

- "2.11. Rigid plastic windscreens**
- 2.11.1. Headform test, without HIC measurement, in accordance with the requirements of Annex 17, paragraph 4.**
- 2.11.2. 227 g ball test in accordance with the requirements of Annex 17, paragraph 5.**
- 2.11.3. Test of resistance to abrasion in accordance with the requirements of Annex 17, paragraph 6.1**
- 2.11.4. Test of resistance to chemicals in accordance with the requirements of Annex 17, paragraph 6.6. and Annex 3, paragraph 11.**
- 2.11.5. Light transmission measurement in accordance with the requirements of Annex 3, paragraph 9.1.**
- 2.11.6. Optical distortion test in accordance with the requirements of Annex 3, paragraph 9.2.**
- 2.11.7. Secondary image separation test in accordance with the requirements of Annex 3, paragraph 9.3.**
- 2.12. Laminated rigid plastic panes**
- 2.12.1. 227 g ball test in accordance with the requirements of Annex 18, paragraph 5.**
- 2.12.2. Test of resistance to high temperature in accordance with the requirements of Annex 18, paragraph 6.5.**
- 2.12.3. Test of resistance to abrasion in accordance with the requirements of Annex 18, paragraph 6.1.**
- 2.12.4. Test of resistance to chemicals in accordance with the requirements of Annex 18, paragraph 9.**
- 2.12.5. Test of light transmission measurement in accordance with the requirements of Annex 3, paragraph 9.1."**

Paragraph 3.6.2., replace the reference to "Annex 18" by "Annex 20"

B. JUSTIFICATION

New types of plastic glazing are considered by automotive industry for installation in vehicles because of weight reduction which leads to less consumption of fuel and less CO₂ emission. These new glazing types are covered by the proposed amendments.
