



**Economic and Social
Council**

Distr.
GENERAL

ECE/TRANS/WP.29/GRSG/2009/8
23 February 2009

Original: ENGLISH
ENGLISH AND FRENCH ONLY

ECONOMIC COMMISSION FOR EUROPE

INLAND TRANSPORT COMMITTEE

World Forum for Harmonization of Vehicle Regulations

Working Party on General Safety Provisions

Ninety-sixth session
Geneva, 4 - 8 May 2009
Item 7 of the provisional agenda

REGULATION No. 43

(Safety glazing)

Proposal for draft amendments to Regulation No. 43

Submitted by the expert from Germany */

The text reproduced below was prepared by the expert from Germany in order to allow the type approval of plastics windshields and laminated rigid plastic panes other than windshields. The modifications to the current text of the Regulation are marked in bold and strikethrough characters.

*/ In accordance with the programme of work of the Inland Transport Committee for 2006-2010 (ECE/TRANS/166/Add.1, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance performance of vehicles. The present document is submitted in conformity with that mandate.

A. PROPOSAL

The contents,

Insert new Annexes 17 and 18, to read:

"Annex 17 Rigid plastic windscreens

Annex 18 Laminated rigid plastic panes other than windscreens"

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

The text of the Regulation,

Insert new paragraph 2.5.3., to read:

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

Paragraph 2.14., replace the reference to "Annex 17" by "Annex 19":

Paragraph 2.15., amend to read:

"2.15. "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 18;** "

Paragraph 2.25., replace the reference to "Annex 17" by "Annex 21"

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 5.5.9. and 5.5.10., to read:

"5.5.9. XII in the case of laminated rigid plastic windscreens.

5.5.10. XIII in the case of laminated rigid plastic glazing with the signification as described in 5.5.5."

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

Insert new paragraph 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 other than windscreens, 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		Double 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	A3/11	A3/11	A3/11	A3/11	A3/11	A3/11
Abrasion	A17/6.1	A14/6.1	-	A18/6.1	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	-	-
High temperature	-	-	-	A3/5	-	-	-	-
Radiation resistance	-	-	-	A3/6	-	-	-	-

^{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."

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, 9, 10 and 11 2/, and in the case of windscreens, the list conforming to 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 OTHER THAN WINDSCREENS

(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**

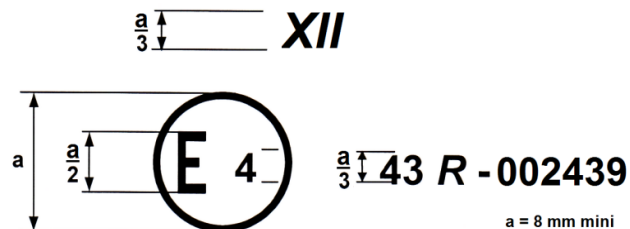
Secondary characteristics:

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

Remarks"

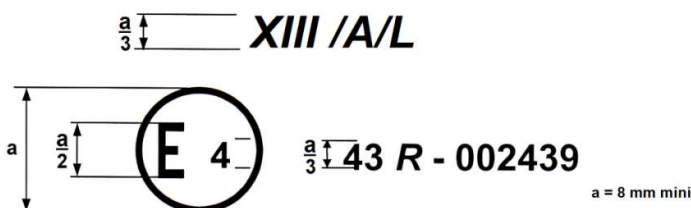
Annex 2, insert the following new paragraphs at the end of the Annex:

"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. 002439. The approval number indicates that the approval was granted in accordance with the requirements of Regulation No. 43.

Laminated rigid plastic panes other than windscreens



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. 002439. The approval number indicates that the approval was granted in accordance with the requirements of Regulation No. 43."

Annex 3.

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"

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 principle 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 \pm 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 is 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 one of the following conditions is met:

4.4.3.1. All the tests give satisfactory results, or

4.4.3.2. One test having an unsatisfactory result, a further series of tests carried out on a new set of test pieces give satisfactory results.

5. MECHANICAL STRENGTH TEST - 227 g BALL TEST

5.1. Indices of difficulty of the secondary characteristics:

(a) without conductors

(b) with conductors

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.

sheet thickness (mm)	height of drop (m)
< 3	3
4	4.5
5	6
> 6	7.5

**5.3.2. The height of drop for the various thickness values is given in the table below:
For intermediate values of test piece thickness in the interval between 3 mm and 6 mm the height of drop must be interpolated.**

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 one of the following conditions is met:

5.4.2.1. Eight or more separate tests give a satisfactory result at the drop height.

5.4.2.2. Three or more tests having given an unsatisfactory result, a further series of tests carried out on a new set of test pieces gives satisfactory results.

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 1000 cycles to measure abrasion of the surface of the product.

6.1.2. Three flat square test pieces of 100 mm for each type of surface shall be subjected to testing.

6.1.3. Interpretation of results

The safety glass pane shall be considered satisfactory with respect to abrasion resistance if the light scatter as a result of abrasion of the test piece does not exceed 2 per cent.

6.1.4. A set of samples for approval shall be considered satisfactory if one of the following conditions is met:

- (a) all samples meet the requirements or
- (b) one sample having failed, a repeat of the tests on a new set of samples gives a satisfactory result.

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 one of the following conditions is met:
 - 6.2.4.1. All test pieces have given a satisfactory result.
 - 6.2.4.2. One test piece having given an unsatisfactory result, a further series of tests carried out on a new set of test pieces or samples gives satisfactory results.
- 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. The cross-cut value Gt1 is met.
 - 6.3.3.2. The test piece shall be considered satisfactory from the point of view of approval if one of the following conditions is met:
 - 6.3.3.2.1. The test has given satisfactory results.
 - 6.3.3.2.2. The test having given an unsatisfactory result, a further test carried out on another remaining test piece from test 6.2 gives 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 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,

6.4.3.1.2. and if the light transmittance measured according to Annex 3, paragraph 9.1. does not fall to less than 95 per cent of the pretest value and additionally to no less than 70 per cent.

6.4.4. After testing the test pieces shall be stored for at least 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, and then subjected to the 227 g ball drop test described under paragraph 5. 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 one of the following conditions is met:

6.5.2.1.1. All samples give a satisfactory result.

6.5.2.1.2. One sample having given an unsatisfactory result a second set of samples gives satisfactory results.

6.6. RESISTANCE TO CHEMICALS

6.6.1. Indices of difficulty and test method

The requirements of Annex 3, paragraph 11 shall apply.

6.6.2. Interpretation of results

A set of samples shall be considered acceptable if one of the following conditions is met:

6.6.2.1. All samples give satisfactory results.

6.6.2.2. One sample having given an unsatisfactory result, a second set of samples gives satisfactory results.

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 samples shall be considered as satisfactory if one of the following conditions is met:

7.1.1. All samples give satisfactory results.

7.1.2. One sample having given an unsatisfactory result, a further set of test pieces gives satisfactory results.

Annex 18

LAMINATED RIGID PLASTIC GLAZING OTHER THAN WINDSCREENS

1. DEFINITION OF TYPE

Laminated-glass panes other than 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 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 ± 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.

4.3. Test method

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

4.3.2. For panes like partitions and separating windows which have impact probability (classification VIII/A) the drop height shall be 3 m. The HIC value is also to be measured.

4.3.3. For panes like side windows, back windows and sunroofs which have reduced impact possibilities (classification VIII/B) the drop height shall be 1.5 m. The HIC value is also to be measured.

4.3.4. For panes which do not have contact possibilities as well as for small windows in vehicles and for all windows in trailers (classification VIII/C) there will be no headform testing. 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 one of the following conditions is met:

4.4.3.1. All the tests give satisfactory results, or

4.4.3.2. One test having an unsatisfactory result, a further series of tests carried out and a new set of test pieces give satisfactory results.

5. MECHANICAL STRENGTH TEST- 227 g BALL TEST

5.1. Indices of difficulty of the secondary characteristics:

- (a) without conductors or heating elements
- (b) with conductors 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 for the various thickness values is given in the table below:

sheet thickness (mm)	height of drop (m)
< 4	3
5	4
6	5
> 7	6

For intermediate values of test piece thickness in the interval between 3 mm and 6 mm the height of drop must be interpolated.

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 one of the following conditions is met:

5.4.2.1. Eight or more separate tests give a satisfactory result at the drop height.

5.4.2.2. Three or more tests having given an unsatisfactory result, a further series of tests carried out on a new set of test pieces gives satisfactory results.

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 total light scatter 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 total light scatter 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. For sun roofs no abrasion test is required.

6.1.4. A set of samples for approval shall be considered satisfactory if one of the following conditions is met:

- (a) all samples meet the requirements or
- (b) one sample having failed, a repeat of the tests on a new set of samples gives a satisfactory result.

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 one of the following conditions is met:

6.2.4.1. All test pieces have given a satisfactory result.

6.2.4.2. One test piece having given an unsatisfactory result, a further series of tests carried out on a new set of test pieces or samples gives satisfactory results.

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. The cross-cut value G_{tl} is met.

6.3.3.2. The test piece shall be considered satisfactory from the point of view of approval if one of the following conditions is met:

6.3.3.2.1. The test has given satisfactory results.

6.3.3.2.2. The test having given an unsatisfactory result, a further test carried out on another remaining test piece from test 6.2 gives 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

6.4.3.1.2 and if the light transmittance measured according to Annex 3, paragraph 9.1. does not fall to less than 95 per cent of the pre-test value and additionally to no less than 70 per cent 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 $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 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. 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 either of the following conditions is fulfilled:
- 6.5.3.2.1.** All the tests give a satisfactory result; or
- 6.5.3.2.2.** one test having given an unsatisfactory result, a further series of tests carried out on a new set of test pieces or samples gives satisfactory results.
- 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;

6.6.3.2.2. One test having given an unsatisfactory result, a further series of tests carried out on a new set of test pieces or samples gives satisfactory results.

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 samples shall be considered as satisfactory if one of the following conditions is met:

7.1.1. All samples give a satisfactory result.

7.1.2. One sample having given an unsatisfactory result, a further set of test pieces gives satisfactory results.

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 one of the following conditions is met:

8.2.1.1. All samples give a satisfactory result.

8.2.1.2. One sample having given an unsatisfactory result a second set of samples gives satisfactory results.

9. RESISTANCE TO CHEMICALS

9.1. Indices of difficulty and test method

The requirements of Annex 3, paragraph 11 shall apply.

9.2. Interpretation of results

A set of samples shall be considered acceptable if one of the following conditions is met:

9.2.1. All samples give satisfactory results.

9.2.2. One sample having given an unsatisfactory result, a second set of samples gives satisfactory results."

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 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 other than windscreens**
- 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 glazings are covered by the proposed amendments.
