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COUNCIL DIRECTIVE 92/22/EEC
of 31 March 1992
on safety glazing and glazing materials on motor vehicles and their trailers

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COUNCIL DIRECTIVE 92/22/EEC
of 31 March 1992

on safety glazing and glazing materials on motor vehicles and their trailers

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100a thereof,

Having regard to the proposal from the Commission⁽¹⁾,

In cooperation with the European Parliament⁽²⁾,

Having regard to the opinion of the Economic and Social Committee⁽³⁾,

Whereas measures should be adopted with the aim of progressively establishing the internal market over a period expiring on 31 December 1992; whereas the internal market comprises an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured;

Whereas the total-harmonization method will be essential in order fully to achieve the single market;

Whereas this method will have to be used at the time of the revision of the entire EEC type-approval procedure, taking account of the spirit of the Council resolution of 7 May 1985 concerning a new approach to the question of technical harmonization and standardization;

Whereas the requirements relating to safety glazing differ from one Member State to another; whereas it is consequently necessary for the same requirements to be adopted by all of the Member States, either in addition to or in place of the existing rules, in order, in particular, to permit implementation, for each type of vehicle, of the EEC type-approval procedure covered by Council Directive 70/156/EEC of 6 February 1970 on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers⁽⁴⁾, as last amended by Directive 87/403/EEC⁽⁵⁾;

Whereas any rules on safety glazing shall contain not only requirements relating to its structure but also to its fitting to vehicles;

Whereas by means of a harmonized procedure for the component type-approval of safety glazing, each Member State shall be able to confirm compliance with common requirements relating to manufacture and testing and to inform the other Member States of any such confirmation by forwarding a copy of the component type-approval certificate drawn up for each type of safety glazing; whereas the affixing of an EEC component type-approval mark to any type of safety glazing that conforms to the type that has been component type-approved means that the official testing of that type of glazing in other Member States is no longer justified;

Whereas the safety aspect of windscreens is especially important since, more than in the case of other types of glazing, they are likely to be subjected to violent impact either as a result of collisions or where there are external shocks and can thus be the cause of serious bodily injury; whereas, while aiming at the approximation of the laws of the Member States, the differences between which raise barriers to trade, the solution to be adopted must take account of the safety requirements of road traffic and the need to improve same,

⁽¹⁾ OJ No C 95, 12. 4. 1990, p. 1.

⁽²⁾ OJ No C 284, 12. 11. 1990, p. 80 and Decision of 12. 2. 1992 (not yet published in the Official Journal).

⁽³⁾ OJ No C 225, 10. 9. 1990, p. 9.

⁽⁴⁾ OJ No L 42, 23. 2. 1970, p. 1.

⁽⁵⁾ OJ No L 220, 8. 8. 1987, p. 44.

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HAS ADOPTED THIS DIRECTIVE:

Article 1

1. Member States shall type-approve any type of safety glazing within the scope defined in Section 1 of Annex I that meets the structural and testing requirements.
2. Member States shall grant whole-vehicle type approval to any vehicle that complies with the fitting requirements laid down in Annex III.
3. The Member State which has granted EEC component type-approval shall take the necessary measures to verify, insofar as is necessary and if need be in cooperation with the competent authorities of the other Member States, that production models conform to the approved type.

Article 2

All applications for EEC component type-approval shall be made by the manufacturer or his authorized representative in a Member State. That Member State shall issue to the manufacturer or his authorized representative an EEC component type-approval mark in compliance with items 4.4 to 4.7 of Annex II for each type of safety glazing that it type-approves in pursuance of Article 1.

Member States shall take all necessary measures to prevent the use of any marks liable to create confusion between items of safety glazing that have already been component type-approved pursuant to Article 1.

Article 3

The competent authorities in each Member State shall, within one month, send to the competent authorities of the other Member States a copy of the component type-approval certificate drawn up for each type of safety glazing and with regard to its fitting, for each type of vehicle to which they grant whole-vehicle type-approval.

Article 4

No Member State may prohibit the marketing or use of safety glazing on grounds relating to its construction where that glazing bears the EEC component type-approval mark.

Article 5

1. If the Member State which has granted EEC component type-approval finds that a number of items of safety glazing bearing the same component type-approval mark do not conform to the approved type, it shall take the necessary measures to ensure that production models do so conform. The competent authorities of that State shall advise those of the other Member States of the measures taken, which may, where necessary, extend to withdrawal of EEC component type-approval. The said authorities shall take like measures if they are informed by the competent authorities of another Member State of such failure to conform.
2. The competent authorities of the Member States shall inform each other, within one month, of any withdrawal of EEC component type-approval, and of the reasons for such a measure.
3. If the Member State which has granted EEC component type-approval disputes the failure to conform notified to it, the Member States concerned shall endeavour to settle the dispute. The Community shall be kept informed and shall, where necessary, hold appropriate consultations for the purpose of reaching a settlement.

Article 6

Any decision taken pursuant to the provisions adopted in implementation of this Directive to refuse or withdraw component type-approval,

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or prohibit sale and use, shall state in detail the reasons on which it is based. Such decision shall be notified to the party concerned, who shall at the same time be informed of the remedies available to him under the laws in force in the Member States and of the time-limits allowed for the exercise of such remedies.

Article 7

No Member State may refuse EEC whole-vehicle type-approval or national type-approval of a type of vehicle, or refuse or prohibit the sale, entry into service or use of a vehicle, on grounds relating to its safety glazing if this bears the EEC component type-approval mark and if it has been fitted in accordance with the requirements set out in Annex III.

Article 8

For the purposes of this Directive, 'vehicle' means any motor vehicle intended for use on the road, having at least four wheels and a maximum design speed exceeding 25 km/h as well as its trailer, with the exception of vehicles which run on rails, agricultural and forestry tractors or machinery, and construction plant and equipment.

The international classification of these vehicles shall be as set out in Note (b) of Annex I to Directive 70/156/EEC.

Article 9

Any amendments necessary to adapt the requirements of the Annexes to technical progress shall be adopted in accordance with the procedure laid down in Article 13 of Directive 70/156/EEC.

Article 10

1. Member States shall adopt and publish the provisions necessary to comply with this Directive before 1 July 1992 and shall forthwith inform the Commission thereof.

When Member States adopt these measures, they shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of their official publication. The methods of making such a reference shall be laid down by the Member States.

They shall apply these provisions from 1 October 1992.

2. Member States shall communicate to the Commission the texts of the main provisions of national law which they adopt in the field covered by this Directive.

Article 11

This Directive is addressed to the Member States.

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ANNEX I

SCOPE AND DEFINITIONS

1. SCOPE

This Directive applies to safety glazing and materials for glazing intended to be fitted in the form of a windscreen or other glazing or separating panels on motor vehicles and their trailers, and to the fitting thereof, with the exception of glass for lighting and light-signalling devices and for the dashboard, and special glazing offering protection against attacks, surfaces made entirely of plastic material intended for use in the construction of category 0 vehicles, motor caravans, opening roofs, the rear windows of convertible vehicles and the sides of off-road vehicles, and windscreens intended for fitting to vehicles used in extreme environments having a maximum speed of 40 km/h.

2. DEFINITIONS

For the purposes of this Directive:

- 2.1. *Glazing* means a pane of glass consisting of a single sheet of glass having undergone a special treatment intended to increase its mechanical strength and limit its fragmentation when smashed.
- 2.2. *Laminated glazing* means: at least two sheets of glass held together by at least one sheet of plastic material that is sandwiched between them; that laminated glass may be:
- 2.2.1. *ordinary* if none of the sheets of glass of which it consists has been treated; or
- 2.2.2. *treated* if at least one of the sheets of glass of which it consists has undergone a special treatment intended to increase its mechanical strength and to limit its fragmentation when smashed.
- 2.3. *Safety glazing coated with plastic* means: glazing as defined in item 2.1 or 2.2 with a coating of plastic material on its inner surface.
- 2.4. *Plastic-glass safety glazing* means laminated glazing having a single sheet of glass and one or several sheets of plastic laid one on top of the other, at least one of which serves as a sandwich layer. The sheet(s) of plastic is (are) located on the inner surface when the glazing is fitted to the vehicle.
- 2.5. *Surface made entirely of plastic material*: means a transparent surface manufactured entirely of organic polymeric material.
- 2.6. *Group of windscreens* means a group consisting of windscreens having different shapes and dimensions which are subjected to an examination of their mechanical properties, fragmentation characteristics and their behaviour during tests on their resistance to attack from their environment;
- 2.6.1. *flat windscreen* means a windscreen which does not have a nominal curvature represented by a segment height of more than 10 mm per linear metre;
- 2.6.2. *curved windscreen* means a windscreen having a nominal curvature represented by a segment height of more than 10 mm per linear metre.
- 2.7. *Double window* means a unit consisting of two panes fitted separately into the same aperture on the vehicle.
- 2.8. *Double glazing* means a unit consisting of two panes assembled at the factory in a permanent manner and separated by a uniform space;
- 2.8.1. *symmetrical double glazing* means double glazing in which the two constituent panes are of the same type (toughened, laminated, etc.) and have the same main and secondary characteristics;
- 2.8.2. *assymetrical double glazing* means double glazing in which the two constituent panes are of a different type (toughened, laminated, etc.) or have different main and/or secondary characteristics.
- 2.9. *Main characteristic* means a characteristic which significantly alters the optical and/or mechanical properties of a pane of glass with regard to the function that that glass is to perform on the

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- vehicle. This term also includes the trade name or manufacturer's mark.
- 2.10. *Secondary characteristic* means a characteristic which is likely to alter the optical and/or mechanical properties of a unit of glazing in a manner that is significant for the function for which it is intended on the vehicle. Account shall be taken of the indices of difficulty when the extent of the alteration is estimated.
- 2.11. *Indices of difficulty* means a classification into two degrees that are applicable to the variations observed in practice for each secondary characteristic. The transition from index 1 to index 2 is an indication of the need to carry out traditional tests.
- 2.12. *Developed area of a windscreen* means the area of the minimum rectangle of glass from which a windscreen can be made.
- 2.13. *Rake angle of a windscreen* means the angle formed by the vertical line and the straight line joining the upper and lower edges of the windscreen, these straight lines being taken in a vertical plane containing the longitudinal axis of the vehicle;
- 2.13.1. the rake angle is measured on a vehicle on the ground and, where the vehicle is used to carry passengers, that vehicle must be in running order, with a full complement of fuel, liquid coolant and lubricant, with tools and spare wheels in place (if these are considered to form part of the standard equipment by the vehicle's manufacturer); account shall be taken of the weight of the driver and, where vehicles are intended to carry additional passengers, of the weight of a passenger on the front seat, the driver and passenger each being taken to a 75 ± 1 kg;
- 2.13.2. where vehicles are fitted with hydropneumatic, hydraulic or pneumatic suspension or with a device automatically regulating ground clearance as a function of load they shall be tested under the normal operating conditions specified by the manufacturer.
- 2.14. *Segment height h* means the maximum distance separating the internal surface of a unit of glazing from a plane passing through the edges of that unit. This distance shall be measured in a direction which is practically normal to the glazing (see Annex II M, Figure 1).
- 2.15. *Type of glazing* means the glazing defined in items 2.1 to 2.4 which does not display any essential differences, and in particular as regards the main and secondary characters mentioned in Annexes II B, II C, II D, II H, II I, II J, II K and II L;
- 2.15.1. although a change in the main characteristics means a new type of product, in certain cases it is accepted that a change in shape and dimensions does not necessarily involve an obligation to carry out a full series of tests. For certain of the tests specified in the separate Annexes glazing units may be grouped together if it is clear that they have similar main characteristics;
- 2.15.2. glazing units only having different secondary characteristics may be considered to be of the same type; however, certain tests can be carried out on samples of such glazing if those tests are explicitly stipulated in the test conditions.
- 2.16. *Type of vehicle*, as regards the fitting of safety glazing, means vehicles which do not show any essential differences, in particular as regards the type of glazing defined in item 2.15 and fitted on the vehicle.
- 2.17. *Curver* means the approximate value of the smallest radius of the arc of the windscreen measured at its most inwardly curved part.

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ANNEX II

GLAZING — STRUCTURAL AND TESTING REQUIREMENTS, APPLICATION FOR EEC COMPONENT TYPE-APPROVAL, MARKING, EEC COMPONENT TYPE-APPROVAL, AMENDMENT OR EXTENSION OF EEC COMPONENT TYPE-APPROVAL, CONFORMITY OF PRODUCTION MODELS AND PENALTIES FOR NON-CONFORMITY OF PRODUCTION

1. STRUCTURAL AND TESTING REQUIREMENTS
 - 1.1. **General specifications**
 - 1.1.1. All types of glass, and in particular glass intended to be used for windscreens must be of a quality enabling the risk of corporal damage in the event of breakage to be reduced as much as possible. The glass must offer adequate resistance to any stressing which may arise during accidents occurring under normal traffic conditions, and similarly to atmospheric and thermal factors, chemical agents, fire and abrasion.
 - 1.1.2. In addition safety glass shall be adequately transparent, cause no noticeable deformation of objects seen through the windscreen, nor cause any confusion between the colours used on road signs. In the event of windscreen breakage the driver must continue to be able to see the road clearly enough in order to be able to brake and bring his vehicle to a halt in complete safety.
 - 1.2. **Individual specifications**

Depending on the category to which they belong all types of glazing must meet the following individual specifications:

 - 1.2.1. as regards panes of uniformly toughened glass windscreens, the requirements set out in Annex II H;
 - 1.2.2. in the case of ordinary laminated glass windscreens, the requirements set out in Annex II B;
 - 1.2.3. in the case of panes of ordinary laminated glass apart from windscreens, the requirements set out in Annex II I;
 - 1.2.4. in the case of treated laminated glass windscreens, the requirements set out in Annex II C;
 - 1.2.5. in the case of plastic-coated safety glass the requirements set out in Annex II K in addition to the appropriate requirements listed above;
 - 1.2.6. in the case of plastic-glass windscreens, the requirements set out in Annex II D;
 - 1.2.7. in the case of plastic-glass panes other than windscreens, the requirements set out in Annex II J;
 - 1.2.8. in the case of double glazing the requirements set out in Annex II L.
 - 1.3. **Tests**
 - 1.3.1. The following tests are prescribed:
 - 1.3.1.1. *Fragmentation*

The purpose of this test is:

 - 1.3.1.1.1. to verify that the fragments and splinters produced by smashing of the pane of glass are such as to minimize the risk of injury,
 - 1.3.1.1.2. in the case of treated laminated glass windscreens to check residual visibility after shattering.
 - 1.3.1.2. *Mechanical strength*
 - 1.3.1.2.1. Ball-impact test

There are two tests, one using a 227 g ball and the other a 2 260 g ball.

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- 1.3.1.2.1.1. Test using the 227 g ball. The aim of this test is to assess the adhesion of the interlayer in laminated glass and the mechanical strength of uniformly toughened glass.
- 1.3.1.2.1.2. Test using a 2 260 g ball. The aim of this test is to assess the ability of the laminated glass to resist ball penetration.
- 1.3.1.2.2. Headform test
The purpose of this test is to verify the glass panes compliance with the requirements relating to the limitation of injury in the event of impact of the head against the windscreen, laminated glass and panes of plastic-glass other than windscreens, together with the double-glazed units used in the side windows.
- 1.3.1.3. *Resistance to the environment*
- 1.3.1.3.1. Abrasion test
The purpose of this test is to determine whether the resistance of a safety-glass pane to abrasion exceeds a specified value.
- 1.3.1.3.2. High-temperature test
The purpose of this test is to verify that no bubbles or other defects occur in the interlayer in a laminated glass or glass-plastics pane when the latter is exposed to high temperatures over an extended period of time.
- 1.3.1.3.3. Resistance-to-radiation test
The purpose of this test is to determine whether the light transmittance of laminated glass, plastic-glass and plastics-coated glass panes exposed to radiation over an extended period of time is significantly reduced thereby or whether the glazing is significantly discoloured.
- 1.3.1.3.4. Resistance-to-humidity test
The purpose of this test is to determine whether a laminated-glass, plastic-glass and plastics-coated glass pane will withstand, without significant deterioration, the effects of prolonged exposure to atmospheric humidity.
- 1.3.1.3.5. Resistance to temperature change
The purpose of this test is to determine whether the plastic material(s) used in safety glazing as defined in items 2.3 and 2.4 in Annex I will withstand, without significant deterioration, the effects of prolonged exposure to extreme temperatures.
- 1.3.1.4. *Optical qualities*
- 1.3.1.4.1. Light-transmission test
The aim of this test is to determine whether the regular transmission of safety-glass panes exceeds a specified value.
- 1.3.1.4.2. Optical distortion test
The purpose of this test is to verify that the distortion of objects as seen through the windscreen is not to such an extent as to be likely to confuse the driver.
- 1.3.1.4.3. Secondary-image-separation test
The purpose of this test is to verify that the angular separation of the secondary image from the primary image does not exceed a specified value.
- 1.3.1.4.4. Colour identification test
The purpose of this test is to verify that there is no risk of confusion of colours as seen through a windscreen.
- 1.3.1.4.5. Fire-resistance test
The purpose of this test is to verify that the inner face of a pane of safety glass as defined in items 2.3 and 2.4 in Annex I has a sufficiently low burn rate.
- 1.3.1.5. *Resistance to chemical agents*
The purpose of this test is to determine whether the inner surface of a pane of safety glass as defined in items 2.3 and 2.4 of Annex I will withstand, without deterioration, the effects of exposure to the

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chemical agents likely to be present or used in a vehicle (for example, cleaning agents).

- 1.3.2. *Tests prescribed for the categories of glass pane defined in items 2.1 to 2.4 in Annex I*
- 1.3.2.1. Safety glass shall be subjected to the tests listed in the following table:

	Windscreen						Other glazing		
	Ordinary laminated glass		Treated laminated glass		Plastic glass	Toughened glass	Laminated glass	Plastic glass	
	II	II P	III	III P	IV				
Fragmentation	—	—	II C/4	II C/4	—	II H/2	—	—	
Mechanical strength									
— 227 g ball	II B/4.3	II B/4.3	II B/4.3	II B/4.3	II B/4.3	II H/3.1	II I/4	II I/4	
— 2 260 g ball	II B/4.2	II B/4.2	II B/4.2	II B/4.2	II B/4.2	—	—	—	
Headform test ⁽¹⁾	II B/3	II B/3	II B/3	II B/3	II D/3	—	II I/3	II B/3	
Abrasion									
— outer face	II B/5.1	II B/5.1	II B/5.1	II B/5.1	II B/5.1	—	II B/5.1	II B/5.1	
— inner face	—	II K/2	—	II K/2	II K/2	II K/2 ⁽²⁾	II K/2 ⁽²⁾	II K/2	
High temperature	II A/5	II A/5	II A/5	II A/5	II A/5	—	II A/5	II A/5	
Radiation	II A/6	II A/6	II A/6	II A/6	II A/6	—	II A/6	II A/6	
Humidity	II A/7	II A/7	II A/7	II A/7	II A/7	II A/7 ⁽²⁾	II A/7	II A/7	
Light transmission	II A/9.1	II A/9.1	II A/9.1	II A/9.1	II A/9.1	II A/9.1	II A/9.1	II A/9.1	
Article distortion	II A/9.2	II A/9.2	II A/9.2	II A/9.2	II A/9.2	—	—	—	
Secondary image	II A/9.3	II A/9.3	II A/9.3	II A/9.3	II A/9.3	—	—	—	
Colour identification	II A/9.4	II A/9.4	II A/9.4	II A/9.4	II A/9.4	—	—	—	
Resistance to temperature changes	—	II A/8	—	II A/8	II A/8	II A/8 ⁽²⁾	II A/8 ⁽²⁾	II A/8	
Fire resistance	—	II A/10	—	II A/10	II A/10	II A/10 ⁽²⁾	II A/10 ⁽²⁾	II A/10	
Resistance to chemical agents	—	II A/11	—	II A/11	II A/11	II A/11 ⁽²⁾	II A/11 ⁽²⁾	II A/11	

⁽¹⁾ This test shall also be performed on double-glazed units in accordance with Annex II L, item 3 (II L/3).

⁽²⁾ Applies only to glass panes coated with plastic material on the inner surface.

NB: A reference such as II C/4 refers to Annex II C and to item 4 in that Annex, where the relevant test is described, together with the conditions attached to acceptance.

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- 1.3.2.2. A safety glass pane shall be type approved if it meets all the requirements prescribed in the relevant provisions, as referred to in the above table.
2. APPLICATION FOR COMPONENT TYPE-APPROVAL
- 2.1. The application for the EEC component type-approval of a type of glass pane shall be submitted by the manufacturer of the safety-glass pane or by his duly accredited representative.
- 2.2. For each type of safety glass, the application shall be accompanied by the document referred to below, in triplicate, and by the following particulars:
- 2.2.1. a technical description comprising all principal and secondary characteristics; and
- 2.2.1.1. in the case of glazing other than windscreens, drawings in a format not exceeding A4 or folded to that format, showing:
- the maximum area,
 - the smallest angle between two adjacent sides of the glass pane, and
 - the maximum height of segment, if any;
- 2.2.1.2. in the case of windscreens:
- 2.2.1.2.1. a list of the models of windscreen for which component type-approval is sought, giving the name of the vehicle manufacturers and the type and category of vehicle;
- 2.2.1.2.2. drawings in full scale for category M₁ and full scale or one-tenth scale for all other categories, together with diagrams of the windscreens and their location on the vehicle, in sufficient detail to show:
- 2.2.1.2.2.1. the position of the windscreen in relation to the 'R' point on the driver's seat where appropriate;
 - 2.2.1.2.2.2. the rake angle of the windscreen;
 - 2.2.1.2.2.3. the rake angle of the seat backrest;
 - 2.2.1.2.2.4. the position and size of the zones in which the optical qualities are checked;
 - 2.2.1.2.2.5. the developed area of windscreen;
 - 2.2.1.2.2.6. the maximum height of segment of the windscreen;
 - 2.2.1.2.2.7. the radius of curvature of the windscreen (for windscreen grouping purposes only).
- 2.2.1.3. In the case of double glazing, drawings in a format not exceeding A4 or folded to that format, showing, in addition to the information referred to in item 2.2.1.1:
- the type of each individual glass pane,
 - the type of sealant (organic, glass-glass or glass-metal),
 - the nominal thickness of the gap between the two glass panes.
- 2.3. In addition, the applicant shall submit a sufficient number of test pieces and samples of the finished glass panes of the models considered, the number being if necessary determined by agreement with the technical department responsible for conducting the tests.
- 2.4. The competent authority shall check the existence of satisfactory measures to ensure effective checking of conformity of production before component type-approval is granted.
3. MARKINGS
- 3.1. All safety-glass panes, including the samples and test pieces submitted for component type-approval, shall bear the trade name or mark of the manufacturer. The marking shall be clearly legible and indelible.

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4. EEC COMPONENT TYPE-APPROVAL
- 4.1. If the samples submitted for component type-approval meet the requirements of items 1.1 to 1.3 below, approval of the pertinent type of safety-glass pane shall be granted.
- 4.2. A component type-approval number shall be assigned to each type as defined in Annexes II H, II I, II J and II L or, in the case of windscreens, to each group approved. The first two digits (currently 00 for the Directive in its original form) indicate the number assigned to the series of amendments corresponding to the most recent major changes made to the Directive on the date when component type-approval is granted.
- 4.3. Notice of approval or extension or refusal of approval of a type of safety-glass pane pursuant to this Directive shall be communicated to the Member States by means of a form drawn up in accordance with the model set out in Annex II P and its appendices.
- 4.3.1. In the case of windscreens, the notice of approval shall be accompanied by a document listing every windscreen model in the approved group, together with the characteristics of the group in accordance with Appendix 7 to Annex II P.
- 4.4. In addition to the marking specified in item 3.1 the EEC component type-approval mark shall be affixed conspicuously to all safety-glass panes and double-glazed units conforming to a type approved under this Directive. Any special type-approval mark assigned to each pane of a double-glazed unit may also be affixed.
- This component type-approval mark consists of:
- 4.4.1. a rectangle surrounding the 'e', followed by the identifying number or letters of the country having granted component type-approval⁽¹⁾;
- 4.4.2. the component type-approval number, located to the right of the rectangle provided for in item 4.1.1.
- 4.5. The following additional symbols shall be affixed close to the component type-approval mark referred to above:
- 4.5.1. in the case of a windscreen:
- II: made of ordinary laminated glass (II/P if it is coated)⁽²⁾;
- III: if it is made of treated laminated glass (III/P if it is coated)⁽²⁾;
- IV: if it is made of plastic glass;
- 4.5.2. V: if this is a pane of glass other than a windscreen covered by item 9.1.4.2 in Annex II A;
- 4.5.3. VI: where this is a double-glazed unit.
- 4.6. The component type-approval mark and the symbol must be clearly legible and indelible.
- 4.7. Annex II N gives examples of component type-approval marks.
5. CHANGES TO OR EXTENSION OF THE EEC COMPONENT TYPE-APPROVAL OF A TYPE OF SAFETY-GLASS PANE
- 5.1. Any change to a type of safety-glass pane, or in the case of a windscreen, any addition of a windscreen to a group, shall be brought to the notice of the administrative department having granted component type-approval for that type of safety-glass pane. That department may then either:
- 5.1.1. consider that the changes made are unlikely to have an appreciable adverse effect and, in the case of windscreens, that the new type falls within the approved group of windscreens, and that at all events the safety-glass pane still complies with the requirements;
- 5.1.2. require a further test report from the technical department that is responsible for conducting the tests.

⁽¹⁾ 1 for the Federal Republic of Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 6 for Belgium, 9 for Spain, 11 for the United Kingdom, 13 for Luxembourg, 18 for Denmark, 21 for Portugal, IRL for Ireland, EL for Greece ► **A1** , 12 for Austria, 17 for Finland and 5 for Sweden ◀.

⁽²⁾ In accordance with the definition set out in item 2.3 of Annex I.

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- 5.2. **Notification**
- 5.2.1. Member States shall be notified of any confirmation, refusal or extension of type-approval in accordance with the procedure specified in item 4.3.
- 5.2.2. The competent authority that has granted an extension of component type-approval shall place a serial number on each notification to that effect.
6. **CONFORMITY OF PRODUCTION**
- 6.1. Safety glazing component type approved under this Directive shall be so manufactured as to conform to the approved type and shall meet the requirements set out in item 1 above.
- 6.2. To verify that the requirements of item 6.1 have been met, constant checks shall be carried out on production.
- 6.3. The holder of the component type-approval shall, in particular:
- 6.3.1. ensure that procedures exist for checking the quality of the product;
- 6.3.2. have access to the equipment necessary for checking conformity to each approved type;
- 6.3.3. record data relating to test results and the ancillary documents⁽¹⁾ which must be made available for a period to be determined in agreement with the administrative department;
- 6.3.4. analyse the results of each type of test in order to verify and ensure consistency of the product characteristics, allowing for the permissible variations in industrial production;
- 6.3.5. ensure that, for each type of product, at least the tests described in Annex II O to this Directive are carried out;
- 6.3.6. ensure that where any samples or test pieces show non-conformity with the type of test concerned, further samples are taken and tested. All necessary steps shall be taken to re-establish conformity in the production concerned.
- 6.4. The competent authority may at any time verify the methods for checking conformity that are applicable to each production unit (see item 3 in Annex II O).
- 6.4.1. At every inspection, the test data and production records shall be presented to the inspector.
- 6.4.2. The inspector may take samples at random to be tested in the manufacturer's laboratory. The minimum number of samples may be determined in the light of the results of the manufacturer's own checks.
- 6.4.3. Where the quality standard appears unsatisfactory or where it appears necessary to verify the validity of the tests carried out in accordance with item 6.4.2 the inspector may select samples to be sent to the technical department which has carried out the component type-approval tests.
- 6.4.4. The competent authority may carry out any test required by this Directive.
- 6.4.5. The normal frequency of inspection shall be two per year for each production unit. If unsatisfactory results are found during any of these inspections, the competent authority shall ensure that all necessary steps are taken in order to re-establish conformity of production as quickly as possible.
7. **PENALTIES FOR NON-CONFORMITY OF PRODUCTION**
- 7.1. The component type-approval granted in respect of a type of safety glass pane pursuant to this Directive may be withdrawn if the requirements laid down in item 6.1 above is not complied with.
- 7.2. If a Member State withdraws a component type-approval it has previously granted, it shall forthwith notify the other Member

⁽¹⁾ The results of the fragmentation tests shall be recorded, even if no photograph is required.

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States thereof by means of a copy of the component type-approval certificate following the model set out in Annex II P.

▼B*ANNEX II A***GENERAL TEST CONDITIONS**

1. FRAGMENTATION TEST
 - 1.1. The pane of glass to be tested shall not be rigidly secured; it may, however, be fastened onto an identical glass pane by means of adhesive tape applied all round the edge.
 - 1.2. To obtain fragmentation a hammer having a mass of roughly 75 g or some other appliance giving equivalent results is used. The radius of curvature of the point shall be $0,2 \pm 0,05$ mm.
 - 1.3. One test shall be carried out at each prescribed point of impact.
 - 1.4. An examination shall be made of the fragments on photographic contact paper, exposure commencing not more than 10 seconds and terminating not more than three minutes after impact. Only the darkest lines, representing the initial fracture, shall be taken into consideration. The laboratory shall keep photographic reproductions of the fragmentation obtained.
2. BALL IMPACT TEST
 - 2.1. **227 g ball test**
 - 2.1.1. *Apparatus*
 - 2.1.1.1. Hardened steel ball with a mass of 227 ± 2 g and a diameter of approximately 38 mm.
 - 2.1.1.2. Means for dropping the ball freely from a height to be specified, or a means of giving the ball a velocity equivalent to that obtained by the free fall. Where a device to project the ball is used, the tolerance on velocity shall be ± 1 % of the velocity equivalent to that obtained by the free fall.
 - 2.1.1.3. Supporting fixture, such as that shown in Figure 1 consisting of two steel frames with 15 mm-wide machined edges fitting onto each other and equipped with rubber gaskets that are roughly 3 mm thick, 15 mm wide and have a hardness of 50 IRHD.

The lower frame rests on a steel box about 150 mm high. The test pane is held in place by the upper frame, the mass of which is about 3 kg. The supporting frame is welded onto a sheet of steel about 12 mm thick resting on the floor, with an interposed sheet of rubber about 3 mm thick and a hardness of 50 IRHD.

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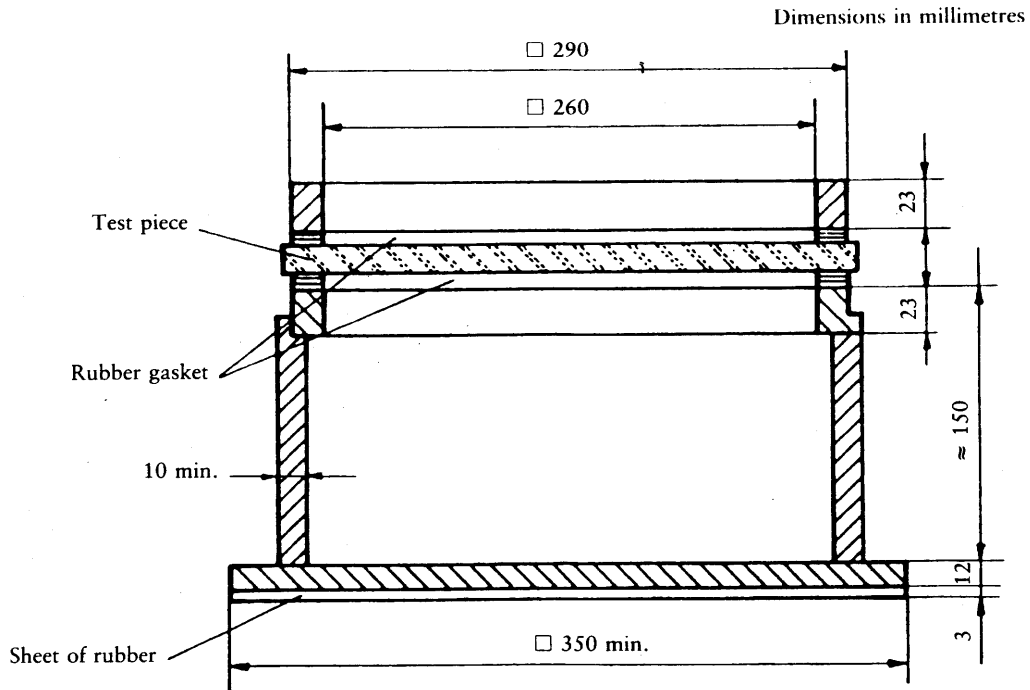


Figure 1

Support for ball tests2.1.2. *Test conditions*

- temperature: 20 ± 5 °C,
- pressure: 860 to 1 060 mbar,
- relative humidity: 60 ± 20 %.

2.1.3. *Test piece*

The test piece shall be a flat square whose sides measure $300 \pm 10/0$ mm.

2.1.4. *Procedure*

Condition the test piece at the specified temperature for at least four hours immediately preceding the test. Place the test piece in the fixture (see item 2.1.1.3). The plane of the test piece shall be perpendicular, to within 3° , to the incident direction of the ball.

The point of impact shall be within 25 mm of the geometric centre of the test piece for a drop height not exceeding 6 m, and within 50 mm of the centre of the test piece for a drop height of more than 6 m. The ball shall strike that face of the test piece which represents the outside face of the safety-glass pane when fitted to the vehicle.

The ball shall be allowed to make only one impact.

2.2. **2 260 g ball test**2.2.1. *Apparatus:*2.2.1.1. Hardened steel ball with a mass of $2\,260 \pm 20$ g and a diameter of approximately 82 mm.

2.2.1.2. Means for dropping the ball freely from a height to be specified, or a means of giving the ball a velocity equivalent to that obtained by the free fall.

Where a device to project the ball is used, the tolerance on velocity shall be ± 1 % of the velocity equivalent to that obtained by the free fall.

2.2.1.3. Supporting fixture such as that shown in Figure 1 and identical to that described in item 2.1.1.3.

2.2.2. *Test conditions*

- temperature: 20 ± 5 °C,

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- pressure: 860 to 1 060 mbar,
- relative humidity: 60 ± 20 %.

2.2.3. *Test piece*

The test piece shall be a flat square whose sides measure $300 \pm 10/0$ mm.

2.2.4. *Procedure*

Condition the test piece at the specified temperature for at least four hours immediately preceding the test.

Place the test piece in the fixture (item 2.1.1.3). The plane of the test piece shall be perpendicular, to within 3° , to the incident direction of the ball.

The point of impact shall be within 25 mm of the geometric centre of the test piece. In the case of plastic-glazing, the test piece shall be held in the fixture by means of pinching through appropriate devices.

The ball shall strike the face of the test piece which represents the outside face of the safety-glass pane when fitted to the vehicle. The ball shall be allowed to make only one impact.

3. HEADFORM TEST

3.1. **Apparatus**

3.1.1. Headform weight with a spherical or semi-spherical headform made of laminated hardwood covered with replaceable felt and with or without a cross-beam made of wood. There is a neck-shaped intermediate piece between the spherical part and cross-beam.

The dimensions shall be in accordance with Figure 2. The total mass of the apparatus shall be $10 \pm 0,2$ kg.

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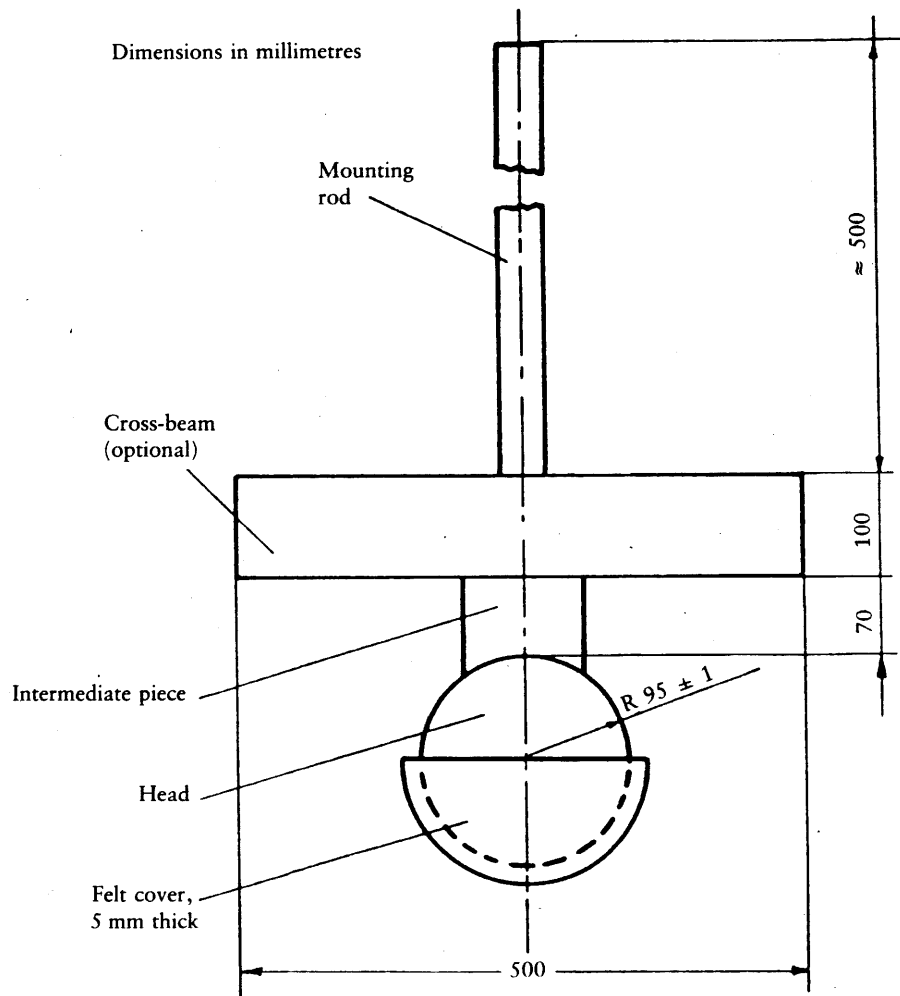


Figure 2

Headform weight

- 3.1.2. Means for dropping the headform weight freely from a height to be specified, or means of giving the weight a velocity equivalent to that obtained by the free fall.

When a device to project the headform weight is used, the tolerance on velocity shall be $\pm 1\%$ of the velocity equivalent to that obtained by the free fall.

- 3.1.3. Supporting fixture as shown in Figure 3, for testing flat test pieces. The fixture consists of two steel frames, with machined borders 50 mm wide, fitting one over the other and faced with rubber gaskets about 3 mm thick and 14 ± 1 mm wide and a hardness of 70 IRHD. The upper frame is held pressed against the lower frame by at least eight bolts.

3.2. **Test conditions**

- temperature: 20 ± 5 °C,
- pressure: 860 to 1 060 mbar,
- relative humidity: $60 \pm 20\%$.

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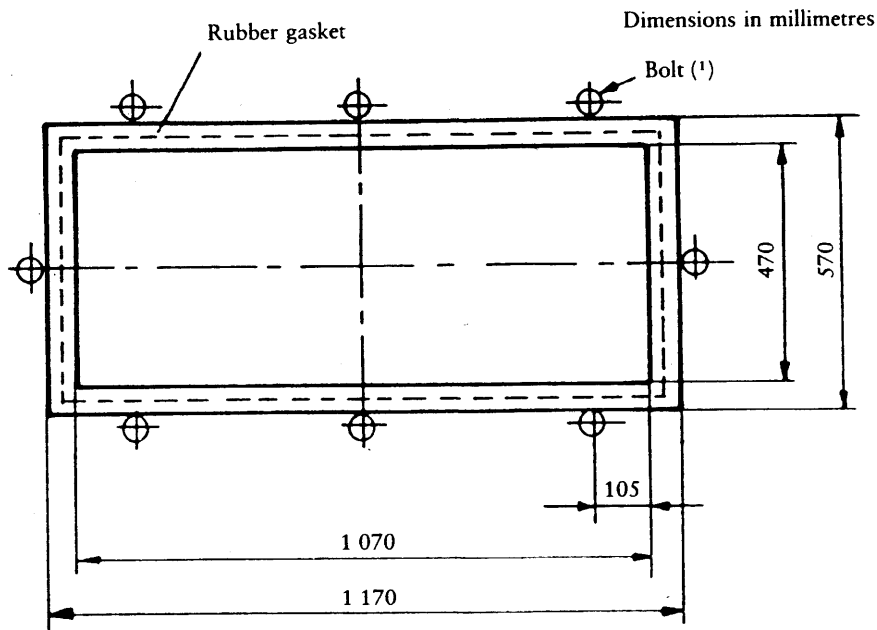


Figure 3

Support for headform tests

3.3. Procedure

3.3.1. Test on a flat test piece

The flat test piece, having a length of $1\,100 + 5/ - 2$ mm and a width of $500 + 5/ - 2$ mm, shall be kept at a constant temperature of 20 ± 5 °C for at least four hours immediately preceding the test. Fix the test piece in the supporting frames (item 3.1.3); the torque on the bolts shall ensure that the movement of the test piece during the test will not exceed 2 mm. The plane of the test piece shall be substantially perpendicular to the incident direction of the weight. The weight shall strike the test piece within 40 mm of its geometric centre on that face which represents the inward face of the safety-glass plane when the latter is mounted on the vehicle, and shall be allowed to make only one impact. The impact surface of the felt cover shall be replaced after 12 tests.

3.3.2. Tests on a complete windscreen (used only for a drop height not exceeding 1,5 m)

Place the windscreen freely on a support with an interposed strip of rubber of hardness 70 IRHD and thickness of about 3 mm, the width of contact over the whole perimeter being about 15 mm.

The support shall consist of a rigid piece corresponding to the shape of the windscreen so that the headform weight strikes the internal surface.

Where necessary the windscreen shall be clamped to the supporting structure by means of appropriate devices.

The support shall rest on a rigid stand with an interposed sheet of rubber of hardness 70 IRHD and thickness of about 3 mm. The surface of the windscreen shall be substantially perpendicular to the incident direction of the headform weight. The headform weight shall strike the windscreen at a point within 40 mm of its geometric centre on that face which represents the inward face of the safety glass pane when the latter is mounted on the vehicle, and shall be allowed to make only one impact.

The impact surface of the felt cover shall be replaced after 12 tests.

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4. ABRASION TEST

4.1. Apparatus

4.1.1. Abrading instrument⁽¹⁾, shown diagrammatically in Figure 4 and consisting of:

- a horizontal turntable, with centre clamp, which revolves counter-clockwise at 65 to 75 rev/min,

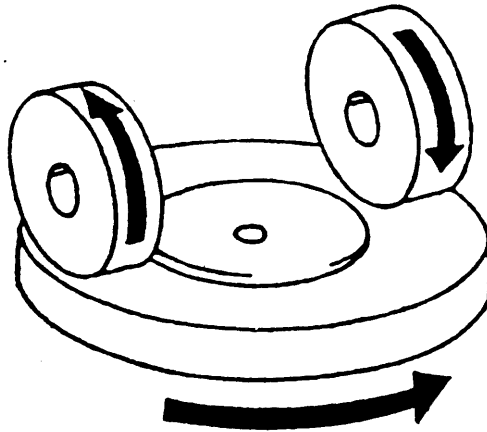


Figure 4

Diagram of abrading instrument

- two weighted parallel arms each carrying a special abrasive wheel freely rotating on a ball-bearing horizontal spindle; each wheel rests on the test specimen under the pressure applied by a mass of 500 g.

The turntable of the abrading instrument shall rotate regularly, substantially in one plane (the deviation from this plane shall not be greater than $\pm 0,05$ mm at a distance of 1,6 mm from the turntable periphery). The wheels shall be mounted in such a way that when they are in contact with the rotating test piece they rotate in opposite directions so as to exert, twice during each rotation of the test piece, a compressive and abrasive action along curved lines over an annular area of about 30 cm².

- 4.1.2. Abrasive wheels⁽²⁾, each 45 to 50 mm in diameter and 12,5 mm thick, consisting of a special finely-screened abrasive embedded in a medium-hard rubber. The wheels shall have a hardness of 72 ± 5 IRHD, as measured at four points equally spaced on the centre line of the abrading surface, the pressure being applied vertically along a diameter of the wheel and the readings being taken 10 seconds after full application of the pressure.

The abrasive wheels shall be prepared for use by very slow rotation against a sheet of flat glass to ensure that their surface is completely even.

- 4.1.3. Light source, consisting of an incandescent lamp with its filament contained within a parallelepiped measuring $1,5 \times 1,5 \times 3$ mm. The voltage applied to the filament shall be such that its colour temperature is $2\,856 \pm 50$ K. The instrument used to check the voltage shall be that of appropriate accuracy.
- 4.1.4. Optical system consisting of a lens with a focal length 'f' of at least 500 mm and corrected for chromatic aberrations. The full aperture of the lens shall not exceed $f/20$. The distance between the lens and the light source shall be adjusted in order to obtain a light beam which is substantially parallel.

A diaphragm shall be inserted to limit the diameter of the light beam to 7 ± 1 mm. This diaphragm shall be situated at a distance of 100 ± 50 mm from the lens on the side remote from the light source.

⁽¹⁾ A suitable abrading instrument is supplied by Teledyne Taber (United States of America).

⁽²⁾ Suitable abrasive wheels may be obtained from Teledyne Taber (United States of America).

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- 4.1.5. Equipment for measuring scattered light (see Figure 5), consisting of a photoelectric cell with an integrating sphere 200 to 250 mm in diameter. The sphere shall be equipped with entrance and exit ports for the light. The entrance port shall be circular and have a diameter at least twice that of the light beam. The exit port of the sphere shall be provided with either a light trap or a reflectance standard, according to the procedure as described in item 4.4.3 below. The light trap shall absorb all the light when no test piece is inserted in the light beam.

The axis of the light beam shall pass through the centre of the entrance and exit ports. The diameter 'b' of the light-exit port shall be equal to $2.a.\tan 4^\circ$, where 'a' is the diameter of the sphere.

The photoelectric cell shall be mounted in such a way that it cannot be reached by light coming directly from the entrance port or from the reflectance standard.

The surfaces of the interior of the integrating sphere and the reflectance standard shall be of substantially equal reflectance and shall be matted and non-selective.

The output of the photoelectric cell should be linear within $\pm 2\%$ over the range of light intensities used. The design of the instrument shall be such that there is no galvanometer needle deflection when the sphere is dark.

The whole apparatus shall be checked at regular intervals by means of calibration standards of defined haze. If haze measurements are made using equipment or methods differing from those defined above, the result shall be corrected, if necessary, to bring them into agreement with those obtained by the apparatus described above.

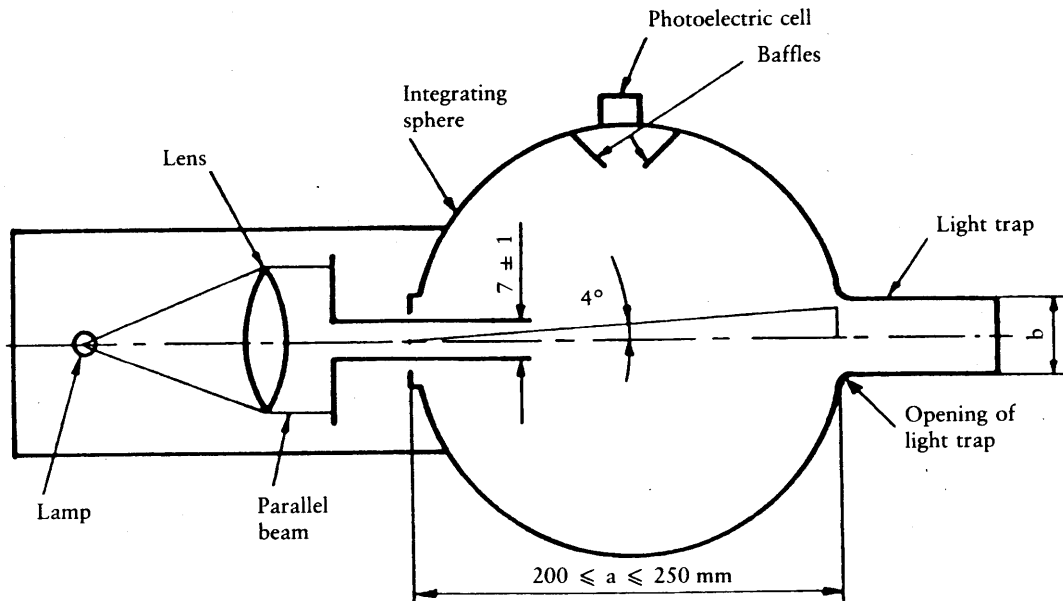


Figure 5

Hazameter

4.2. Test conditions

- temperature: $20 \pm 5^\circ\text{C}$,
- pressure: 860 to 1 060 mbar,
- relative humidity: $60 \pm 20\%$.

4.3. Test pieces

The test pieces shall be flat squares whose sides measure 100 mm having both surfaces substantially plane and parallel and having a fixing hole $6,4 + 0,2 / - 0$ mm in diameter drilled in the centre, if necessary.

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4.4. Procedure

The test shall be carried out on that surface of the test piece which represents the outside face of the laminated-glass pane when the latter is mounted on the vehicle and also on the inward face in the case of a glass with a plastic coating.

4.4.1. Immediately before and after the abrasion, clean the test pieces in the following manner:

- (a) wipe with a linen cloth or under clean running water;
- (b) rinse with distilled or demineralized water;
- (c) blow dry with oxygen or nitrogen;
- (d) remove possible traces of water by rubbing softly with a damp linen cloth.

If necessary dry by pressing lightly between two linen cloths. Any treatment with ultrasonic equipment shall be avoided. After cleaning the test pieces shall be handled only by their edges and shall be stored to prevent damage to, or contamination of, their surfaces.

4.4.2. Condition the test pieces for a minimum of 48 hours at 20 ± 5 °C and 60 ± 20 % relative humidity.

4.4.3. Place the test piece immediately against the entrance port of the integrating sphere. The angle between the normal (perpendicular) to the surface of the test piece and the axis of the beam shall not exceed 8°.

Take four readings as indicated in the following table:

Reading	With test piece	With light trap	With reflectance standard	Quality represented
T_1	No	No	Yes	Incident light
T_2	Yes	No	Yes	Total light transmitted by test piece
T_3	No	Yes	No	Light scattered by instrument
T_4	Yes	Yes	No	Light scattered by instrument and test piece

Repeat the readings for T_1 , T_2 , T_3 and T_4 with other specified positions of the test piece to determine uniformity.

Calculate total transmittance $T_t = T_2/T_1$.

Calculate the diffuse transmittance T_d as follows:

$$T_d = \frac{T_4 - T_3 (T_2/T_1)}{T_1}$$

Calculate the percentage haze, or light, or both, scattered, as follows:

$$\frac{T_d}{T_t} \times 100 \%$$

Measure the initial haze of the test piece at a minimum of four equally-spaced points in the unabraded area in accordance with the formula above. Average the results for each test piece. In lieu of the four measurements an average value may be obtained by rotating the piece uniformly at three rev/sec or more.

For each pane of safety glass carry out three tests under the same loading. Use the hazing as a measure of the subsurface abrasion after the test piece has been subjected to the abrasion test.

Measure the light scattered by the abraded track at a minimum of four equally-spaced points along the track in accordance with the formula above. Average results for each test piece. In lieu of the four measurements an average value may be obtained by rotating the piece uniformly at three rev/sec or more.

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- 4.5. The abrasion test will be carried out only at the discretion of the laboratory conducting the test with due regard to the information already at its disposal.

Except where plastic-glass is used, there are changes in the inter-layer or material thickness, further testing will as a general rule not be required.

- 4.6. **Indices of difficulty of the secondary characteristics**

No secondary characteristics are involved.

5. HIGH TEMPERATURE TEST

- 5.1. **Procedure**

Heat three square test specimens or three test pieces measuring at least 300 mm by 300 mm taken by the laboratory from three wind-screens or panes, as appropriate, one of whose dimensions corresponds to the upper edge of the pane, to 100 °C.

Maintain this temperature for two hours and then allow the test specimen or specimens to cool down to room temperature. If both the external surfaces of the safety glass pane are of inorganic material the tests may be carried out by immersing the test specimen vertically in boiling water for the specified period of time, care being taken to avoid undue thermal shock. If the specimens are cut from windscreens one edge of each such test specimen shall be part of an edge of the windscreen.

- 5.2. **Indices of difficulty of the secondary characteristics**

	<i>Colourless</i>	<i>Tinted</i>
Colouring of the interlayer:	1	2

The other secondary characteristics are not involved.

- 5.3. **Interpretation of results**

- 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 from any cracks which may occur during the test.

- 5.3.2. The set of test pieces or samples submitted for component type-approval shall be considered satisfactory from the point of view of the high-temperature test if either of the following conditions is fulfilled:

- 5.3.2.1. all of the tests give a satisfactory result; or
- 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. RESISTANCE-TO-RADIATION TEST

- 6.1. **Test method**

- 6.1.1. *Apparatus*

- 6.1.1.1. Radiation source consisting of a medium-pressure mercury-vapour arc lamp with a tubular quartz bulb of the ozone-free type. The bulb axis shall be vertical. The nominal dimensions of the lamp shall be 360 mm in length by 9,5 mm in diameter. The arc length shall be 300 ± 4 mm. The lamp shall be operated at 750 ± 50 W.

Any other source of radiation which produces the same effects as the lamp specified above may be used. To check that the effects of another source are the same, a comparison shall be made by measuring the amount of energy emitted within a wavelength range of 300 to 450 nanometers, all other wavelengths being removed by the use of suitable filters. The alternative source shall then be used with these filters.

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In the case of safety glass panes for which there is no satisfactory correlation between this test and the conditions of use it will be necessary to review the test conditions.

- 6.1.1.2. Power supply transformer and capacitor capable of supplying to the lamp (item 1.1.1) a starting peak voltage of 1 100 V minimum and an operating voltage of 500 ± 50 volts.
- 6.1.1.3. Device for mounting and rotating the test specimens at 1 to 5 rev/min about the centrally located radiation source in order to ensure even exposure.
- 6.1.2. *Test specimens*
- 6.1.2.1. The size of the test specimens shall be 76×300 mm.
- 6.1.2.2. The test specimens shall be cut by the laboratory from the upper part of the panes in such a way that:
- in the case of glazing other than windscreens the upper edge of the test specimens coincides with the upper edge of the panes,
 - in the case of windscreens the upper edge of the test specimens coincides with the upper limit of the zone in which regular transmittance is to be checked and determined in accordance with item 9.1.2.2 of this Annex.

6.1.3. *Procedure*

Check the regular light transmittance, determined in accordance with items 9.1.1 to 9.1.2 in this Annex, of three test specimens before exposure.

Protect a portion of each test specimen from the radiation, and then place the test specimen in the test apparatus 230 mm from and parallel lengthwise to the lamp axis. Maintain the temperature of the test specimens at $45 \pm 5^\circ$ throughout the test. The face of each test specimen which would constitute the outer face of the vehicle glazing shall face the lamp. For the type of lamp specified in item 6.1.1.1 the exposure time shall be 100 hours.

After exposure, measure the regular light transmittance again in the exposed area of each test specimen.

- 6.1.4. Each test piece or sample (total number three pieces) shall, in accordance with the above procedure, be subjected to radiation on each point of the test piece or sample such that the radiation produces on the interlayer used the same effect as that which would be produced by solar radiation of $1\,400 \text{ W/m}^2$ for 100 hours.

6.2. **Indices of difficulty of the secondary characteristics**

	<i>Colourless</i>	<i>Tinted</i>
Colouring of glass:	2	1
Colouring of interlayer:	1	2

The other secondary characteristics are not involved.

6.3. **Interpretation of results**

- 6.3.1. The test for resistance to radiation shall be deemed to have given a positive result if the following conditions are fulfilled:
- 6.3.1.1. the total light transmittance measured in accordance with items 9.1.1 to 9.1.2 in this Annex does not fall below 95 % of the original value before irradiation and, in any case, does not fall below:
- 6.3.1.1.1. 70 % in the case of glazing other than windscreens, which must meet the requirements concerning the drivers field of vision in all directions;
- 6.3.1.1.2. 75 % in the case of windscreens, within the zone in which regular transmittance is to be checked, as defined in item 9.1.2.2 below;

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- 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.
- 6.3.2. A set of test pieces or samples submitted for approval shall be considered satisfactory from the point of view of the resistance to radiation tests if either of the following conditions is fulfilled:
- 6.3.2.1. all the tests give a satisfactory result; or
- 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. RESISTANCE TO HUMIDITY TEST

7.1. **Procedure**

Keep three samples or test pieces of at least 300 × 300 mm vertically for two weeks in a closed container in which the temperature is maintained at 50 ± 2 °C and the relative humidity is 95 ± 4 %⁽¹⁾.

Test specimens shall be prepared in such a way that:

- one edge of each test specimen shall be part of an original edge of the pane,
- should several test specimens be tested at the same time adequate spacing shall be provided between them.

Precautions shall be taken to prevent condensate from the walls or ceiling of the test chamber from falling on the test specimens.

7.2. **Indices of difficulty of the secondary characteristics**

	<i>Colourless</i>	<i>Tinted</i>
Colouring of interlayer	1	2

The other secondary characteristics are not involved.

7.3. **Interpretation of results**

- 7.3.1. Safety glazing shall be deemed to be satisfactory from the point of view of resistance to humidity if no significant change is observed more than 10 mm from the uncut edges or more than 15 mm away from the cut edges, following a stay of two hours in the ambient atmosphere by ordinary untreated laminated glass, and of 48 hours in the ambient atmosphere by plastic coated and plastic glazing.
- 7.3.2. A set of test pieces or samples submitted for approval shall be considered satisfactory from the point of view of resistance to humidity if either of the following conditions is met:
- 7.3.2.1. all the tests give a satisfactory result;
- 7.3.2.2. one test having given an unsatisfactory result, a further series of test carried out on a new set of samples gives satisfactory results.

8. TESTING OF RESISTANCE TO CHANGES IN TEMPERATURE

8.1. **Test methods**

Two 300 × 300 mm test pieces shall be placed in an enclosed chamber for six hours at a temperature of - 40 ± 5 °C; they shall then be placed in the ambient air at a temperature of 23 ± 2 °C for an hour or until the test pieces have reached a stable temperature. They shall then be placed in an air flow at a temperature of 72 ± 2° for three hours. The test pieces shall then be examined after they have been returned to the ambient air at 23 ± 2 °C and cooled to that temperature.

⁽¹⁾ The test conditions do not allow any condensation on the test pieces.

▼ **B**8.2. **Indices of difficulty of the secondary characteristics**

	<i>Colourless</i>	<i>Tinted</i>
Colouring of plastic interlayer or coating:	1	2

No other secondary characteristics are involved.

8.3. **Interpretation of the results**

The testing of resistance to changes in temperature shall be considered to have a given positive result if the test pieces display no cracking, opacification, exfoliation or other obvious deterioration.

9. OPTICAL QUALITIES

9.1. **Light transmission test**9.1.1. *Apparatus*

9.1.1.1. Light source consisting of an incandescent lamp having its filament contained in a parallelepiped measuring $1,5 \times 1,5 \times 3$ mm. The voltage at the lamp filament shall be such that the colour temperature is $2\,856 \pm 50$ K. This voltage shall be stabilized within $\pm 1/1000$. The instrument used to check the voltage shall be of appropriate accuracy.

9.1.1.2. Optical system consisting of a lens with a focal length of at least 500 mm and corrected for chromatic aberrations. The full aperture of the lens shall not exceed $f/20$. The distance between the lens and the light source shall be so adjusted as to obtain a light beam which is substantially parallel. A diaphragm shall be inserted to limit the diameter of the light beam to 7 ± 1 mm. This diaphragm shall be situated at a distance of 100 ± 50 mm from the lens on the side remote from the light source. The point of measurement shall be taken at the centre of the light beam.

9.1.1.3. **Measuring equipment**

The receiver shall have a relative spectral sensitivity in substantial agreement with the relative ICI⁽¹⁾ spectral luminous efficiency for photopic vision. The sensitive surface of the receiver shall be covered with a diffusing medium and shall have at least twice the cross section of the parallel light beam emitted by the optical system. If an integrating sphere is used the aperture of the sphere shall have a cross sectional area at least twice that of the parallel portion of the beam.

The linearity of the receiver and the associated measuring instrument shall be better than 2 % of the effective part of the scale.

The centre of the receiver shall coincide with the axis of the light beam.

9.1.2. *Procedure*

Adjust the instrument indicating the response of the receiver so that it indicates 100 divisions when the safety-glass pane is not inserted in the light path.

When no light is falling on the receiver the instrument shall read zero.

Place the safety-glass pane at a distance from the receiver equal to approximately five times the diameter of the receiver. Insert the safety glass pane between the diaphragm and the receiver and adjust its inclination in such a way that the angle of the incidence of the light beam is equal to $\pm 5^\circ$. The regular transmittance shall be measured on the safety-glass pane, and for every point measured the number of divisions, 'n', shown on the indicating instrument, shall be read. The regular transmittance τ_r is equal to $n/100$.

9.1.2.1. In the case of windscreens, alternative test methods may be applied using either a test piece cut from the flattest part of a windscreen or a specially prepared flat square with material and thickness charac-

(1) International Commission on Illumination.

▼B

teristics identical to those of the actual windscreen, the measurements being taken normal (perpendicular) to the glass pane.

- 9.1.2.2. In the case of windscreens intended for category-M₁ vehicles, the test shall be carried out in the zone B defined in Annex II F. In the case of all other vehicles the test shall be carried out in zone I provided for in item 9.2.5.2.3 in this Annex.

- 9.1.3. *Indices of difficulty of the secondary characteristics*

	<i>Colourless</i>	<i>Tinted</i>
Colouring of the glass:	1	2
Colouring of the interlayer (in the case of laminated wind-screens):	1	2

	<i>Not included</i>	<i>Included</i>
Shade and/or obscuration bands:	1	2

The other secondary characteristics are not involved.

- 9.1.4. *Interpretation of results*

- 9.1.4.1. The regular transmission measured in accordance with item 9.1.2 shall not, in the case of windscreens, be less than 75 % and, in the case of windows other than windscreens, shall not be less than 70 %.

- 9.1.4.2. In the case of windows situated at points which are not essential to the driver's field of vision (glazed roof, for example), the regular transmission factor of the light from the pane may be less than 70 %.

Glazing materials whose regular light transmission factor is less than 70 % must be marked with the supplementary symbol provided for in item 4.5.2 of Annex II.

- 9.2. **Optical-distortion test**

- 9.2.1. *Scope*

The method specified is a projection method which permits evaluation of the optical distortion of a safety-glass pane.

- 9.2.1.1. *Definitions*

- 9.2.1.1.1. Optical deviation: the angle between the true and apparent direction of a point viewed through the safety-glass pane, the magnitude of the angle being a function of the angle of incidence of the line of sight, the thickness and inclination of the glass pane and the radius of curvature at the point of incidence.

- 9.2.1.1.2. Optical distortion in a direction MM': the algebraic difference in angular deviation Δ_a measured between two points M and M' on the surface of the safety-glass pane, the distance between the two points being such that their projections in a plane at right angles to the direction of vision are separated by a given distance Δ_x (see Figure 6).

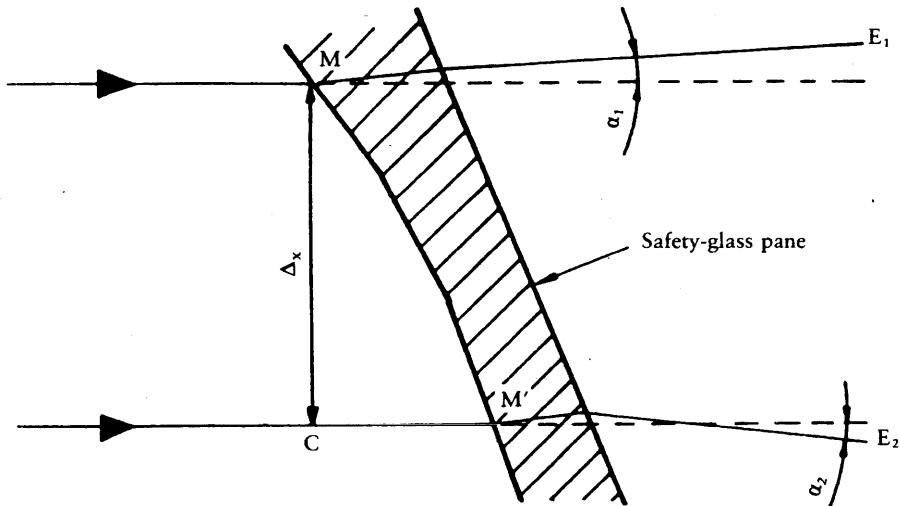
Anti-clockwise deviation should be regarded as positive and clockwise deviation as negative.

- 9.2.1.1.3. Optical distortion at a point M: the optical-distortion maximum for all directions MM' from the point M.

- 9.2.1.2. *Apparatus*

This method entails the projection of an appropriate slide (raster) onto the display screen through the safety-glass pane being tested. The change caused in the shape of the projected image by the insertion of the safety-glass pane in the line of sight provides a measure of the distortion. The apparatus shall comprise the following items, arranged as shown in Figure 9.

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Notes: $\Delta_{\alpha} = \alpha_1 - \alpha_2$, i.e. the optical distortion in the direction MM' .
 $\Delta_x = MC$ i.e. the distance between two straight lines parallel to the direction of vision and passing through the points M and M' .

Figure 6

Diagrammatic representation of optical distortion

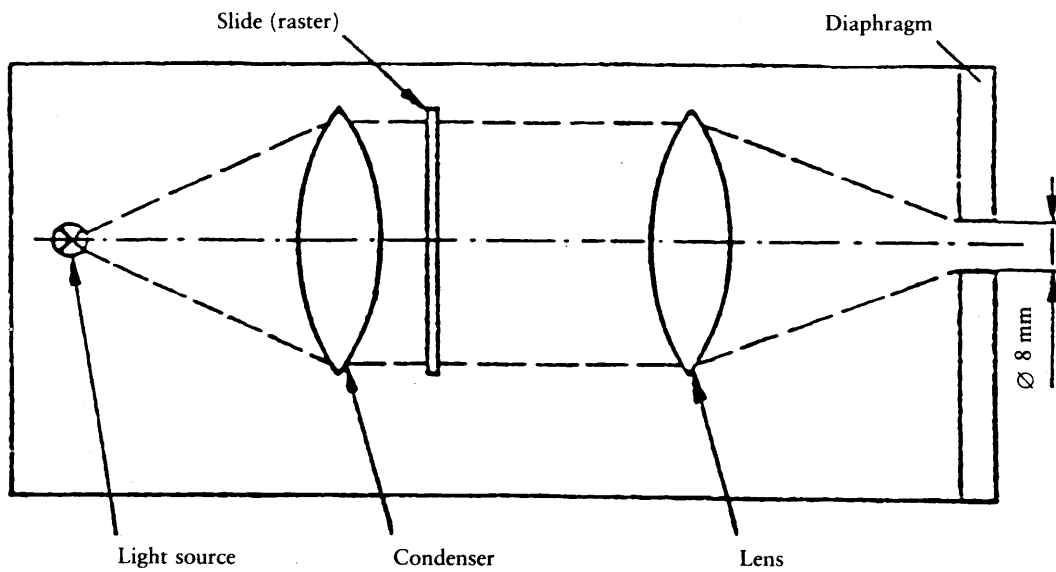


Figure 7

Optical arrangement of the projector

- 9.2.1.2.1. Projector, of good quality, with a high-intensity point light source, having for example the following characteristics:
- focal length of at least 90 mm,
 - aperture approximately 1/2,5,
 - 150 W quartz halogen lamp (used without a filter),
 - 250 W quartz halogen lamp (if used with a green filter).

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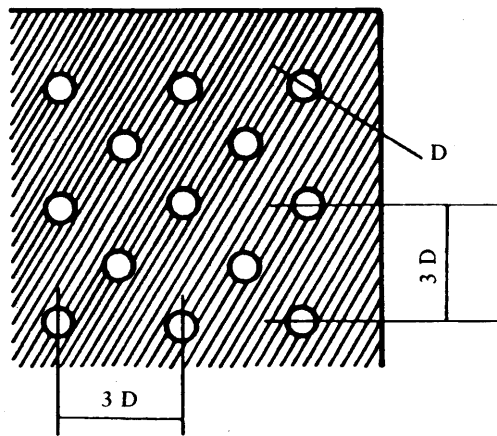


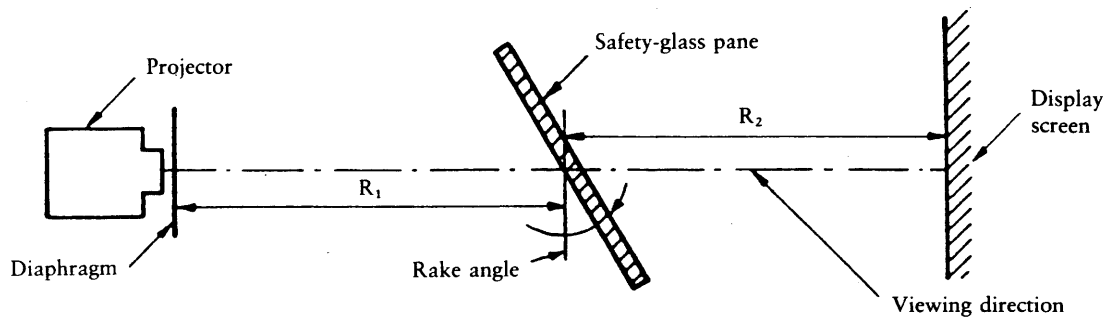
Figure 8

Enlarged section of the slide

The projector is shown schematically in Figure 7. A diaphragm of 8 mm diameter is positioned approximately 100 mm from the front lens.

- 9.2.1.2.2. Slides (rasters) consisting, for example, of an array of bright circular shapes on a dark background (see Figure 8). The slides shall be of sufficiently high quality and contrast to enable measurements to be carried out with an error of less than 5 %. In the absence of the safety-glass pane to be examined the dimensions of the circular shape shall be such that when they are projected they form an array of circles of diameter

$$\frac{R_1 + R_2}{R_1} \Delta_x \text{ on the screen, where } \Delta_x = 4 \text{ mm (see Figures 6 and 9).}$$



$$R_1 = 4 \text{ m}$$

$$R_2 = 2 \text{ m to } 4 \text{ m (4 m preferred)}$$

Figure 9

Arrangement of the apparatus for the optical-distortion test

- 9.2.1.2.3. Support stand, preferably one permitting vertical and horizontal scanning, as well as rotation of the safety-glass pane.
- 9.2.1.2.4. Checking template for measuring changes in dimensions where a rapid assessment is desired. A suitable design is shown in Figure 10.

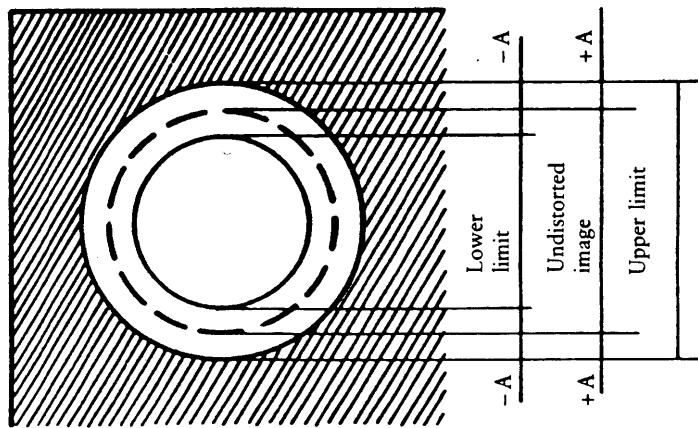
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Figure 10

Design for a suitable checking template

9.2.1.3. Procedure

9.2.1.3.1. General

Mount the safety-glass pane on the support stand (item 9.2.1.3.2) at the specified rake angle. Project the test image through the area being examined. Rotate the safety-glass pane or move it either horizontally or vertically in order to examine the whole of the specified area.

9.2.1.3.2. Assessment using a checking template

Where a rapid assessment with a possible margin of error of up to 20 % is sufficient, calculate the value of A (see Figure 10) from the limit value $\Delta\alpha_L$ for the change in deviation and the value of R_2 , for the distance from the safety-glass pane to the display screen:

$$A = 0,145 \Delta\alpha_L \cdot R_2$$

The relationship between the change in diameter of the projected image Δd and the change in angular deviation $\Delta\alpha$ is given by:

$$\Delta d = 0,29 \Delta\alpha \cdot R_2$$

where:

- Δd is in millimeters,
- A is in millimeters,
- $\Delta\alpha_L$ is in minutes of an arc,
- $\Delta\alpha$ is in minutes of an arc,
- R_2 is in metres.

9.2.1.3.3. Measurements using a photoelectric device

Where a precise measurement with a possible margin of error of less than 10 % of the limit value is required, measure Δd on the projection axis, the value of the spot width being taken at the point where the luminance is 0,5 times the maximum spot-luminance value.

9.2.1.4. Expression of results

Evaluate the optical distortion of the safety-glass panes by measuring Δd at any point on the surface and in all directions in order to find Δd max.

9.2.1.5. Alternative method

In addition, a strioscopic technique is permitted as an alternative to the projection techniques, provided that the accuracy of the measurements given in items 9.2.1.3.2 and 9.2.1.3.3 is maintained.

9.2.1.6. The distance Δx shall be 4 mm.

9.2.1.7. The windscreen shall be mounted at the same rake angle as on the vehicle.

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9.2.1.8. The projection axis in the horizontal plane shall be maintained approximately normal to the trace of the windscreen in that plane.

9.2.2. *The measurements shall be performed:*

9.2.2.1. in the case of category M_1 vehicles (a) in Zone A extended to the median plane of the vehicle and in the part of the windscreen corresponding symmetrically to that zone in relation to the median longitudinal plane of the vehicle and (b) in zone B;

9.2.2.2. in the case of vehicles in categories M and N other than M_1 , in zone I as defined in item 9.2.5.2 in this Annex.

9.2.2.3. Type of vehicle

The tests shall be repeated if the windscreen is to be mounted on a vehicle of a type which has a different forward field of vision from that of the vehicle type for which the windscreen has already been component type approved.

9.2.3. *Indices of difficulty of the secondary characteristics*

9.2.3.1. Nature of the material

<i>Polished plate glass</i>	<i>Float glass</i>	<i>Sheet glass</i>
1	1	2

9.2.3.2. Other secondary characteristics

No other secondary characteristics are involved.

9.2.4. *Number of samples*

Four samples shall be submitted for testing.

9.2.5. *Definitions of zones*

9.2.5.1. In the case of windscreens fitted to category M_1 vehicles, zones A and B are those defined in Annex II F.

9.2.5.2. In the case of category M and N vehicles other than those in category M_1 , the zones are defined starting from:

9.2.5.2.1. an ocular point normal to the R point for the driver's seat and 625 mm above that point in the vertical plane parallel to the median longitudinal plane of the vehicle for which the windscreen is intended, and passing through the axis of the steering wheel. This point is designated by O below;

9.2.5.2.2. a line OQ, this being the horizontal straight line passing through ocular point O and running normal to the median longitudinal plane of the vehicle.

9.2.5.2.3. Zone I — the zone of the windscreen bounded by the intersection of the windscreen with the four following planes:

P_1 — a vertical plane passing through the O point and forming an angle of 15° to the left of the median longitudinal plane of the vehicle;

P_2 — a vertical plane symmetrical to P_1 in relation to the median longitudinal plane of the vehicle.

If such an arrangement is impossible (absence of median longitudinal plane of symmetry, for example), the plane symmetrical to P_1 in relation to the longitudinal plane of the vehicle passing through the A point is taken to be P_2 ;

P_3 — a plane containing right angle OQ and forming an angle of 10° above the horizontal plane;

P_4 — a plane containing straight line OQ and forming an angle of 8° below the horizontal plane.

9.2.6. *Interpretation of results*

The type of windscreen shall be considered satisfactory as regards optical distortion if, in the four samples submitted for testing, optical distortion does not, in each zone, exceed the following maximum values:

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Vehicle category	Zone	Maximum optical distortion values
M ₁	A — Extent in accordance with item 9.2.2.1	2' of an arc
	B	6' of an arc
M categories other than M ₁ , and N	I	2' of an arc

- 9.2.6.1. No measurement shall be carried out in a 25 mm-wide peripheral zone on category M and N vehicles.
- 9.2.6.2. In the case of divided windscreens no check is performed within a band of 35 mm in width starting from the edge of the pane, which may be adjacent to the screen divider.
- 9.2.6.3. A tolerance of up to 6' of an arc is permitted for all parts of zone I or of zone A at least 100 mm from the edges of the windscreen.
- 9.2.6.4. Slight departures from the requirements are tolerated in zone B, provided that these are localized and mentioned in the test report.

9.3. Secondary-image-separation test

9.3.1. Scope

Two test methods are recognized:

- target test, and
- collimator-telescope test.

These tests may be used for component type-approval, quality control or product evaluation purposes, as appropriate.

9.3.1.1. Target test

9.3.1.1.1. Apparatus

This method involves viewing an illuminated target through the safety-glass pane. The target may be designed in such a way that the test can be carried out on a simple 'go-no go' basis. The target shall preferably be one of the following types:

- (a) an illuminated 'ring' target whose outer diameter, D, subtends an angle of N minutes of an arc at a point situated at x metres (Figure 11a); or
- (b) an illuminated 'ring and spot' target whose dimensions are such that the distance, D from a point on the edge of the spot to the nearest point on the inside of the ring subtends an angle of n minutes of an arc at a point situated at x metres (Figure 11b);

where:

- n is the limit value of secondary-image separation,
- x is the distance from the safety-glass pane to the target (not less than 7 m),
- D is given by the formula

$$D = x \cdot \tan n.$$

The illuminated target consists of a light box, approximately 300 × 300 × 150 mm, whose front is most inconveniently constructed of glass masked with opaque black paper or coated with matt black paint. The box shall be illuminated by a suitable light source. The inside of the box shall be coated with matt white paint.

It may be convenient to use other forms of target such as that shown in Figure 14. It is also acceptable to replace the target system by a projection system and to examine the resulting images on a screen.

9.3.1.1.2. Procedure

Mount the safety glass pane at the specified rake angle on a suitable stand in such a way that the observation is carried out in the horizontal plane passing through the centre of the target.

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The light box shall be viewed, in a dark or semi-dark room, through each part of the area being examined, in order to detect the presence of any secondary image associated with the illuminated target. Rotate the safety-glass pane as necessary to ensure that the correct direction of view is maintained. A monocular may be used for viewing.

9.3.1.1.3. Expression of results

Determine whether,

- when the target is used (see Figure 11a), the primary and secondary images of the circle separate i.e. whether the limit value of n is exceeded, or,
- when target (b) is used (see Figure 11b), the secondary image of the spot shifts beyond the point of tangency with the inside edge of the circle, i.e. whether the limit value of n is exceeded.

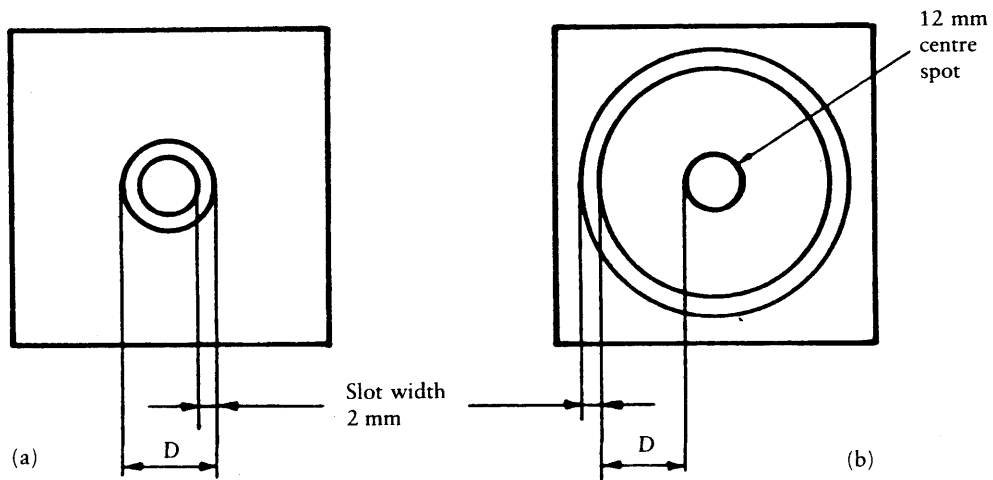


Figure 11

Dimensions of targets

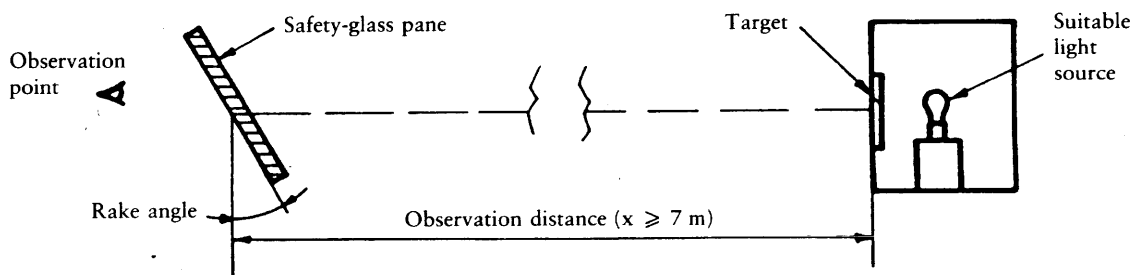
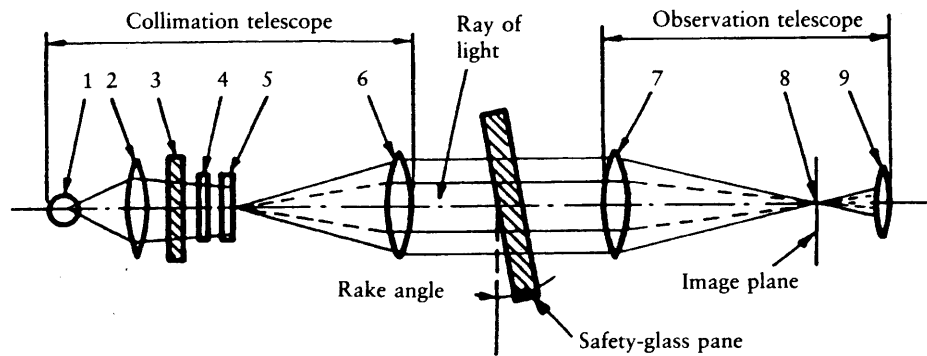


Figure 12

Arrangement of apparatus

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1. Lamp bulb.
2. Condenser aperture $> 8,6$ mm.
3. Ground-class screen aperture $>$ condenser aperture.
4. Colour filter with central hole approximately 0,3 mm in diameter; diameter $> 8,6$ mm.
5. Polar-coordinate plate, diameter $> 8,6$ mm.
6. Achromatic lens, $f \geq 86$ mm, aperture 10 mm.
7. Achromatic lens, $f \geq 86$ mm, aperture 10 mm.
8. Black spot, diameter approximately 0,3 mm.
9. Achromatic lens, $f = 20$ mm, aperture ≤ 10 mm.

Figure 13

Apparatus for collimation-telescope test

9.3.1.2. Collimation-telescope test

If necessary, the procedure described in this paragraph shall be applied.

9.3.1.2.1. Apparatus

The apparatus comprises a collimator and a telescope and may be set up in accordance with Figure 19. However, any equivalent optical system may be used.

9.3.1.2.2. Procedure

The collimation telescope forms, at infinity, the image of a polar coordinate system with a bright point at its centre (see Figure 14).

In the focal plane of the observation telescope a small opaque spot with a diameter slightly larger than that of the projected bright point is placed on the optical axis, thus obscuring the bright point.

When a test piece which exhibits a secondary image is placed between the telescope and the collimator a second, less bright, point appears at a certain distance from the centre of the polar coordinate system. The secondary image separation can be read out as the distance between the points seen through the observation telescope (see Figure 14).

(The distance between the dark spot and the bright spot at the centre of the polar coordinate system represents the optical deviation).

9.3.1.2.3. Expression of results

The safety glass pane shall first be examined by a simple scanning technique to establish the area giving the strongest secondary image.

That area shall then be examined by the collimator-telescope system at the appropriate angle of incidence. The maximum secondary-image separation shall then be measured.

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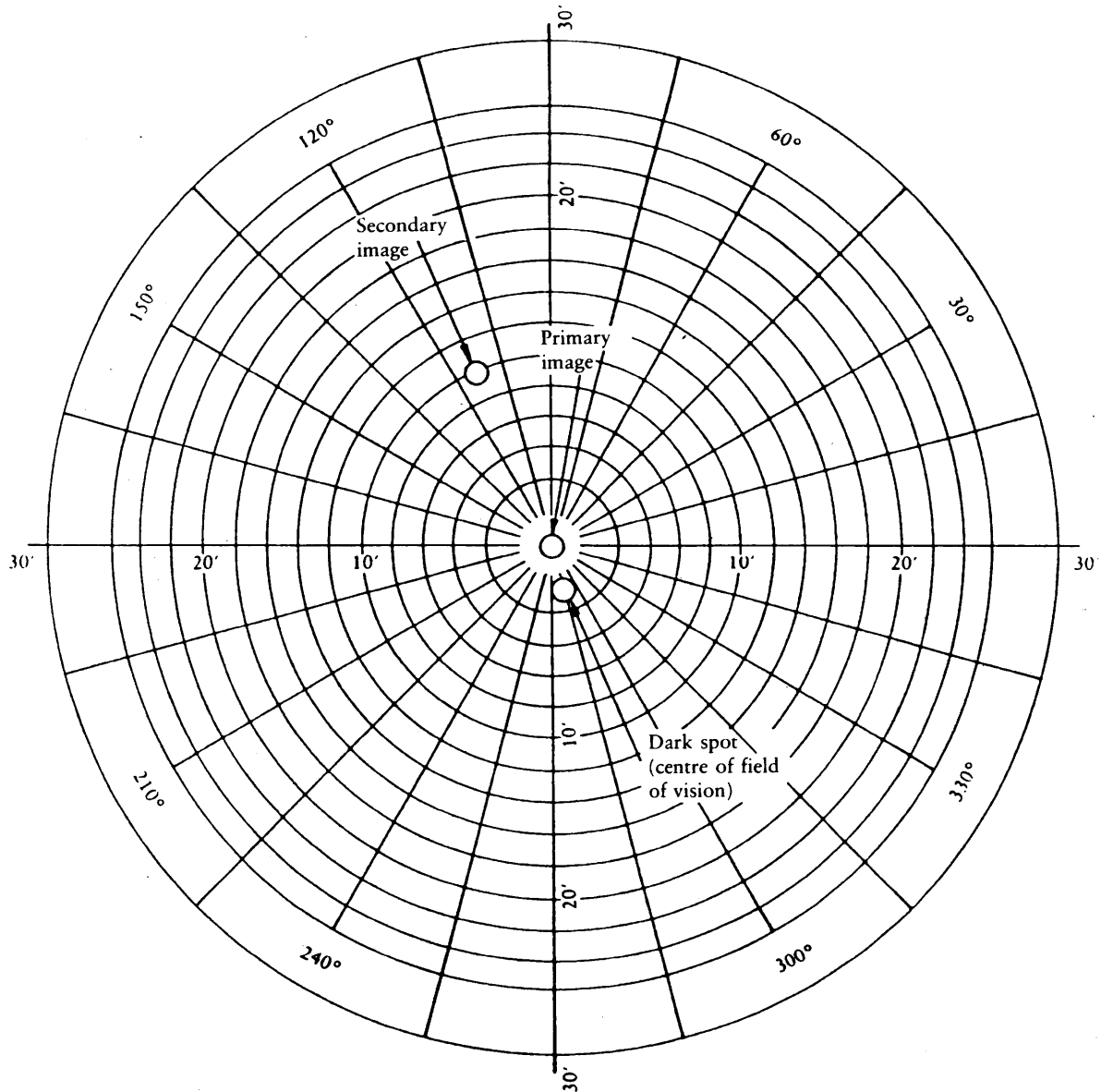


Figure 14

Example of observation by the collimation-telescope test method

- 9.3.1.3. The direction of observation in the horizontal plane shall be maintained approximately normal to the trace of the windscreen in that plane.
- 9.3.2. The measurements shall be carried out in accordance with the vehicle categories in the zones as defined in item 9.2.2 above.
- 9.3.2.1. Vehicle type
- The test shall be repeated if the windscreen is to be mounted on a vehicle of a type which has a forward field of vision different from that of the type of vehicle for which the windscreen has already been component type approved.
- 9.3.3. *Indices of difficulty of the secondary characteristics*
- 9.3.3.1. Nature of the material
- | <i>Polished plate glass</i> | <i>Float glass</i> | <i>Sheet glass</i> |
|-----------------------------|--------------------|--------------------|
| 1 | 1 | 2 |
- 9.3.3.2. Other secondary characteristics
- No other secondary characteristics are involved.

▼B9.3.4. *Number of samples*

Four samples shall be submitted for testing.

9.3.5. *Interpretation of results*

A type of windscreen shall be considered satisfactory as regards secondary-image separation if, in the four samples submitted for testing, separation of the primary and secondary image does not exceed the following maximum values for each zone:

Vehicle category	Zone	Maximum values for separation of primary and secondary images
M ₁	A — Extent in accordance with item 9.2.2.1	15' of an arc
	B	25' of an arc
Category M other than M ₁ and N	I	15' of an arc

9.3.5.1. No measurement shall be carried out in a 25 mm-wide peripheral zone in the case of category M and N vehicles.

9.3.5.2. In the case of divided windscreens no check is performed within a band 35 mm in width, starting from the edge of the pane, which may be adjacent to the screen divider.

9.3.5.3. A tolerance of up to 25' of an arc is permitted for all of the parts of zone I or of zone A situated less than 100 mm from the edges of the windscreen.

9.3.5.4. Slight departures from the requirements are tolerated in zone B provided that these are localized and mentioned in the test report.

9.4. **Identification-of-colours test**

When a windscreen is tinted in the zones defined in item 9.2.5.1 or 9.2.5.2 four windscreens shall be tested for identifiability of the following colours:

- white,
- selective yellow,
- red,
- green,
- blue,
- amber.

10. FIRE-RESISTANCE TEST

10.1. **Purpose and scope**

This method enables the horizontal burning rate of the materials used in the passenger compartment of motor vehicles (passenger cars, lorries, station wagons, motor buses) to be determined after exposure to a small flame.

This method permits testing of the materials and coverings used inside vehicles to be tested either individually or in combination up to a thickness of 13 mm. It is used to judge the uniformity of production batches of such materials in respect of their burning behaviour.

Because of the many differences between the real-world situation and the precise test conditions prescribed herein (application and orientation within a vehicle, conditions of use, ignition sources, etc.) this method cannot be considered to be suitable for evaluation of all true in-vehicle burning characteristics.

10.2. **Definitions**

10.2.1. Burning rate: the quotient of the burnt distance, measured in accordance with this method, and the time taken to burn at that distance.

It is expressed in millimetres per minute.

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- 10.2.2. Composite material: a material consisting of several layers of similar or different materials closely held together at their surface by cementing, bonding, cladding, welding, etc.

When different materials are connected together intermittently (for example by sewing, high frequency welding, riveting, etc.), thus permitting the taking of individual samples in accordance with item 10.5, such materials shall not be considered to be composite materials.

- 10.2.3. Exposed side: the side which is facing towards the passenger compartment when the material is fitted to the vehicle.

10.3. **Principle**

A sample is held horizontally in a U-shaped holder and is exposed to the action of a defined low-energy flame for 15 seconds in a combustion chamber, the flame acting on the free edge of the sample. The test determines whether and when the flame is extinguished, or the time the flame requires to travel over a measured distance.

10.4. **Apparatus**

- 10.4.1. Combustion chamber (Figure 15), preferably made of stainless steel, having the dimensions given in Figure 16.

The front of the chamber contains a flame-proof observation window, which may cover the entire front and which can act as an access panel.

The bottom of the chamber has vent holes and the top has a vent slot all around.

The combustion chamber is placed on four feet, 10 mm high. The chamber may have a hole at one end for the introduction of the sample holder containing the sample; in the opposite end a hole is provided for the gas-supply line. Melted material is caught in a pan (see Figure 17) which is placed on the bottom of the chamber between the vent holes without covering any of them.

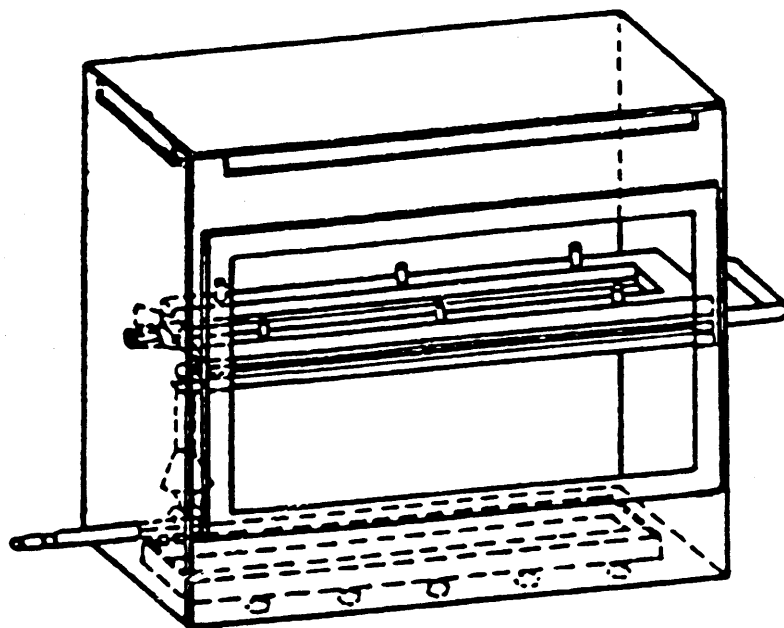


Figure 15

Example of combustion chamber with sample holder and drip pan

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Dimensions in millimetres — tolerances according to ISO 2768

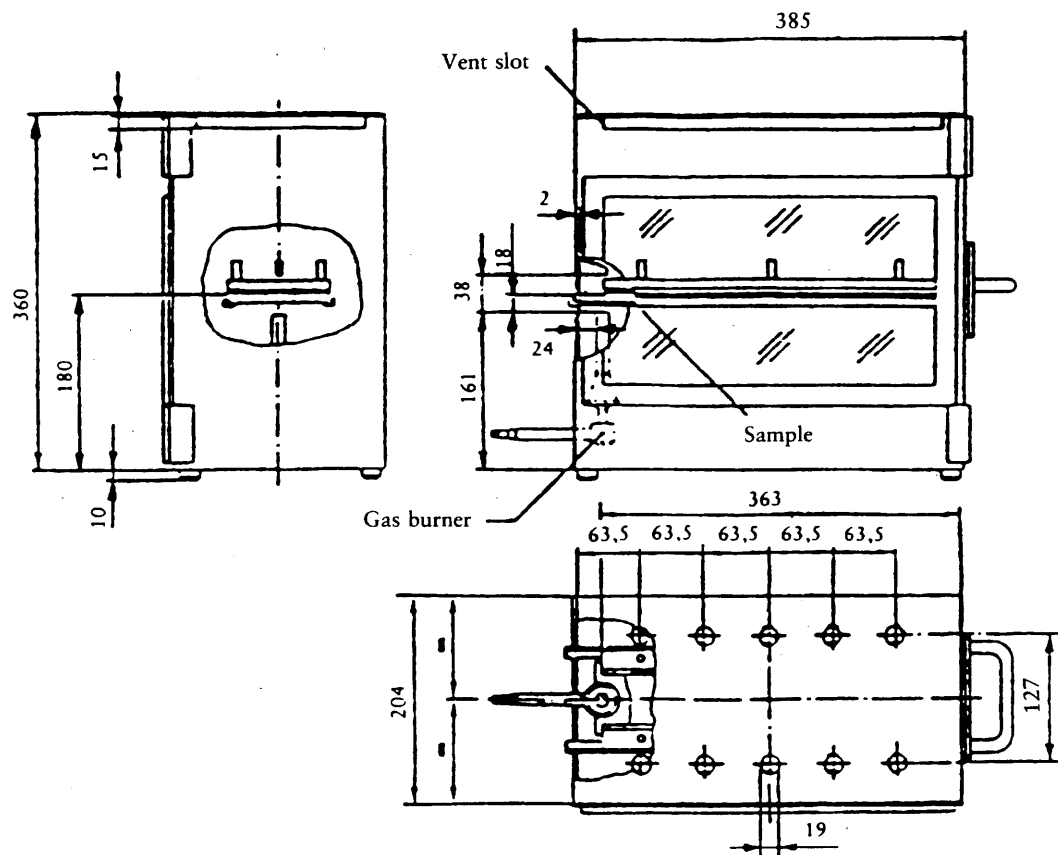


Figure 16

Example of combustion chamber

Dimensions in millimetres — tolerances according to ISO 2768

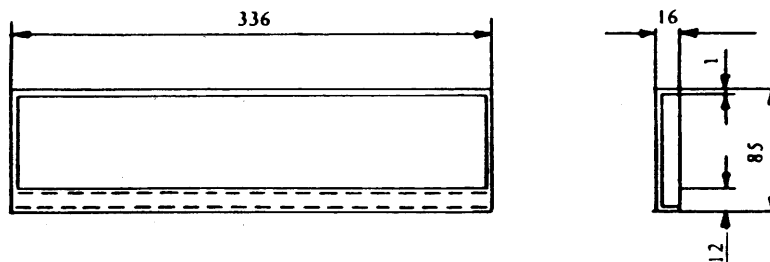


Figure 17

Typical drip pan

- 10.4.2. Sample holder consisting of two U-shaped metal plates or frames of corrosion-proof material. The dimensions are given in Figure 18.

The lower plate is equipped with pins and the upper one with corresponding holes in order to ensure a consistent holding of the sample. The pins also serve as measuring points at the beginning and end of the burning distance.

Intervals over the bottom U-shaped frame (see Figure 19).

The lower side of the sample shall be 178 mm above the floor plate; the distance of the front edge of the sample holder from end of the chamber shall be 22 mm; the distances of the longitudinal sides of the sample holder from the sides of the chamber shall be 50 mm (all inside dimensions) (see Figures 15 and 16).

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Dimensions in millimetres — tolerances according to ISO 2768

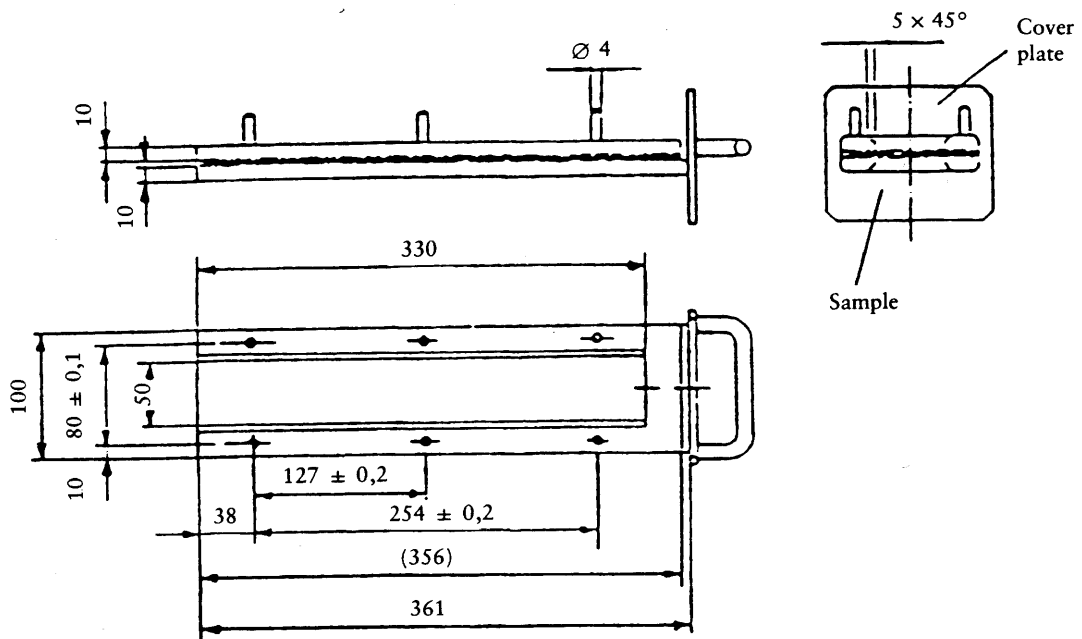


Figure 18

Example of sample holder

Dimensions in millimetres — tolerances according to ISO 2768

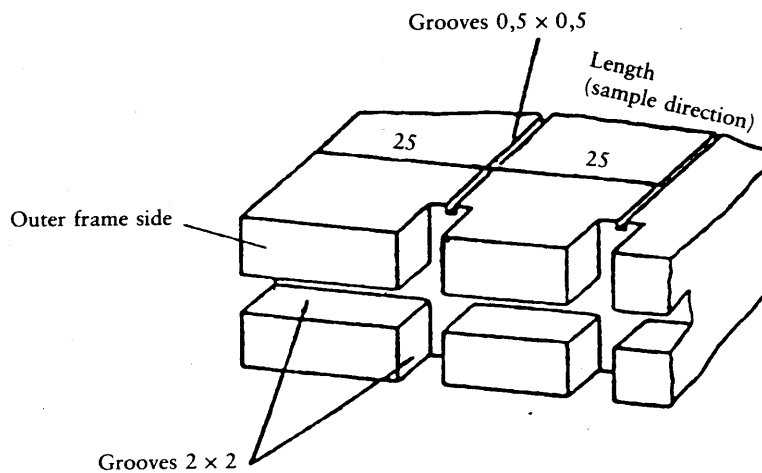


Figure 19

Example of section lower U-frame design for wire support facility

10.4.3. Gas burner

The small ignition source is provided by a Bunsen burner having an inside diameter of 9,5 mm. It is so located in the test cabinet that the centre of its nozzle is 19 mm below the centre of the bottom edge of the open end of the sample (see Figure 16).

10.4.4. Test gas

The gas supplied to the burner shall have calorific value of about 38 MJ/m³ (for example natural gas).

10.4.5. Metal comb, at least 110 mm in length, with seven or eight smooth rounded teeth per 25 mm.

10.4.6. Stop-watch, accurate to 0,5 sec.

▼B10.4.7. *Fume cupboard*

The combustion chamber may be placed in a fume-cupboard assembly provided that the latter's internal volume is at least 20 times, but not more than 110 times, greater than the volume of the combustion chamber and provided that no single height, width, or length dimension of the fume cupboard is greater than 2½ times either of the other two dimensions.

Before the test the vertical velocity of the air through the fume cupboard shall be measured 100 mm forward of and to the rear of the ultimate site of the combustion chamber. It shall be between 0,10 and 0,30 m/s in order to avoid possible discomfort to the operator from combustion products. It shall be possible to use a fume cupboard with natural ventilation and an appropriate air velocity.

10.5. **Samples**10.5.1. *Shape and dimension*

The shape and dimensions of samples are given in Figure 20. The thickness of the sample corresponds to the thickness of the product to be tested. It shall not be more than 13 mm. When sample-taking so permits, the sample shall have a constant section over its entire length. When the shape and dimensions of a product do not permit a sample of a given size to be taken, the following minimum dimensions shall be maintained:

- (a) for samples having a width of 3 to 60 mm, the length shall be 356 mm. In this case the material is tested over the product width;
- (b) for a sample having a width of 60 to 100 mm the length shall be at least 138 mm. In this case the potential burning distance corresponds to the length of the sample, the measurement starting at the first measuring point;
- (c) samples less than 60 mm wide and less than 356 mm long, and samples 60 to 100 mm wide and less than 138 mm long cannot be tested in accordance with the present method, nor can samples less than 3 mm wide.

10.5.2. *Sampling*

At least five samples shall be taken from the material under test. In materials having burning rates differing according to the direction of the material (this being established by preliminary tests) the five (or more) samples shall be taken and placed in the test apparatus in such a way that the highest burning rate will be measured. When the material is supplied in set widths a length of at least 500 mm covering the entire width shall be cut. From the piece so cut the samples shall be taken at a point not less than 100 mm from the edge of the material and at points equidistant from each other.

Samples shall be taken in the same way from finished products when the shape of the product so permits. If the thickness of the product is over 13 mm it shall be reduced to 13 mm by a mechanical process applied to the side which does not face a passenger compartment.

Composite materials (see item 10.2.2) shall be tested as if they were homogeneous.

In the case of materials comprising superimposed layers of different composition which are not considered to be composite materials, all the layers of material included within a depth of 13 mm from the surface facing towards the passenger compartment shall be tested individually.

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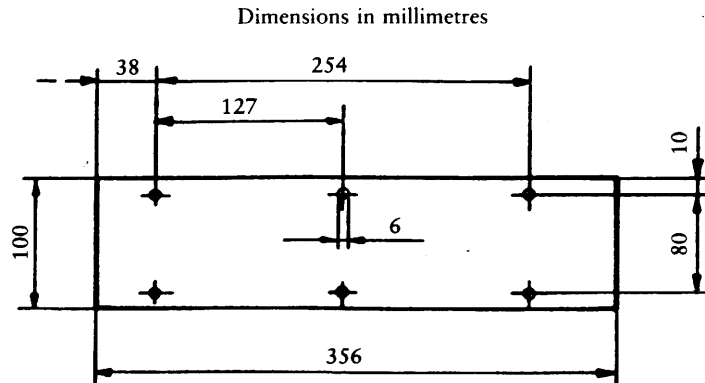


Figure 20

Sample

10.5.3. Conditioning

The samples shall be conditioned for at least 24 hours, but not more than seven days, at a temperature of 23 ± 2 °C and a relative humidity of 50 ± 5 % and be maintained under these conditions until immediately prior to testing.

10.6. Procedures

10.6.1. Place samples with napped or tufted surfaces on a flat surface, and comb twice against the nap using the comb (item 10.4.5).

10.6.2. Place the sample in the sample holder (item 10.4.2) so that the exposed side faces downwards towards the flame.

10.6.3. Adjust the gas flame to a height of 38 mm using the mark on the chamber, the air intake of the burner being closed. The flame shall burn for at least one minute, for stabilization, before the first test is started.

10.6.4. Push the sample-holder into the combustion chamber so that the end of the sample is exposed to the flame, and after 15 seconds cut off the gas flow.

10.6.5. Measurement of the burning time starts at the moment when the foot of the flame passes the first measuring point. Observe the flame propagation on the side (upper or lower) which burns faster.

10.6.6. Measurement of the burning time is completed when the flame has come to the last measuring point or when the flame is extinguished before reaching that point. If the flame does not reach the last measuring point, measure the burnt distance up to the point where the flame is extinguished. The burnt distance is that part of the sample destroyed, on the surface or inside, by burning.

10.6.7. If the sample does not ignite or does not continue burning after the burner has been extinguished, or the flame goes out before reaching the first measuring point, so that no burning time can be measured, note in the test report that the burning speed is 0 mm/min.

10.6.8. When running a series of tests or performing repeat tests make sure before starting a test that the temperature of the combustion chamber and sample holder does not exceed 30 °C.

10.7. Calculation

The burning rate B, in mm per minute, is given by the formula:

$$B = \frac{s}{t} \times 60$$

where:

s is the burnt distance, in millimetres,

t is the time, in seconds, taken to burn the distance s.

10.8. Indices of difficulty of the secondary characteristics

No secondary characteristics are involved.

▼B**10.9. Interpretation of results**

Plastic coated (item 2.3 in Annex I) and plastic safety glazing (item 2.4 in Annex I) should be considered satisfactory from the point of view of burning behaviour (fire resistance) if the burn rate does not exceed 250 mm minute.

11. TESTING OF RESISTANCE TO CHEMICAL AGENTS**11.1. Chemical agents to be used**

11.1.1. Non-abrasive soapy solution: 1 % by weight of potassium oleate in de-ionized water.

11.1.2. Window cleaning product: aqueous solution of isopropanol and dipropylene glycol monomethyl ether, each at a concentration of 5 to 10 % by weight, and of ammonium hydroxide at a concentration of 1 to 5 % by weight.

11.1.3. Non-dilute denatured alcohol: one part by volume of methyl alcohol in 10 parts by volume of ethyl alcohol.

11.1.4. Reference gasoline mixture of 50 % by volume of toluene, 30 % by volume of 2.2.4 trimethylpentane, 15 % by volume of 2.4.4 trimethyl-1-pentane and 5 % by volume of ethylalcohol.

11.1.5. Reference kerosene: mixture of 50 % by volume of n-octane and 50 % by volume of n-decane.

11.2. Test method

Two 180 × 25 mm test pieces shall each be tested with chemical agents as provided for item 11.1 above, a new test piece being used for each test and product.

Before each test the test pieces shall be cleaned in accordance with the manufacturers instructions, and then be conditioned for 48 hours at a temperature of 23 ± 2 °C and a relative humidity of 50 ± 5 %. These conditions shall be maintained during the tests.

The test pieces shall be completely immersed in the test liquid for one minute, be withdrawn and then immediately be dried with a clean absorbent cotton cloth.

11.3. Indices of difficulty of secondary characteristics

	<i>Colourless</i>	<i>Tinted</i>
Colouring of plastic interlayer, or coating:	1	2

No other secondary characteristics are involved.

11.4. Interpretation of the results

11.4.1. The test for resistance to chemical agents shall be considered to be positive if the test piece displays no softening, stickiness, surface cracking or apparent loss of transarence.

11.4.2. A series of test pieces submitted for component type-approval shall be considered satisfactory as regards resistance to chemical agents if one of the following conditions has been met:

11.4.2.1. all the tests give positive results;

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



ANNEX II B

ORDINARY LAMINATED-GLASS WINDSCREEN

1. DEFINITION OF TYPE

Windscreens made of ordinary laminated glass 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. the trade name or mark;
 - 1.1.2. shape and dimensions

windscreens made of ordinary laminated glass shall be considered to form an integral part of a group in respect of the mechanical-property and resistance-to-the-ambient environment tests;
 - 1.1.3. number of layers of glass;
 - 1.1.4. the nominal thickness 'e' of the windscreen, a manufacturing tolerance of 0,2 n mm being permitted on either side of the nominal value, where n is the number of layers of glass in the windscreen;
 - 1.1.5. the nominal thickness of the interlayer or interlayers;
 - 1.1.6. the nature and type of the interlayer or interlayers e.g. PVB or other plastic-material interlayer or interlayers.
 - 1.2. **The secondary characteristics are as follows:**
 - 1.2.1. the nature of the material (polished glass, float glass, sheet glass);
 - 1.2.2. the colouring (total or partial) of the interlayer or interlayers (colourless or tinted);
 - 1.2.3. the colouring of the glass (colourless or tinted);
 - 1.2.4. the presence or absence of conductors;
 - 1.2.5. the presence or absence of obscuration bands.
2. GENERAL
 - 2.1. In the case of ordinary laminated-glass windscreens the tests, other than the headform tests (item 3.2) and those on optical qualities, shall be carried out on flat test pieces which are either cut from actual windscreens or are specially made. In either case the test pieces shall in all respects be rigorously representative of the windscreens for the production of which component type-approval is sought.
 - 2.2. Before each test the test pieces shall be stored for at least four hours at a temperature of 23 ± 2 °C. The tests shall be performed as soon as possible after the test pieces have been taken out of the receptacle in which they were stored.
3. HEADFORM TEST
 - 3.1. **Indices of difficulty of the secondary characteristics**

No secondary characteristics are involved.
 - 3.2. **Headform test on complete windscreen**
 - 3.2.1. *Number of samples*

Four samples from the batch having the smallest developed area and four from the batch having the largest developed area, selected in accordance with Annex II E, will be submitted to the tests.
 - 3.2.2. *Test methods*
 - 3.2.2.1. The method used should be that described in item 3.3.2 in Annex II A.
 - 3.2.2.2. The height of drop shall be 1,5 m \pm 0/5 mm.

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- 3.2.3. *Interpretation of results*
- 3.2.3.1. This test shall be deemed to have given a satisfactory result if the following conditions are fulfilled:
- 3.2.3.1.1. the test piece yields and breaks, displaying numerous circular cracks centred approximately on the point of impact; the closest crack being at the most 80 mm from the point of impact;
- 3.2.3.1.2. the glass layers shall remain bonded to the plastic interlayer. Several delaminations shall be accepted provided that these are less than 4 mm wide on each side of the crack outside a circle having a diameter of 60 mm centred on the point of impact;
- 3.2.3.1.3. on the side of the impact:
- 3.2.3.1.3.1. the interlayer shall not be laid bare over an area of more than 20 cm²;
- 3.2.3.1.3.2. tearing of the interlayer shall be acceptable over a length of 35 mm.
- 3.2.3.2. A set of test pieces subjected to component type-approval testing shall be considered satisfactory from the point of view of behaviour under headform impact if one of the following two conditions is met:
- 3.2.3.2.1. all the tests give satisfactory results;
- 3.2.3.2.2. one test having given an unsatisfactory result, a further series of tests carried out on a new set of test pieces gives satisfactory results.
- 3.3. **Headform test on flat test pieces**
- 3.3.1. *Number of test pieces*
- Six flat test pieces measuring $1\ 100 + 5/ - 2\ \text{mm} \times 500 + 5/ - 2\ \text{mm}$ should be submitted to testing.
- 3.3.2. *Test method*
- 3.3.2.1. The method used should be that described in item 3.3.1 in Annex II A.
- 3.3.2.2. The height of drop shall be $4\ \text{m} + 25/ - 0\ \text{mm}$.
- 3.3.3. *Interpretation of results*
- 3.3.3.1. This test shall be deemed to have a satisfactory result if the following conditions are fulfilled:
- 3.3.3.1.1. the test piece yields and breaks, displaying numerous circular cracks centred approximately on the point of impact;
- 3.3.3.1.2. tears in the interlayer are allowed, but the manikin's head must not pass through;
- 3.3.3.1.3. no large fragments of glass shall become detached from the interlayers;
- 3.3.3.2. a set of test pieces subjected to approval testing shall be considered satisfactory from the point of view of behaviour under head impact if one of the following conditions is met:
- 3.3.3.2.1. all the tests give satisfactory results; or
- 3.3.3.2.2. one test having given an unsatisfactory result, a further series of tests carried out on a new set of test pieces gives satisfactory results.
4. **MECHANICAL STRENGTH TEST**
- 4.1. **Indices of difficulty of the secondary characteristics**
- No secondary characteristics are involved.
- 4.2. **2 260 g ball-impact tests**
- 4.2.1. *Number of test pieces*
- Six flat square test pieces of $300 + 10/ - 0\ \text{mm}$ per side should be subjected to testing.

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4.2.2. *Test method*

4.2.2.1. The method used shall be that described in item 2.2 in Annex II A.

4.2.2.2. The height of drop (from the underface of the ball to the upper face of the test piece) shall be $4\text{ m} + 25/ - 0\text{ mm}$.4.2.3. *Interpretation of results*

4.2.3.1. The test shall be deemed to have given a satisfactory result if the ball does not pass through the pane of glass within five seconds from the time of impact.

4.2.3.2. A set of test pieces subjected to component type-approval shall be considered satisfactory from the point of view of the 2 260 g ball-impact test if one of the following conditions is met:

4.2.3.2.1. all the tests have given a satisfactory result;

4.2.3.2.2. one test having given an unsatisfactory result, a further series of tests carried out on a new set of test pieces gives satisfactory results.

4.3. **227 g ball-impact test**4.3.1. *Index of difficulty of the secondary characteristic*

No secondary characteristics are involved.

4.3.2. *Number of test pieces*Twenty square test pieces of $300 \pm 0\text{ mm}$ shall be submitted to testing.4.3.3. *Test methods*4.3.3.1. The method used shall be that described in item 2.1 in Annex II A. Ten examples shall be subjected to a test at a temperature of $+ 40 \pm 2\text{ °C}$ and 10 at a temperature of $- 20 \pm 2\text{ °C}$.

4.3.3.2. Height of drop for the various thickness categories and the mass of the fragments detached set out in the following table:

Thickness of test piece mm	+ 40 °C		- 20 °C	
	Height of drop m (*)	Maximum authorized mass of fragments g	Height of drop m (*)	Maximum authorized mass of fragments g
$e \leq 4,5$	9	12	8,5	12
$4,5 < e \leq 5,5$	10	15	9	15
$5,5 < e \leq 6,5$	11	20	9,5	20
$e > 6,5$	12	25	10	25

(*) A tolerance of $+ 25/ - 0\text{ mm}$ is permitted for the height of drop.4.3.4. *Interpretation of results*

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

- the ball does not pass through the test piece,
- the test piece does not smash into several pieces,
- if the interlayer is not torn the weight of the fragments detached from the side of the glass opposite to the point of impact does not exceed the appropriate values specified in item 4.3.3.2.

4.3.4.2. A set of test pieces subjected to approval testing shall be considered satisfactory from the point of view of the 227 g ball-impact test if one of the following conditions is met:

4.3.4.2.1. at least eight tests carried out at each of the test temperatures have given a satisfactory result,

4.3.4.2.2. more than two tests at each of the test temperatures have given an unsatisfactory result, a further series of tests carried out on a new set of test pieces gives satisfactory results.

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5. RESISTANCE TO THE ENVIRONMENT TEST
 - 5.1. **Abrasion**
 - 5.1.1. *Indices of difficulty and test methods*

The requirements of item 4 in Annex II A shall apply, the test shall be continued for 1 000 cycles.
 - 5.1.2. *Interpretation of results*

Safety glass shall be considered satisfactory from the point of view of abrasion resistance if the light scattered as a result of abrasion of the test piece does not exceed 2 %.
 - 5.2. **Resistance to high-temperature test**

The requirements set out in item 5 in Annex II A shall apply.
 - 5.3. **Resistance-to-radiation tests**
 - 5.3.1. *General requirement*

This test shall be conducted only if the laboratory deems it useful in the light of the information in its possession concerning the interlayer.
 - 5.3.2. The requirements of item 6 in Annex II A shall apply.
 - 5.4. **Resistance-to-humidity tests**

The requirements of item 7 in Annex II A shall apply.
6. OPTICAL QUALITIES

The provisions concerning optical qualities set out in item 9 in Annex II A shall apply to all types of windscreen.



ANNEX II C

TREATED LAMINATED-GLASS WINDSCREEN

1. DEFINITION OF TYPE
- Windscreens made of treated laminated glass shall be deemed to belong to different types if they differ in at least one of the following main or secondary characteristics.
- 1.1. **The principal characteristics are as follows:**
- 1.1.1. the trade name of mark;
- 1.1.2. the shape and dimensions
- windscreens made of treated laminated glass shall be considered to form part of a single group for the fragmentation, mechanical properties and resistance to environment tests;
- 1.1.3. a number of sheets of glass;
- 1.1.4. the nominal thickness of 'e' of the windscreen, a manufacturing tolerance of 0,2 n mm being acceptable on either side of the nominal value, where n is the number of sheets of glass in the windscreen;
- 1.1.5. any special treatment which one or several sheets of glass has undergone;
- 1.1.6. the nominal thickness of the interlayer(s);
- 1.1.7. the nature and type of the interlayer(s) (e. g. PVB or other plastic interlayer).
- 1.2. **The secondary characteristics are as follows:**
- 1.2.1. the nature of the material (polished glass, float glass, sheet glass);
- 1.2.2. the colouring (total or partial, colourless or tinted) of the interlayer or interlayers;
- 1.2.3. the colouring of the glass (colourless or tinted);
- 1.2.4. the presence or absence of conductors;
- 1.2.5. the presence or absence of obscuration bands.
2. GENERAL
- 2.1. In the case of treated laminated glass windscreens the headform tests shall be carried out on complete windscreens and the optical quality tests shall be carried out on samples and/or flat specimens especially designed to that effect. However, the test specimens must at all points be rigorously representative of the mass-produced windscreens for which type-approval is requested.
- 2.2. Before each test the pieces or samples shall be stored for four hours at least at a temperature of 23 ± 2 °C. The tests should be formed as soon as possible after the test pieces or samples have been removed from the receptacle in which they were stored.
3. TESTS REQUIRED
- Windscreens made of treated laminated glass should be subjected to the following:
- 3.1. the tests required in Annex II B for ordinary laminated-glass windscreens;
- 3.2. the fragmentation test described in item 4 below.
4. FRAGMENTATION TEST
- 4.1. **The index of difficulty of the secondary characteristics**

Material	Index of difficulty
Polished glass	2

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Material	Index of difficulty
Float glass	1
Plate glass	1

4.2. Number of specimens or samples

One sample per point of impact or one specimen measuring $1\,100 \times 500 \text{ mm} + 5 / - 2 \text{ mm}$ shall be submitted to the test.

4.3. Test method

The method used shall be that described in item 1 in Annex II A.

4.4. Point(s) of impact

The pane shall be struck on each of the outside or central treated layers in the sample.

4.5. Interpretation of the results

4.5.1. The fragmentation test shall be deemed to have given a satisfactory result for each point of impact if the cumulative area of the fragments exceeding 2 cm^2 is equal to at least 15 % of the area of the rectangle of visibility that it is at least 20 cm high and 50 cm wide.

4.5.1.1. *In the case of a sample*

4.5.1.1.1. In the case of category M_1 vehicles the centre of the rectangle is situated in a circle having a radius of 10 cm centred on the projection of the centre of segment V1 V2.

4.5.1.1.2. In the case of category M or category N vehicles other than category M_1 the centre of the rectangle shall be located within a circle having a diameter of 10 cm centred on the projection of point 0.

4.5.1.1.3. The height of the abovementioned rectangle may be reduced to 15 cm in the case of windscreens that are less than 44 cm in height and the fitting angle which is less than 15° to the vertical and the percentage of visibility must equal 10 % of the area of a corresponding rectangle.

4.5.1.2. In the case of a specimen the centre of the rectangle is situated on the largest axis of the specimen 450 mm from one of the edges.

4.5.2. The sample(s) or specimen(s) submitted for component type-approval shall be deemed satisfactory from the point of view of fragmentation if either of the following conditions is met:

4.5.2.1. the test has given a satisfactory result at each point of impact;

4.5.2.2. where a test having been repeated on a new series of four samples for each point of impact for which initially the result was unsatisfactory, the four new tests carried out on the same points all yield a satisfactory result.



ANNEX II D

PLASTIC-GLASS WINDSCREENS

1. DEFINITION OF TYPE

Plastic-glass 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. the trade name or mark;
 - 1.1.2. the shape and dimensions

plastic-glass windscreens shall be deemed to form an integral part of a group for the purpose of mechanical strength, resistance to the environment, resistance to temperature change and resistance to chemicals tests;
 - 1.1.3. the number of plastic layers;
 - 1.1.4. nominal thickness 'e' of the windscreen, a manufacturing tolerance of $\pm 0,2$ mm being acceptable;
 - 1.1.5. the nominal thickness of the pane of glass;
 - 1.1.6. the nominal thickness of the plastic interlayer sheet or sheets;
 - 1.1.7. the type of plastic interlayer sheet or sheets (e.g. PVB or other plastic material) and of the plastic sheet on the inside face;
 - 1.1.8. any special treatment which the glass sheet may have undergone.
 - 1.2. **The secondary characteristics are as follows:**
 - 1.2.1. the nature of the material (polished glass, float glass, sheet glass);
 - 1.2.2. the colouring (total or partial) of the plastic interlayer sheet or sheets (colourless or tinted);
 - 1.2.3. the colouring of the glass (colourless or tinted);
 - 1.2.4. the presence or absence of conductors;
 - 1.2.5. the presence or absence of obscuration bands.
2. GENERAL
 - 2.1. In the case of windscreens made of plastics-glass, the tests, apart from those involving the headform test (item 3.2) and the optical qualities, shall be conducted on flat test pieces which are either cut from actual glass panes or are specially made. In either case the test pieces shall in all respects be rigorously representative of the series-produced windscreens for which component type-approval is sought.
 - 2.2. Before each test the test pieces shall be stored for not less than four hours at a temperature of 23 ± 2 °C. The tests shall be performed as soon as the test pieces have been taken out of the receptacle in which they were stored.
3. HEADFORM TEST
 - 3.1. **Indices of difficulty of the secondary characteristics**

No secondary characteristics are involved.
 - 3.2. **Headform test on complete windscreen**
 - 3.2.1. *Number of test pieces*

Four samples from the series batch which has the smallest developed area and four samples from the production batch having the largest developed area, selected in accordance with the provisions of Annex II E, shall be submitted to the tests.

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- 3.2.2. *Test method*
- 3.2.2.1. The method used shall be that described in item 3.3.2 in Annex II A.
- 3.2.2.2. The height of drop shall be 1,50 m + 0/ - 5 mm.
- 3.2.3. *Interpretation of results*
- 3.2.3.1. This test shall be deemed to have given a satisfactory result if the following conditions are fulfilled:
- 3.2.3.1.1. the glass sheet breaks, displaying numerous circular cracks centred approximately on the point of impact, the closest cracks being no more than 80 mm from the point of impact;
- 3.2.3.1.2. the glass sheet remains bonded to the plastic interlayer. One or several delaminations less than 4 mm wide will be accepted on each side of the crack outside a 60 mm diameter circle centred on the point of impact;
- 3.2.3.1.3. tears in the interlayer are allowed over a length of 35 mm on the side of the impact.
- 3.2.3.2. A set of test pieces submitted for component type-approval shall be considered satisfactory from the point of view of behaviour under head impact if either of the following conditions is met:
- 3.2.3.2.1. all the tests give a satisfactory result;
- 3.2.3.2.2. one test having given an unsatisfactory result, a further series of tests carried out on a new set of test pieces give satisfactory results.
- 3.3. **Head impact behaviour test on flat test pieces**
- 3.3.1. *Number of test pieces*
- Six flat 1 100 × 500 mm (+ 5/ - 2 mm) test pieces shall be submitted to tests.
- 3.3.2. *Test method*
- 3.3.2.1. The method used shall be that described in Annex II A, item 3.3.1.
- 3.3.2.2. The height of drop shall be 4 m + 25/ - 0 mm.
- 3.3.3. *Interpretation of results*
- 3.3.3.1. This test shall be deemed to have given a satisfactory result if the following conditions are fulfilled:
- 3.3.3.1.1. the glass sheet yields and breaks, displaying numerous circular cracks that are roughly centred on the point of impact;
- 3.3.3.1.2. tears in the interlayer are allowed, but the manikin's head must not pass through;
- 3.3.3.1.3. no large fragments of glass shall become detached from the interlayer.
- 3.3.3.2. A set of test pieces subjected to component type-approval testing shall be considered satisfactory from the point of view of behaviour under head impact if one of the following two conditions is met:
- 3.3.3.2.1. all the tests give satisfactory results;
- 3.3.3.2.2. one test having given an unsatisfactory result, a further series of tests carried out on a new set of test pieces gives satisfactory results.
4. MECHANICAL STRENGTH TEST
- 4.1. **Indices of difficulty, test method and interpretation of results:**
- the requirements set out in Annex II B, item 4 shall apply.
- 4.2. However, the third condition in Annex II B, item 4.3.4.1 does not apply.

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5. RESISTANCE TO THE ENVIRONMENT
 - 5.1. **Abrasion test**
 - 5.1.1. *Abrasion test on the external face*
 - 5.1.1.1. The requirements of Annex II B, item 5.1 shall apply.
 - 5.1.2. *Abrasion test on the internal face*
 - 5.1.2.1. The requirements of Annex II K, item 2 shall apply.
 - 5.2. **High-temperature test**

The requirements of Annex II A, item 5 shall apply.
 - 5.3. **Resistance to radiation test**

The requirements of Annex II A, item 6 shall apply.
 - 5.4. **Resistance to humidity test**

The requirements of Annex II A, item 7 shall apply.
 - 5.5. **Resistance to changes in temperature test**

The requirements of Annex II, item 8 shall apply.
6. OPTICAL QUALITY

The requirements set out in Annex II A, item 9 concerning optical qualities shall apply to each type of windscreen.
7. RESISTANCE TO FIRE

The requirements set out in Annex II A, item 10 shall apply.
8. RESISTANCE TO CHEMICALS

The requirements set out in Annex II A, item 11 shall apply.



ANNEX II E

GROUPING OF WINDSCREENS FOR EEC COMPONENT TYPE-APPROVAL TESTS

1. THE FEATURES TAKEN INTO ACCOUNT ARE:
 - 1.1. the developed area of the windscreen;
 - 1.2. the height of segment;
 - 1.3. the curvature.
2. A GROUP IS MADE UP OF A THICKNESS CLASS
3. CLASSIFICATION IS PERFORMED IN ASCENDING ORDER OF DEVELOPED AREAS

The five largest and the five smallest developed areas shall be selected, and shall be numbered as follows:

1 for the largest	1 for the smallest
2 for the next smallest after 1	2 for the next largest after 1
3 for the next smallest after 2	3 for the next largest after 2
4 for the next smallest after 3	4 for the next largest after 3
5 for the next smallest after 4	5 for the next largest after 4
4. WITHIN EACH OF THE TWO SERIES DEFINED IN ITEM 3 THE HEIGHTS OF SEGMENT SHALL BE INDICATED AS FOLLOWS:
 - 1 for the largest height of segment,
 - 2 for the next smallest,
 - 3 for the next smallest after the preceding value, etc.
5. IN EACH OF THE TWO SERIES DEFINED IN ITEM 3 THE RADII OF CURVATURE SHALL BE INDICATED AS FOLLOWS:
 - 1 for the smallest radius of curvature,
 - 2 for the next largest radius of curvature,
 - 3 for the radius of curvature next largest to the preceding radius, etc.
6. THE NUMBERS AWARDED TO EACH WINDSCREEN IN THE TWO SERIES DEFINED IN ITEM 3 ABOVE SHALL BE ADDED TOGETHER
 - 6.1. That windscreen among the five largest which has the smallest total and that windscreen among the five smallest which has the smallest total shall be selected for the full tests defined in Annex II B, II C, II D or II K.
 - 6.2. The other windscreens in the same series shall be tested to verify the optical quality defined in Annex II A, item 9.
7. A few windscreens having significantly different parameters of shape and/or radius of curvature from the extremes of the selected group may also be tested if the technical department conducting the tests considers that the parameters in question are likely to have appreciable adverse effects.
8. The limits of the group are determined by the developed area of the windscreens. Where a windscreen submitted for component type-approval for a given type has a developed area outside the approved limit and/or has a significantly greater height of segment or a significantly smaller radius of curvature, it shall be considered to be a new type and be subjected to additional tests if the technical

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- department deems such tests technically necessary, having regard to the information already in its possession concerning the product and the material used.
9. Should any other windscreen model subsequently be manufactured by the holder of a component type-approval in a thickness class already component type approved:
 - 9.1. it shall be ascertained whether that model can be included among the five largest or the five smallest selected for the component type approval of the group in question;
 - 9.2. renumbering shall be by the procedures defined in paragraphs 3, 4 and 5.
 - 9.3. if the sum of the numbers awarded to the windscreen newly incorporated among the five largest or five smallest windscreens:
 - 9.3.1. is found to be the smallest, the following tests shall be performed:
 - 9.3.1.1. in the cases of windscreens made of ordinary laminated glass or covered with plastic material or made of plastic-glass:
 - 9.3.1.1.1. headform impact;
 - 9.3.1.1.2. optical distortion;
 - 9.3.1.1.3. secondary-image separation;
 - 9.3.1.1.4. light transmission.
 - 9.3.1.2. Treated laminated glass windscreens: the tests specified in items 9.3.1.1.1, 9.3.1.1.2, 9.3.1.1.3 and 9.3.1.1.4 above and the fragmentation test in accordance with Annex II C, item 4.
 - 9.3.2. Where this is not the case those tests will be carried out which are intended to check the optical qualities defined in Annex II A, item 7.

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ANNEX II F

**PROCEDURE TO BE FOLLOWED IN ORDER TO DETERMINE THE
TEST ZONES ON WINDSCREENS OF CATEGORY M₁ VEHICLES IN
RELATION TO THE 'V' POINTS**

1. POSITION OF 'V' POINTS
- 1.1. Tables 1 and 2 show the position of the 'V' points in relation to the 'R' point (see Annex II G), as emerging from their coordinates XYZ in the three-dimensional reference system.
- 1.2. Table 1 contains the basic coordinates for an intended seat back rake angle of 25°. The positive direction of the coordinates is indicated in Figure 3 in this Annex.

TABLE 1

'V' point	X	Y	Z
V ₁	68 mm	- 5 mm	665 mm
V ₂	68 mm	- 5 mm	589 mm

- 1.3. **Correction for the intended back rest rake angles other than 25°**
- 1.3.1. Table 2 sets out the additional corrections to be made to coordinates X and Z for each 'V' point when the intended back rest rake angle differs from 25°. The positive direction of the coordinates is shown in Figure 3 in this Annex.

TABLE 2

Seat back rake angle (degrees)	Horizontal coordinates X	Vertical coordinates Z
5	- 186 mm	28 mm
6	- 176 mm	27 mm
7	- 167 mm	27 mm
8	- 157 mm	26 mm
9	- 147 mm	26 mm
10	- 137 mm	25 mm
11	- 128 mm	24 mm
12	- 118 mm	23 mm
13	- 109 mm	22 mm
14	- 99 mm	21 mm
15	- 90 mm	20 mm
16	- 81 mm	18 mm
17	- 71 mm	17 mm
18	- 62 mm	15 mm
19	- 53 mm	13 mm
20	- 44 mm	11 mm
21	- 35 mm	9 mm
22	- 26 mm	7 mm
23	- 17 mm	5 mm
24	- 9 mm	2 mm
25	0 mm	0 mm
26	9 mm	- 3 mm
27	17 mm	- 5 mm
28	26 mm	- 8 mm

▼B

Seat back rake angle (degrees)	Horizontal coordinates X	Vertical coordinates Z
29	34 mm	- 11 mm
30	43 mm	- 14 mm
31	51 mm	- 17 mm
32	59 mm	- 21 mm
33	67 mm	- 24 mm
34	76 mm	- 28 mm
35	84 mm	- 31 mm
36	92 mm	- 35 mm
37	100 mm	- 39 mm
38	107 mm	- 43 mm
39	115 mm	- 47 mm
40	123 mm	- 52 mm

2. TEST ZONES

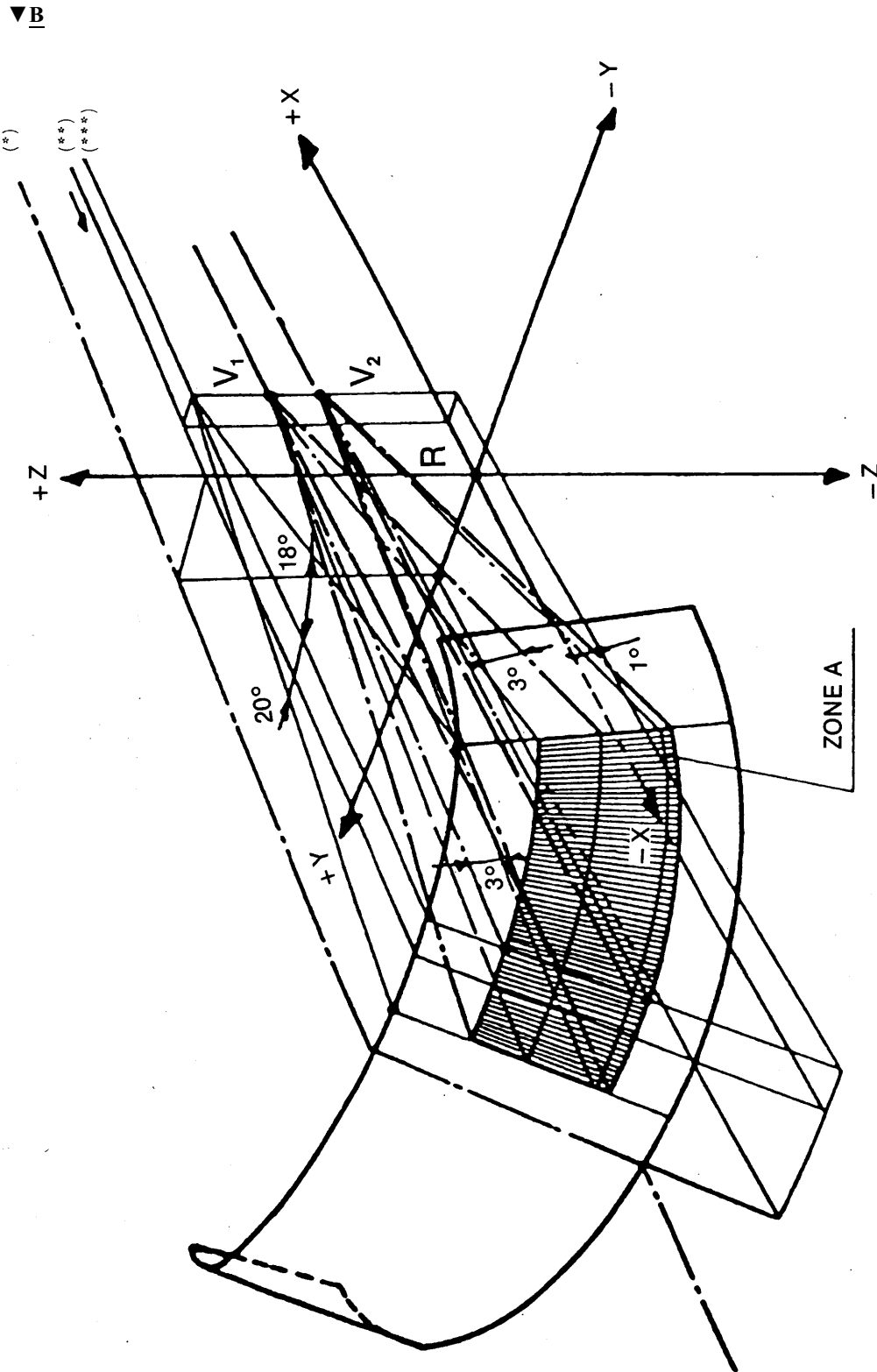
2.1. Two test zones are determined, starting from the 'V' points.

2.2. Test zone A is the zone on the outer apparent surface of the windscreen delimited by the four following planes projecting forwards from the 'V' points (see Figure 1).

- the vertical plane passing through V_1 and V_2 , making an angle of 13° with the X axis towards the left for vehicles with left-hand drive and towards the right for vehicles with right-hand drive,
- a plane parallel to the Y axis, passing through V_1 and forming an angle of 3° upwards with the X axis,
- a plane parallel to the Y axis, passing through V_2 and forming an angle of 1° downwards with the X axis,
- a vertical plane passing through V_1 and V_2 making an angle of 20° with the X axis towards the right in the case of left-hand drive vehicles and towards the left in the case of right-hand drive vehicles.

2.3. Test zone B is the zone on the outer surface of the windscreen situated more than 25 mm from the side edge of the transparent surface and delimited by the intersection of the outer surface of the windscreen with the four following planes (see Figure 2):

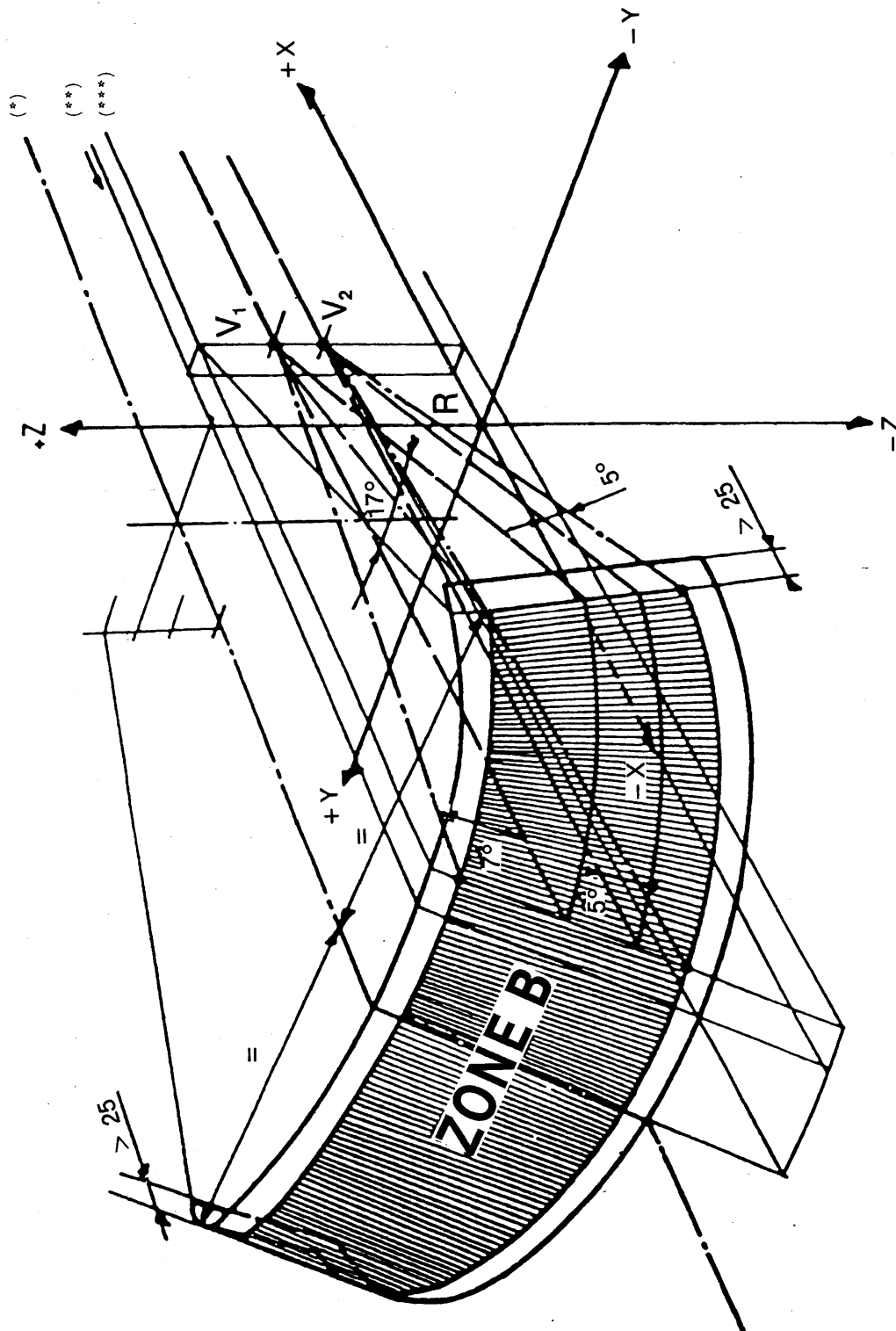
- a plane pointing 7° upwards in relation to the X axis, passing through V_1 and parallel to the Y axis,
- a plane pointing 5° downwards in relation to the X axis, passing through V_2 and parallel to the Y axis,
- a vertical plane passing through V_1 and V_2 , forming an angle of 17° with the X axis towards the left in the case of left-hand drive vehicles and towards the right in the case of right-hand drive vehicles,
- a plane symmetrical to that above in relation to the median longitudinal plane of the vehicle.



- (*) Trace of the longitudinal plane of symmetry of the vehicle.
- (**) Trace of the vertical plane passing through R.
- (***) Trace of the vertical plane passing through V₁ and V₂.

Figure 1
 Test zone A (example of a left-hand drive vehicle)

▼B



- (*) Trace of the longitudinal plane of symmetry of the vehicle.
- (**) Trace of the longitudinal plane passing through R.
- (***) Trace of the longitudinal plane passing through V₁ and V₂.

Figure 2

Test zone B (example of a left-hand drive vehicle)

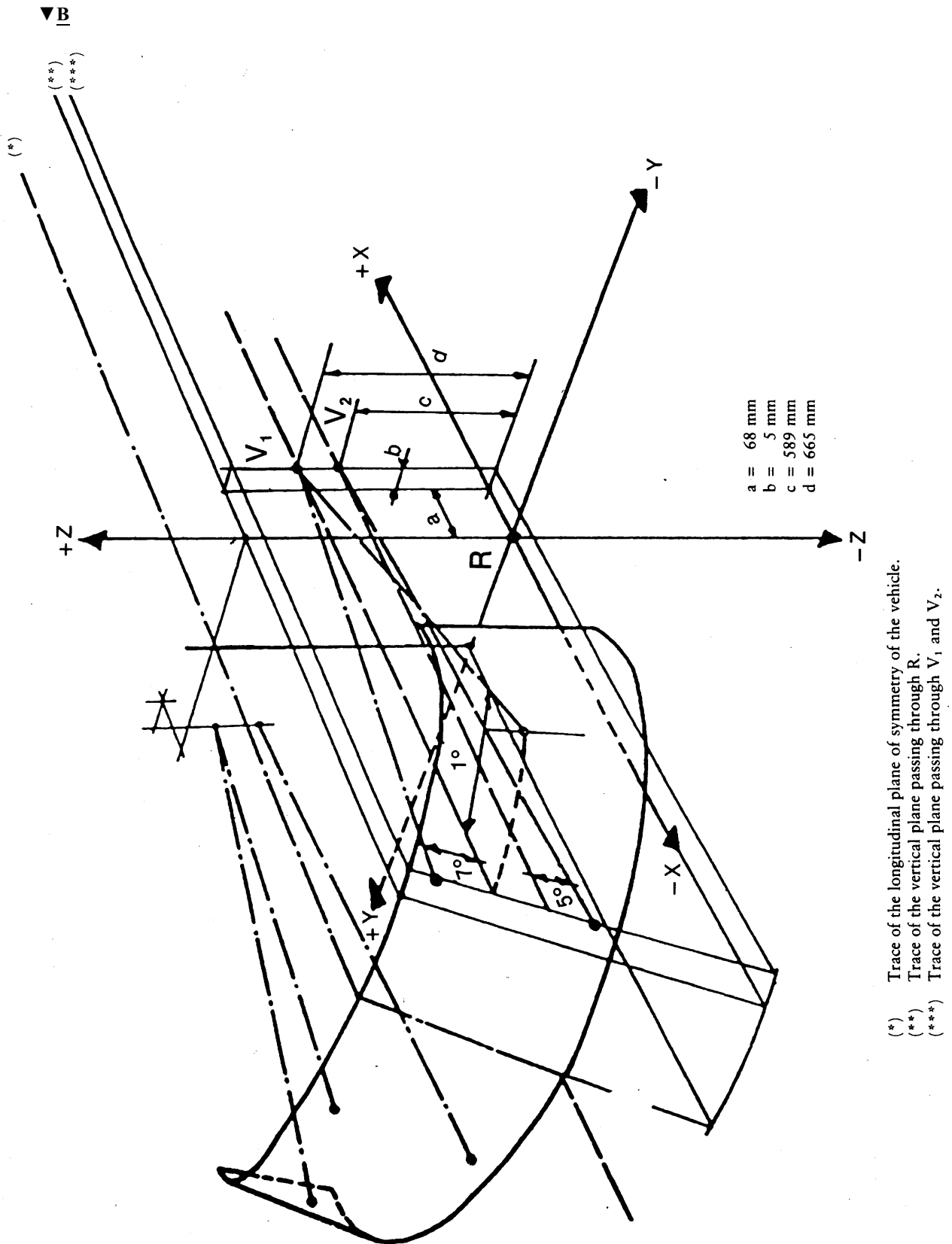


Figure 3

Determination of the 'V' points for a back rest angle of 25° (example of a left-hand drive vehicle)

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ANNEX II G

**PROCEDURE FOR DETERMINATION OF THE 'H' POINT AND OF
THE TRUE TORSO ANGLE FOR THE SEATING POSITIONS OF
MOTOR VEHICLES**

See Annex III to Directive 77/649/EEC⁽¹⁾, as amended by Directive 90/630/EEC⁽²⁾

⁽¹⁾ OJ No L 267, 19. 10. 1977, p. 1.
⁽²⁾ OJ No L 341, 6. 12. 1990, p. 20.



ANNEX II H

UNIFORMLY TOUGHENED GLAZING

1. DEFINITION OF TYPE

Uniformly toughened glazing shall be deemed to belong to different types if it differs in at least one of the following principal or secondary characteristics.

1.1. **The principal characteristics are as follows:**

- 1.1.1. the trade name or mark;
- 1.1.2. the nature of the toughening process (thermal or chemical);
- 1.1.3. the shape category; a distinction is made between two categories:
 - 1.1.3.1. flat glass panes;
 - 1.1.3.2. flat and curved glass panes.
- 1.1.4. The thickness category to which the nominal thickness 'e' lies, a manufacturing tolerance of $\pm 0,2$ mm being allowed:

Category I: $e \leq 3,5$ mm,

Category II: $3,5 \text{ mm} < e \leq 6,5$ mm,

Category III: $4,5 \text{ mm} < e \leq 6,5$ mm,

Category IV: $6,5 \text{ mm} < e$.

1.2. **The secondary characteristics are as follows:**

- 1.2.1. nature of the material (polished glass, float glass, sheet glass);
- 1.2.2. colouring (colourless or tinted);
- 1.2.3. the incorporation or otherwise of conductors.

2. FRAGMENTATION TEST

2.1. **Indices of difficulty of the secondary characteristics:**

Material	Index of difficulty
Polished glass	2
Float glass	1
Sheet glass	1

No other secondary characteristics are involved.

2.2. **Selection of samples**

- 2.2.1. Samples of each shape category and of each thickness category that is difficult to produce shall be selected for testing in accordance with the following criteria:
 - 2.2.1.1. in the case of flat glass panes two sets of samples shall be supplied, corresponding to:
 - 2.2.1.1.1. the largest area developed;
 - 2.2.1.1.2. the smallest angle between two adjacent sides.
 - 2.2.1.2. In the case of flat and curved glass panes three sets of samples shall be supplied, corresponding to:
 - 2.2.1.2.1. the largest developed area;
 - 2.2.1.2.2. the smallest angle between two adjacent sides;
 - 2.2.1.2.3. the largest height of segment.

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- 2.2.2. Tests conducted on samples corresponding to the largest area 's' shall be deemed to be applicable to any other area smaller than S + 5 %.
- 2.2.3. If the samples submitted have an angle γ of less than 30°, the tests shall be deemed to be applicable to all panes manufactured having an angle greater than $\gamma - 5^\circ$.
- If the samples submitted have an angle γ of not less than 30° the tests shall be deemed to be applicable to all panes manufactured having an angle of not less than 30°.
- 2.2.4. If the height of segment 'h' of the samples submitted is greater than 100 mm, the test shall be deemed to be applicable to all panes manufactured having a height of segment less than h + 30 mm.
- If the height of segment of the samples submitted is not less than 100 mm, the tests shall be deemed to be applicable for all panes manufactured having a height of segment not exceeding 100 mm.

2.3. **Number of samples per set**

The number of samples in each group shall be as follows, according to the shape category defined in item 1.1.3 above:

Kind of glass plane	Number of samples
Flat (2 sets)	4
Flat and curved (3 sets)	5

2.4. **Test method**

- 2.4.1. The method used shall be that described in item 1 in Annex II A.

2.5. **Points of impact (see Annex II and Figure 2).**

- 2.5.1. For flat and curved glass panes the points of impact represented respectively in Figures 2 (a), (b), (c) in Annex II M shall be as follows:
- Point 1: 3 cm from the edges of the pane in the part where the radius of curvature of the edge is smallest;
- Point 2: 3 cm from the edge on one of the medians, the side of the glass plane bearing tong marks (if any) being selected;
- Point 3: at the geometric centre of the glass;
- Point 4: for curved glass panes only; this point shall be selected on the longest median in the part of the pane where the radius of curvature is the smallest.

- 2.5.2. Only one test shall be carried out at each prescribed point of impact.

2.6. **Interpretation of results**

- 2.6.1. A test shall be deemed to have given a satisfactory result if the fragmentation satisfies the following conditions:
- 2.6.1.1. the number of fragments in any 5 × 5 cm² is not less than 40 nor more than 400, of 450 in the case of glazing not more than 3,5 mm thick;
- 2.6.1.2. for the purposes of the above rule, fragments extending across a side of a square shall count as half fragments;
- 2.6.1.3. fragmentation shall not be checked in a strip 2 cm wide around the edge of the samples, this strip representing the frame of the glass, nor within a radius of 7,5 cm around the point of impact;
- 2.6.1.4. fragments of an area exceeding 3 cm² shall not be allowed, except in the parts defined in item 2.6.1.3;
- 2.6.1.5. a few fragments of elongated shape shall be allowed, provided that:
- their ends are not knife-edged,
 - where they extend to the edge of the pane they do not form an angle of more than 45° with it, and

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- if, unless item 2.6.2.2 above applies, they are not more than 7,5 cm long.
- 2.6.2. A set of samples submitted for component type-approval shall be considered satisfactory from the point of view of fragmentation if at least one of the following conditions is fulfilled:
- 2.6.2.1. all of the tests carried out using the points of impact prescribed in item 2.5.1 have given a satisfactory result;
- 2.6.2.2. one test, among all the tests carried out using the points of impact defined in item 2.5.1 exhibits deviations which are unsatisfactory but do not meet the limits set out below:
- up to a maximum of eight fragments between 6 and 7,5 cm long,
- up to a maximum of four fragments between 7,5 and 10 cm long,
- and is repeated on a new sample complying with item 2.6.1 or exhibiting deviations within the above limits;
- 2.6.2.3. two tests among all of the tests carried out using the points of impact defined in item 2.5.1 exhibit deviations which are unsatisfactory but do not exceed the limits set out in item 2.6.2.2, but a further series of tests carried out on a new set of samples complies with item 2.6.1, or not more than two samples of the new set exhibit deviations within the limits laid down in item 2.6.2.2.
- 2.6.3. Any deviations as referred to above shall be mentioned in the report, and photographs of the effective parts of the pane concerned shall be attached.

3. MECHANICAL STRENGTH

3.1. Impact test with a 227 g ball

3.1.1. Indices of difficulty of the secondary characteristics

Material	Index of difficulty	Colouring	Index of difficulty
Polished glass	2	Colourless	1
Float glass	1	Tinted	2
Plate glass	1		

The other secondary characteristic (presence or absence of conductors) is not involved.

3.1.2. *Number of test pieces*

Six test pieces shall be subjected to testing for each thickness category as defined in item 1.1.4 above.

3.1.3. *Test methods*

3.1.3.1. The test method used shall be that described in Annex II A, item 2.1.

3.1.3.2. The height of drop (from the underface of the ball to the upper surface of the test piece) shall be as indicated in the following table, according to the thickness of the glass pane:

Nominal thickness of glass pane (e)	Height of drop
$e \leq 3,5$ mm	2,0 m + 5/ - 0 mm
3,5 mm < e	2,5 m + 5/ - 0 mm

3.1.4. *Interpretation of results*

3.1.4.1. The test shall be deemed to have given a satisfactory result if the test piece does not break.

3.1.4.2. A series of test pieces submitted for component type-approval shall be considered satisfactory from the point of view of mechanical strength if at least one of the following conditions is fulfilled:

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- 3.1.4.2.1. not more than one test has given an unsatisfactory result;
 - 3.1.4.2.2. two tests having given unsatisfactory results, a further series of tests carried out on a new set of six test pieces gives satisfactory results.
4. OPTICAL QUALITIES
- 4.1. The requirements set out in Annex II a, item 9.1, on the coefficient of regular light transmission shall apply. Glazing materials whose regular light transmission factor is less than 70 % must be marked with the supplementary symbol provided for in item 4.5.2 of Annex II.



ANNEX II I

LAMINATED GLAZING OTHER THAN WINDSCREENS

1. DEFINITION OF TYPE

Panes of laminated glass 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. The trade name or mark;
 - 1.1.2. the glass thickness category in which the nominal thickness 'e' lies, a manufacturing tolerance of $\pm 0,2 n$ mm being allowed, where n is the number of layers of glass in the pane.

Category I: $< e \leq 5,5$ mm
 Category II: $5,5 \text{ mm} < e \leq 6,5$ mm
 Category III: $6,5 \text{ mm} < e$
 - 1.1.3. the nominal thickness of the interlayer or interlayers;
 - 1.1.4. the nature and type of the interlayer or interlayers (e.g. PVB or other plastic interlayers);
 - 1.1.5. any special treatment which one of the layers of glass may have undergone.
 - 1.2. **The secondary characteristics are as follows:**
 - 1.2.1. the nature of the material (polished glass, float glass, sheet glass);
 - 1.2.2. the colouring (total or partial) of the interlayer (colourless or tinted);
 - 1.2.3. the colouring of the glass (colourless or tinted).
2. GENERAL
 - 2.1. In the case of panes of laminated glass other than windscreens the tests shall be conducted on flat test pieces which are either cut from actual glass panes or are specially made. In either case the test pieces shall be in all respects rigorously representative of the glass panes for the production of which component type-approval is requested.
 - 2.2. Before each test the test pieces of laminated glass shall be stored for at least four hours at a temperature of $23 \text{ }^\circ\text{C} \pm 2 \text{ }^\circ\text{C}$. The test shall be performed on the test pieces as soon as these have been taken out of the receptacle in which they were stored.
 - 2.3. Panes of glass submitted for component type-approval will be deemed to have fulfilled the requirements of this Annex if they have the same composition as a windscreen that has already been component type approved in accordance with the provisions of Annex II B, Annex II C or Annex II K.
3. HEADFORM TESTS
 - 3.1. **Indices of difficulty of the secondary characteristics**

No secondary characteristics are involved.
 - 3.2. **Number of test pieces**

Six flat test pieces measuring $1\ 100 \text{ mm} \times 500 \text{ mm}$ ($+ 25 \text{ mm}/ - 0 \text{ mm}$) shall be subjected to testing.
 - 3.3. **Test method**
 - 3.3.1. The method used shall be that described in Annex II A, item 3.
 - 3.3.2. The height of drop shall be $1,50 \text{ mm} + 0/ - 5 \text{ mm}$.

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- 3.4. **Interpretation of results**
- 3.4.1. This test shall be deemed to have given satisfactory results if the following conditions are fulfilled:
- 3.4.1.1. the test piece yields and breaks, displaying numerous circular cracks centred approximately on the point of impact;
- 3.4.1.2. tears in the interlayer are allowed but the manikin's head must not pass through;
- 3.4.1.3. no large fragments of glass shall become detached from the interlayer.
- 3.4.2. A set of test pieces subjected to testing shall be considered satisfactory from the point of view of behaviour under head impact if one of the following two conditions is met:
- 3.4.2.1. all the tests give satisfactory results; or
- 3.4.2.2. one test having given an unsatisfactory result, a further series of tests carried out on a new set of test pieces gives satisfactory results.

4. **MECHANICAL STRENGTH, 227 G BALL-IMPACT TEST**

4.1. **Indices of difficulty of the secondary characteristics**

No secondary characteristics are involved.

4.2. **Number of test pieces**

Four flat square test pieces measuring 300×300 mm (+ 10/ - 0 mm) on each side shall be subjected to testing.

4.3. **Test method**

- 4.3.1. The method used shall be that described in Annex II A, item 2.1.
- 4.3.2. The height of drop (from the underface of the ball to the upper face of the test piece) shall be as indicated in the following table as a function of nominal thickness:

Nominal thickness	Height of drop
$e \leq 5,5$ mm	5 m
$5,5 \text{ mm} \leq e \leq 6,5$ mm	6 m
$6,5 \text{ mm} \leq e$	7 m

} + 25/ - 0 mm

4.4. **Interpretation of results**

- 4.4.1. The ball impact test shall be deemed to have given a satisfactory result if the following conditions are fulfilled:
- the ball does not pass through the test piece,
 - the test piece does not break into several pieces,
 - the total weight of the few fragments which may be produced on the side opposite to the point of impact does not exceed 15 g.
- 4.4.2. A set of test pieces subjected to testing shall be considered satisfactory from the point of view of mechanical strength if one of the following conditions is met:
- 4.4.2.1. all the tests have given a satisfactory result;
- 4.4.2.2. not more than two tests having given an unsatisfactory result, a further series of tests carried out on a new set of test pieces gives satisfactory results.

5. **RESISTANCE TO THE ENVIRONMENT**

5.1. **Abrasion test**

5.1.1. *Indices of difficulty in test method*

The requirements of Annex II A, item 4, shall apply and the test shall last for 1 000 cycles.

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- 5.1.2. *Interpretation of results*
- A pane of safety glass shall be considered satisfactory from the point of view of abrasion resistance if the light scattered as a result of abrasion of the test piece does not exceed 2 %.
- 5.2. **High temperature test**
- The requirements of Annex II A, item 5, shall apply.
- 5.3. **Resistance-to-radiation test**
- 5.3.1. *General requirements*
- This test is to be conducted only if the laboratory deems it useful in the light of the information in its possession concerning the inter-layer.
- 5.3.2. The requirements of Annex II A, item 6, shall apply.
- 5.4. **Resistance-to-humidity test**
- The requirements of Annex II A, item 7, shall apply.
6. **OPTICAL QUALITIES**
- The requirements concerning the regular light transmission factor set out in Annex II A, item 9.1, shall apply. Glazing materials whose regular light transmission factor is less than 70 % must be marked with the supplementary symbol provided for in item 4.5.2 of Annex II.

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ANNEX II J

PLASTIC GLAZING OTHER THAN WINDSCREENS

1. DEFINITION OF TYPE

Plastic glazing other than windscreens shall be deemed to belong to different types if it differs in at least one of the following principal or secondary characteristics.

 - 1.1. **The principal characteristics are as follows:**
 - 1.1.1. the trade name or mark;
 - 1.1.2. the thickness category in which the nominal thickness 'e' lies (a manufacturing tolerance of $\pm 0,2$ mm being allowed):
 - Category I: $e \leq 3,5$ mm
 - Category II: $3,5 \text{ mm} < e \leq 4,5$ mm
 - Category III: $4,5 \text{ mm} < e$
 - 1.1.3. the nominal thickness of the plastic interlayer sheet or sheets;
 - 1.1.4. the nominal thickness of the pane;
 - 1.1.5. the type of plastic interlayer sheet or sheets (e.g. PVB or other plastics material) and of the plastic sheet on the inside face;
 - 1.1.6. any special treatment which the glass sheet may have undergone.
 - 1.2. **The secondary characteristics are as follows:**
 - 1.2.1. the nature of the material (polished glass, float glass, sheet glass);
 - 1.2.2. the colouring (total or partial) of the plastic interlayer sheet or sheets (colourless or tinted);
 - 1.2.3. the colouring of the glass (colourless or tinted).
2. GENERAL
 - 2.1. In the case of plastic glazing other than windscreens the tests shall be conducted on flat test pieces which are either cut from actual glass panes or are specially made. In either case the test pieces shall in all respects be rigorously representative of the production glass panes for which component type-approval is sought.
 - 2.2. Before each test the plastic glazing test pieces shall be stored for not less than four hours at a temperature of 23 ± 2 °C. The tests shall be performed as soon as the test pieces have been taken out of the receptacle in which they were stored.
 - 2.3. The glazing presented for component type-approval shall be deemed to comply with the provisions of this Annex if it has the same composition as a windscreen already approved in accordance with the provisions of Annex II D.
3. HEADFORM TEST
 - 3.1. **Indices of difficulty of the secondary characteristics**

No secondary characteristics are involved.
 - 3.2. **Number of test pieces**

Six flat test pieces measuring $1\ 100 \times 500$ mm (+ 5/ - 2 mm) shall be subjected to testing.
 - 3.3. **Test method**
 - 3.3.1. The method used shall be that described in Annex II A, item 3.
 - 3.3.2. The height of drop shall be $1,5 + 0/ - 5$ mm.

▼B**3.4. Interpretation of results**

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

3.4.1.1. the glass sheet breaks, displaying numerous cracks;

3.4.1.2. tears in the interlayer are allowed but the dummy's head must not pass through;

3.4.1.3. no large fragments of glass shall become detached from the interlayer.

3.4.2. A series of test pieces subjected to component type-approval testing shall be considered satisfactory from the point of view of behaviour under head impact if one of the following two conditions is met:

3.4.2.1. all the tests give satisfactory results; or

3.4.2.2. one test having given an unsatisfactory result, a further series of tests carried out on a new set of test pieces gives satisfactory results.

4. MECHANICAL STRENGTH — 227 G BALL IMPACT TEST

4.1. The requirements of Annex II I, item 4, shall be applicable with the exception of the table in item 4.3.2, which must be replaced by the following:

Nominal thickness	Height of drop	
$e \leq 3,5 \text{ mm}$	5 m	} + 25/ - 0 mm
$3,5 \text{ mm} \leq e \leq 4,5 \text{ mm}$	6 m	
$e > 4,5 \text{ mm}$	7 m	

4.2. However, the requirements set out in Annex II I, item 4.4.1.2, shall not apply.

5. RESISTANCE TO THE ENVIRONMENT TESTS**5.1. Abrasion test**

5.1.1. *Abrasion test of the external face*

The requirements of Annex II I, item 5.1 shall apply.

5.1.2. *Abrasion test of the internal face*

The requirements of Annex II K, item 2.1 shall apply.

5.2. High-temperature test

The requirements of Annex II A, item 5, shall apply.

5.3. Resistance-to-radiation test

The requirements of Annex II A, item 6, shall apply.

5.4. Resistance-to-humidity test

The requirements of Annex II A, item 7, shall apply.

5.5. Temperature-change test

The provisions of Annex II A, item 8, shall apply.

6. OPTICAL QUALITIES

The requirements set out in Annex II A, item 9.1, on the regular light transmission factor shall apply. Glazing materials whose regular light transmission factor is less than 70 % must be marked with the supplementary symbol provided for in item 4.5.2 of Annex II.

7. FIRE RESISTANCE TEST

The requirements of Annex II A, item 10, shall apply.

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8. RESISTANCE-TO-CHEMICAL AGENTS TEST

The requirements set out in Annex II A, item 11, shall apply.

▼B*ANNEX II K***PLASTIC-COATED SAFETY GLAZING****(on the inner surface)**

1. DEFINITION OF TYPE
Safety-glazing materials as defined in Annexes II B, II C, II H and II I, if coated on their inner face with a layer of plastic material, shall conform with the following requirements, which are additional to those in the appropriate Annexes.
2. ABRASION TEST
 - 2.1. **Indices of difficulty and test methods**
The plastic coating shall be subjected to a test in accordance with Annex II A, item 4, which shall last for 100 cycles.
 - 2.2. **Interpretation of results**
The plastic coating shall be considered satisfactory from the point of view of abrasion resistance if the light scattered as a result of abrasion of the test piece does not exceed 4 %.
3. RESISTANCE-TO-HUMIDITY TEST
 - 3.1. In the case of plastic-coated toughened safety glazing a resistance-to-humidity test shall be performed.
 - 3.2. The requirements of Annex II A, item 7, shall apply.
4. TEST OF RESISTANCE TO TEMPERATURE CHANGE
The requirements of Annex II A, item 8, shall apply.
5. TEST OF RESISTANCE TO FIRE
The requirements of Annex II A, item 10, shall apply.
6. TEST OF RESISTANCE TO CHEMICALS
The requirements of Annex II A, item 11, shall apply.



ANNEX II L

DOUBLE GLAZING

1. DEFINITION OF TYPE

Double glazing shall be deemed to belong to different types if it differs in at least one of the following principal or secondary characteristics.

 - 1.1. **The principal characteristics are:**
 - 1.1.1. the trade name or mark;
 - 1.1.2. the composition of the double glazing (symmetrical, asymmetrical);
 - 1.1.3. the type of each of the component panes, as defined in item 1 in Annexes II H, II I or II J;
 - 1.1.4. the nominal thickness of the gap between the two panes;
 - 1.1.5. the type of bonding (organic, glass-glass or glass-metal).
 - 1.2. **The secondary characteristics are as follows:**
 - 1.2.1. the secondary characteristics of each of the component panes, as defined in item 1.2 in Annexes II H, II I and II J.
2. GENERAL
 - 2.1. Each of the component panes of double glazing must be either component type-approved or subject to the requirements of the Annex (II H, II I or II J) applying to it.
 - 2.2. Tests conducted on double glazing with a nominal gap thickness 'e' shall be deemed to be applicable to all double glazing with the same characteristics and a nominal gap thickness of $e \pm 3$ mm. However, applicants may submit for component type-approval the sample with the smallest gap and the one with the largest gap.
 - 2.3. In the case of double glazing with at least one pane of laminated or plastics glazing, the test pieces shall be stored for not less than four hours before testing at a temperature of 23 ± 2 °C. The tests shall be performed as soon as the test pieces have been taken out of the receptacle in which they were stored.
3. HEADFORM TESTS
 - 3.1. **Index of difficulty of the secondary characteristics**

No secondary characteristics are involved.
 - 3.2. **Number of test pieces**

Six test pieces measuring $1\ 100 \times 500$ mm + 5/ - 2 mm shall be subjected to testing for each thickness category of the component panes and each gap thickness as defined in item 1.1.4, above.
 - 3.3. **Test method**
 - 3.3.1. The method used shall be that described in Annex II A, item 3.
 - 3.3.2. The height of drop shall be $1,50$ m + 0/ - 5 mm.
 - 3.3.3. In the case of an asymmetrical double-glazing unit three tests shall be performed on one surface and two tests on the other.
 - 3.4. **Interpretation of results**
 - 3.4.1. Double glazing comprising two panes of uniformly toughened glass:

the headform test shall be deemed to have given a satisfactory result if both components break.
 - 3.4.2. Double glazing comprising panes of laminated and/or plastic glass panes other than windscreens:

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

- 3.4.2.1. both components of the test piece yield and break, displaying numerous circular cracks centred approximately on the point of impact;
- 3.4.2.2. tears in the interlayer or interlayers are allowed but the dummy's head must not pass through;
- 3.4.2.3. no large fragments of glass shall become detached from the interlayer.
- 3.4.3. Double glazing comprising one pane of uniformly toughened glass and one pane of laminated glass or plastic-glass other than wind-screens:
 - 3.4.3.1. the toughened glass pane breaks;
 - 3.4.3.2. the laminated glass pane or the plastic-glass pane yields and breaks, displaying numerous circular cracks centred approximately on the point of impact;
 - 3.4.3.3. tears in the interlayer or interlayers are allowed but the manikin's head must not pass through;
 - 3.4.3.4. no large fragments of glass shall become detached from the interlayer.
- 3.4.4. A set of samples submitted for component type-approval shall be considered satisfactory from the point of view of behaviour under impact of the head if either of the following conditions is fulfilled:
 - 3.4.4.1. all the tests have given a satisfactory result;
 - 3.4.4.2. one test having given an unsatisfactory result, a further series of tests carried out on a new set of samples has given satisfactory results.

4. OPTICAL QUALITIES

The requirements set out in Annex II A, item 9.1, concerning the regular light transmission factor shall apply. Glazing materials whose regular light transmission factor is less than 70 % must be marked with the supplementary symbol provided for in item 4.5.2 of Annex II.

▼B

ANNEX II M

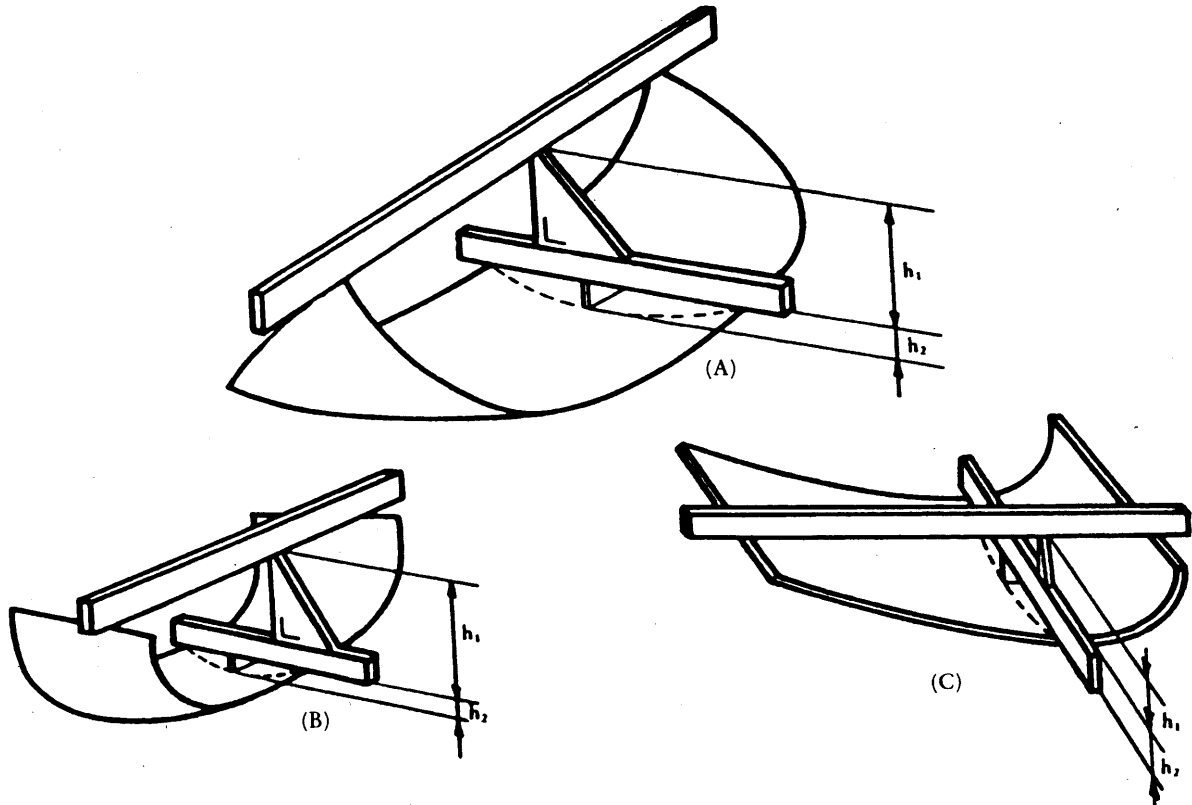
MEASUREMENTS OF SEGMENT HEIGHTS AND POSITION OF
IMPACT POINTS

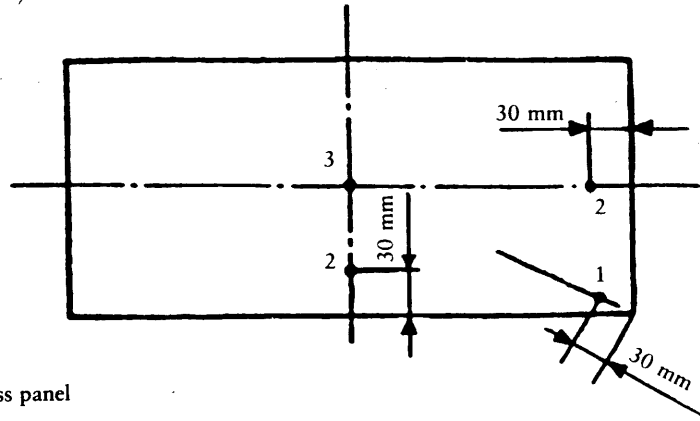
Figure 1

Determination of height of segment 'h'

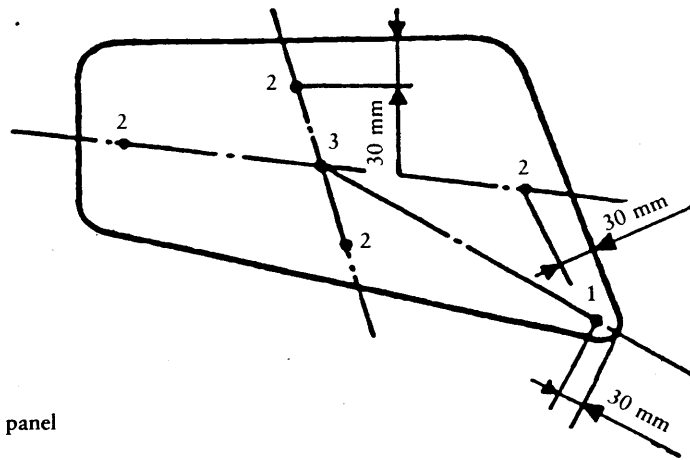
For a glass pane with a single curve, the height of segment will be h_1 maximum

For a glass pane with a double curve, the height of segment will be h_1 maximum
+ h_2 maximum.

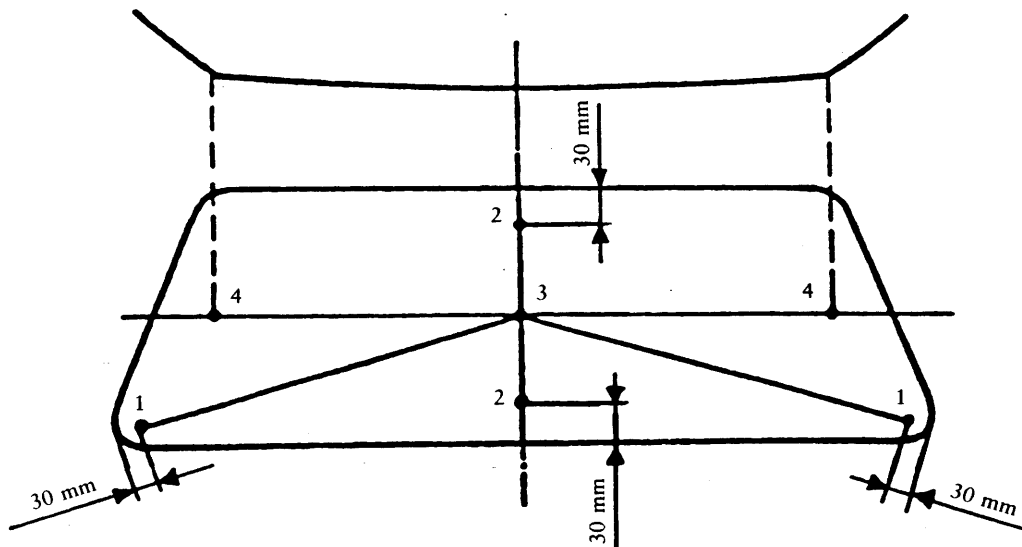
▼B



2 (a) Flat glass panel



2 (b) Flat glass panel



2 (c) Curved glass panel

Figure 2 (a), (b) and (c)

Prescribed points of impact for panes of uniformly toughened glass

The points '2' shown in figure 2 (a), (b) and (c) are examples of the sites for point '2' prescribed in Annex II H, item 2.5.

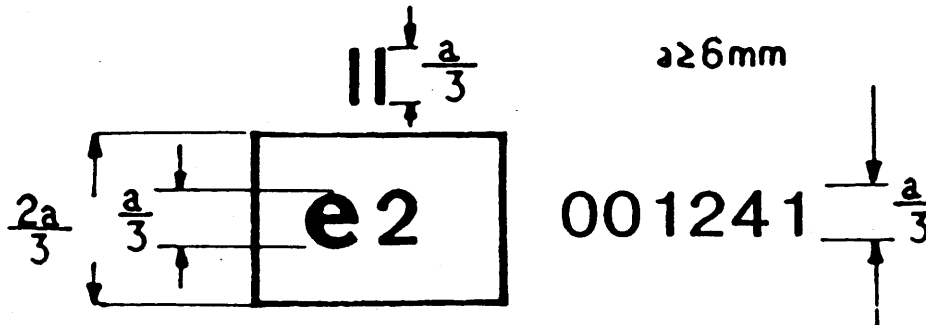
▼B

ANNEX II N

EXAMPLES OF EEC COMPONENT TYPE-APPROVAL MARKS

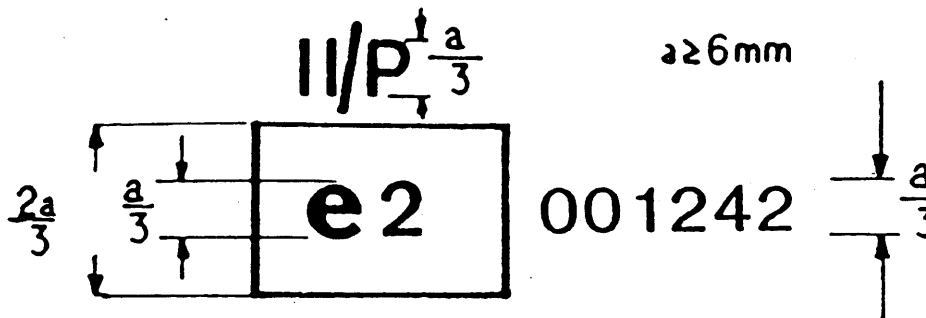
(see item 4.7 in Annex II)

Ordinary toughened-glass windscreen:



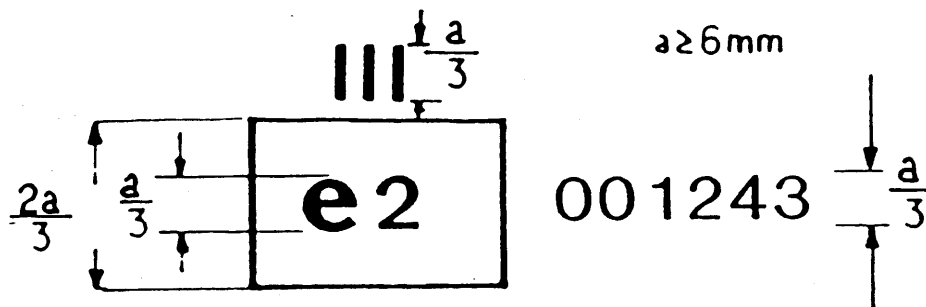
The above component type-approval mark, affixed to an ordinary toughened-glass windscreen, shows that the component concerned was approved in France (e2) pursuant to this Directive under component type-approval No 001241.

Toughened-glass windcreens faced with plastic material:



The above component type-approval mark affixed to an ordinary toughened-glass windscreen faced with plastic material shows that the component concerned was approved in France (e2) pursuant to this Directive under component type-approval No 001242.

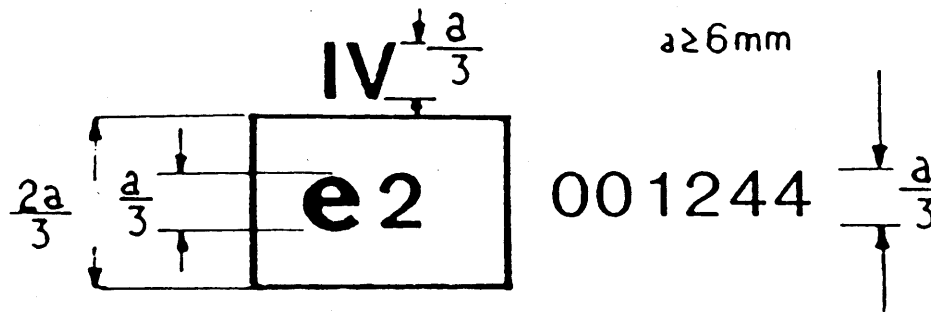
Treated laminated-glass windcreens:



The above component type-approval mark affixed to a treated laminated-glass windscreen shows that the component concerned was approved in France (e2) pursuant to this Directive under component type-approval No 001243.

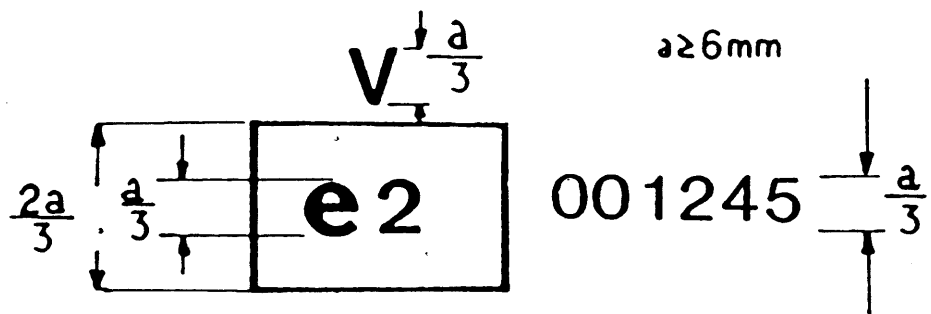
▼B

Glass-plastic windscreens:



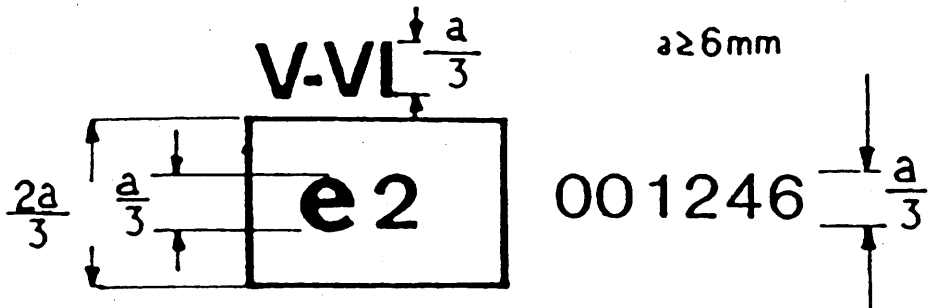
The above component type-approval mark affixed to a treated glass-plastic windscreen shows that the component concerned was approved in France (e2) pursuant to this Directive under component type-approval No 001244.

Glass panes other than windscreen having a regular light transmittance of less than 70 %:



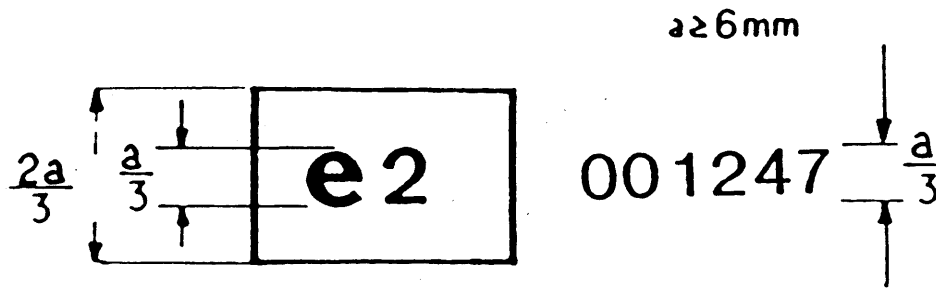
The above component type-approval mark affixed to a glass pane other than windscreen to which the requirements of Annex II A, item 9.1.4.2, are applicable shows that the component concerned was approved in France (e2) pursuant to this Directive under component type-approval No 001245.

Double-glazed unit having a regular light transmittance of less than 70 %:



The above component type-approval mark affixed to a double-glazed unit shows that the component concerned was approved in France (e2) pursuant to this Directive under component type-approval No 001246.

Glass panes other than windscreens having a regular light transmittance of 70 % or more:

▼B

The above component type-approval mark affixed to a glass pane other than windscreen to which the requirements of Annex II A, item 9.1.4.1, are applicable shows that the component concerned was approved in France (e2) pursuant to this Directive under component type-approval No 001247.



ANNEX II O

CHECKS ON CONFORMITY OF PRODUCTION

1. DEFINITIONS

For the purposes of this Annex:

- 1.1. *type of product* means all glass panes having the same principal characteristics;
- 1.2. *thickness class* means all glass panes having the same thickness of component parts within the permitted tolerances;
- 1.3. *production unit* means all production facilities of one or several types of glass pane established in the same place; it may include several production lines;
- 1.4. *shift* means a period of production carried out by the same production line during daily working hours;
- 1.5. *production run* means a continuous period of production of the same type of product by the same production line;
- 1.6. *ps* means the number of glass panes of the same type of product by the same shift;
- 1.7. *pi* means the number of glass panes of the same type of product produced during a production run.

2. TESTS

The glass panes shall be submitted to the following tests

2.1. **Uniformly toughened glass panes**

- 2.1.1. Fragmentation test in accordance with the requirements of Annex II H, item 2.
- 2.1.2. Light transmission measurement in accordance with the requirements of Annex II A, item 9.1.

2.2. **Ordinary laminated-glass and glass-plastic windscreens**

- 2.2.1. Head impact test in accordance with the requirements of Annex II B, item 3.
- 2.2.2. 2 260 g ball impact test in accordance with the requirements of Annex II B, item 4.2, and Annex II A, item 2.2.
- 2.2.3. High-temperature test in accordance with the requirements of Annex II A, item 5.
- 2.2.4. Light transmission measurement in accordance with the requirements of Annex II A, item 9.1.
- 2.2.5. Optical distortion test in accordance with the requirements of Annex II A, item 9.2.
- 2.2.6. Secondary image separation test in accordance with the requirements of Annex II A, item 9.3.
- 2.2.7. For plastic-glass windscreens only:
 - 2.2.7.1. abrasion test in accordance with the requirements of Annex II K, item 2.1;
 - 2.2.7.2. resistance-to-humidity test in accordance with the requirements of Annex II K, item 3;
 - 2.2.7.3. resistance-to-chemicals test in accordance with the requirements of Annex II A, item 11.

2.3. **Panes of ordinary laminated glass and plastic-glass other than windscreens**

- 2.3.1. 227 g ball impact test in accordance with the requirements of Annex II I, item 4.
- 2.3.2. High-temperature resistance test in accordance with the requirements of Annex II A, item 5.

▼B

- 2.3.3. Measurement of light transmission in accordance with the requirements of Annex II A, item 9.1.
- 2.3.4. Solely in the case of plastic-glass panes:
- 2.3.4.1. abrasion tests in accordance with the requirements of Annex II K, item 2.1;
- 2.3.4.2. resistance-to-humidity test in accordance with the requirements of Annex II K, item 3;
- 2.3.4.3. resistance-to-chemicals test in accordance with the requirements of Annex II A, item 11.
- 2.3.5. The above conditions shall be considered to have been met if the corresponding tests have been carried out on a windscreen of the same composition.

2.4. Treated laminated-glass windscreens

- 2.4.1. In addition to the tests provided for in item 2.2 above in this Annex, a fragmentation test will be conducted in accordance with the requirements of Annex II C, item 4.

2.5. Plastic-faced glazing

In addition to the tests described in the various paragraphs of this Annex, the following tests shall be carried out:

- 2.5.1. abrasion test in accordance with the requirements of Annex II K, item 2.1;
- 2.5.2. resistance-to-humidity test in accordance with the requirements of Annex II K, item 3;
- 2.5.3. resistance-to-chemicals test in accordance with the requirements of Annex II A, item 11.

2.6. Double glazing

The tests to be carried out shall be those described in this Annex for each of the panes in the double glazing, with the same frequency and the same requirements.

3. FREQUENCY AND RESULTS OF TESTS**3.1. Fragmentation****3.1.1. Tests**

- 3.1.1.1. A first series of tests consisting of a break at each impact point specified by this Directive shall be carried out with photographic prints at the beginning of the production of each new type of glass pane to determine the most severe break point.
- 3.1.1.2. During the production run the check test shall be carried out using the break point determined in item 3.1.1.1.
- 3.1.1.3. A check test shall be carried out at the beginning of each production run or following a change of colour.
- 3.1.1.4. During the production run the check tests shall be carried out at the following minimum frequency:

Uniformly toughened glass panes	Treated laminated glass wind-screens
Pr ≤ 500: one per shift St > 500: two per shift	0,1 % per type

- 3.1.1.5. A check test shall be carried out at the end of the production run on one of the last glass panes manufactured.
- 3.1.1.6. For Pr < 20 only one fragmentation test per production run needs to be carried out.

▼B

- 3.1.2. *Results*
- All of the results shall be recorded, including the results without a photographic print.
- In addition, a photographic contact print shall be made once per shift except for ≤ 500 . In this case only one photographic contact print shall be made per production run.
- 3.2. **Headform impact**
- 3.2.1. *Tests*
- The checks shall be carried out on samples corresponding to at least 0,5 % of the daily production of laminated-glass windscreens from one production line. A maximum of 15 windscreens per day shall be tested.
- The choice of samples shall be representative of the production of the various types of windscreen.
- With the agreement of the administrative department these tests may be replaced by the 2 260 g ball impact test (see item 3.3 below). In any event the headform tests shall be carried out on at least two samples for each thickness class per year.
- 3.2.2. *Results*
- All results shall be recorded
- 3.3. **2 260 g ball impact**
- 3.3.1. *Tests*
- The check shall be performed at least once per month per thickness category.
- 3.3.2. *Results*
- All results shall be recorded.
- 3.4. **227 g ball impact**
- 3.4.1 *Tests*
- The test pieces shall be cut from samples. However, for practical reasons the tests may be carried out on finished products or parts thereof.
- The checks shall be carried out on a sample corresponding to at least 0,5 % of the production of one shift, with a maximum of 10 samples per day.
- 3.4.2. *Results*
- All results shall be recorded.
- 3.5. **High temperature**
- 3.5.1. *Tests*
- The test pieces shall be cut from samples. However, for practical reasons, the tests may be carried out on finished products or parts thereof. These should be selected so that all interlayers are tested proportionately to their use.
- The check shall be carried out on at least three samples per colour of interlayer taken from the daily production.
- 3.5.2. *Results*
- All results shall be recorded.
- 3.6. **Light transmission**
- 3.6.1. *Tests*
- Representative samples of tinted finished products shall be submitted to this test.
- The checks shall be carried out at least at the beginning of each production run if there is any change in the characteristics of the glass pane affecting the results of the test.

▼B

Glass panes having a regular light transmission measured during component type-approval tests of not less than 80 % in the case of windscreens and not less than 75 % in the case of glass panes other than windscreens, and glass panes of category V (see Annex II, item 4.5.2), shall be exempted from this test.

Alternatively, for toughened glass, a certificate of compliance with the above requirements may be submitted by the glass supplier.

3.6.2. *Results*

The light transmission value shall be recorded. In addition, for windscreens with shade bands or obscuration bands, it shall be verified, from the drawings referred to in Annex II, item 2.2.1.2.2.4 that such bands are outside zone B or zone I, depending upon the category of vehicle for which the windscreen is intended.

3.7. **Optical distortion and secondary-image separation**3.7.1. *Tests*

Every windscreen shall be inspected for visual defects. In addition, using the methods specified in this Directive or any other method giving similar results, measurements shall be carried out in the various fields of vision at the following minimum frequencies:

- either, where $P_s \leq 200$, one sample per shift,
- or where $P_s > 200$, two samples per shift,
- or 1 % of the entire production, the samples chosen being representative of all production.

3.7.2. *Results*

All of the results shall be recorded.

3.8. **Resistance to abrasion**3.8.1. *Tests*

Plastic-faced and plastic-glass panes only shall be submitted to this test. There shall be at least one check per month and per type of plastic-material facing or interlayer.

3.8.2. *Results*

The measurement of the light scatter shall be recorded.

3.9. **Resistance to humidity**3.9.1. *Tests*

Plastic-faced and plastic-glass panes only shall be submitted to this test. There shall be at least one check per month and per type of plastic-material facing or interlayer.

3.9.2. *Results*

All results shall be recorded.

3.10. **Resistance to chemicals**3.10.1. *Tests*

Plastic-faced and plastic-glass panes only shall be submitted to this test. There shall be at least one check per month and per type of plastic-material facing or interlayer.

3.10.2. *Results*

All results shall be recorded.

▼B

ANNEX II P

**NOTICE CONCERNING EEC COMPONENT TYPE-APPROVAL OR THE EXTENSION OR
REFUSAL OR WITHDRAWAL OF EEC COMPONENT TYPE-APPROVAL OR THE FINAL
CESSATION OF THE PRODUCTION OF A TYPE OF SAFETY GLASS**

(1)

(Maximum format: A4 (210 × 297 mm))

EEC component type-approval mark No: Extension No:

1. Category or safety glass:
2. Description of pane: see Appendices 1, 2, 3, 4, 5, 6 ⁽²⁾ and, in the case of windscreens, the list in accordance with Appendix 7.
3. Trade name or mark:
4. Manufacturer's name and address:
.....
5. Name and address of manufacturer's representative, where applicable:
.....
6. Submitted for component type-approval on:
7. Technical department responsible for conducting component type-approval tests:
8. Date of tests report:
9. Number of test report:
10. Component type-approval granted/refused/extended/withdrawn ⁽¹⁾:
11. Ground(s) for extending component type-approval:
12. Remarks:
13. Place:
14. Date:
15. Signature:
16. A list is attached of the documents, obtainable on request, comprising the component type-approval file lodged with the administrative department granting component type-approval.

⁽¹⁾ Name of administration.⁽²⁾ Delete whichever is inapplicable.

▼B*Appendix 1***LAMINATED-GLASS WINDSCREENS****(Ordinary, treated or plastic-coated)****(Principal and secondary characteristics in accordance with Annex II B, II C or II K)**

EEC component type-approval mark No:

Extension No:

Principal characteristics:

- Number of layers of glass:
- Number of interlayers:
- Nominal thickness of windscreen:
- Nominal thickness of interlayer(s):
- Special treatment of glass:
- Nature and type of interlayer(s):
- Nature and type of plastics coating(s):

Secondary characteristics:

- Nature of material (polished glass, float glass, sheet glass):
- Colouring of glass:
- Colouring of interlayer (total/partial):
- Colouring of plastic coating(s):
- Conductors incorporated (Yes/No):
- Anti-glare strips incorporated (Yes/No):
- Colouring of coating:

Remarks:

 Documents attached: list of windscreens (see Appendix 7).

▼B*Appendix 2***GLASS-PLASTICS WINDSCREENS****(Principal and secondary characteristics in accordance with Annex II D)**

EEC component type-approval mark No:

Extension No:

Principal characteristics:

- Shape category:
- Number of layers of plastics:
- Nominal thickness of glass:
- Glass treated (Yes/No):
- Nominal thickness of windscreen:
- Nominal thickness of plastic layer(s) acting as interlayer(s):
-
- Nature and type of outer plastic layer:
-
-

Secondary characteristics:

- Nature of material (polished glass, float glass, sheet glass):
-
- Colouring of plastic layer(s) (total/partial):
- Colouring of glass:
-
- Conductors incorporated (Yes/No):
- Anti-glare strips incorporated (Yes/No):

Remarks:

 Documents attached: list of windscreens (see Appendix 7).

▼B

Appendix 3

UNIFORMLY TOUGHENED-GLASS PANES

(Principal and secondary characteristics in accordance with Annex II H or II K)

Component type-approval mark No:

Extension No:

Principal characteristics:

- Shape category:
- Nature of toughening process:
- Thickness category:
- Nature and type of plastic coating(s):
-

Secondary characteristics:

- Nature of material (polished glass, float glass, sheet glass):
-
- Colouring of glass:
- Colouring of plastic coating(s):
- Conductors incorporated (Yes/No):
- Anti-glare strips incorporated (Yes/No):

Criteria component type approved:

- Maximum area (flat glass):
- Smallest angle:
- Maximum developed area (curved glass):
- Maximum height of segment:

Remarks:

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Appendix 4

LAMINATED-GLASS PANES OTHER THAN WINDSCREENS

(Principal and secondary characteristics in accordance with Annex II I or II K)

Component type-approval mark No:

Extension No:

Principal characteristics:

- Number of layers of glass:
- Number of interlayers:
- Thickness category:
- Nominal thickness of interlayer(s):
- Special treatment of glass:
- Nature and type of interlayer(s):
-
- Nature and type of plastic coating(s):
-
- Thickness of plastic coating(s):

Secondary characteristics:

- Nature of material (polished glass, float glass, sheet glass):
-
- Colouring of interlayer (total/partial):
- Colouring of glass:
- Colouring of plastic coating(s):
- Conductors incorporated (Yes/No):
- Anti-glare strips incorporated (Yes/No):

Remarks:

▼B

Appendix 5

GLASS-PLASTIC PANES OTHER THAN WINDSCREENS

(Principal and secondary characteristic in accordance with Annex II J)

EEC component type-approval mark No:

Extension No:

Principal characteristics:

- Number of layers of plastic:
- Thickness of the glass component:
- Treatment of the glass component (yes/no):
- Nominal thickness of the pane:
- Nominal thickness of plastic layer(s) acting as interlayer(s):
- Nature and type of layers of plastic acting as interlayer:
- Nature and type of outer plastic layer:

Secondary characteristics:

- Nature of material (plate, float, sheet glass):
.....
- Colouring of glass (colourless/tinted):
- Colouring of layer(s) (total/partial):
.....
- Conductors incorporated (yes/no):
- Anti-glare strips incorporated (Yes/No):

Remarks:

▼B

Appendix 6

DOUBLE-GLAZED UNITS

(Principal and secondary characteristics in accordance with Annex II L)

Component type-approval mark No: Extension No:

Principal characteristics:

- Composition of double-glazed units (symmetrical/asymmetrical):
- Nominal thickness of gap:
- Method of assembly:
- Type of each pane in accordance with Annex II H, II I, II K or II J:

Documents attached:

A form for both panes in a symmetrical double-glazed unit in accordance with the Annex under which they were tested or component type approved.

A form for each pane in an asymmetrical double-glazed unit in accordance with the Annexes under which they were tested or component type approved.

Remarks:

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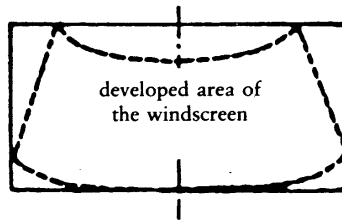
Appendix 7

CONTENTS OF THE LIST OF WINDSCREENS (1)

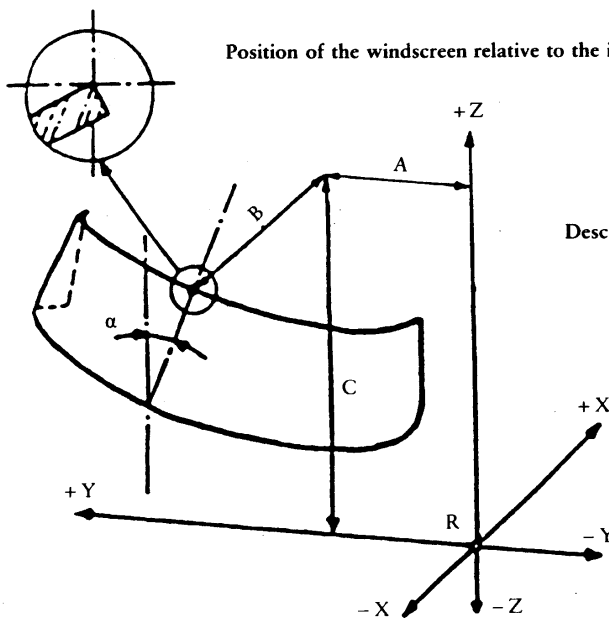
At least the following information shall be supplied for each of the windcreens covered by this component type-approval:

- Vehicle manufacturer:
- Type of vehicle:
- Category of vehicle:
- Developed area (F):
- Height of segment (h):
- Curvature (r):
- Installed angle (α):
- Back rest angle (β):
- Coordinates of R-point (A, B, C) in relation to the mid-point of the upper edge of the windscreen:
.....
.....

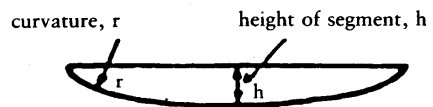
Description of the parameter, F, of the windscreen



Position of the windscreen relative to the index point



Description of the parameters, r and h, of the windscreen



(1) This list shall be attached to Appendices 1 and 2 to this Annex.

▼B*ANNEX III***VEHICLES — REQUIREMENTS CONCERNING THE FITTING OF WINDSCREENS AND GLAZING OTHER THAN WINDSCREENS TO VEHICLES**

1. Windscreens and panes of glass other than windscreens shall be fitted in such a way that, despite the stresses to which the vehicle is submitted under normal operating conditions, they remain in position and continue to afford visibility and safety to the occupants of the vehicle.
2. For all motor vehicles in categories M and N, the following checks must be made:
 - 2.1. The windsreen bears the appropriate EEC component type-approval mark specified in item 4.4 of Annex II, followed by one of the additional symbols provided for in item 4.5.1 of Annex II.
 - 2.1.1. The windscreen is type-approved for the vehicle type on which is fitted.
 - 2.1.2. The windscreen is correctly fitted with reference to the vehicle 'R' point. This verification may be carried out either on vehicle or drawings, at the vehicle manufacturer's choice.
 - 2.2. The side and rear windows bear the appropriate EEC type-approval mark specified in item 4.4 of Annex II. Side and rear windows through which either the driver's forward direct field of view ov 180° is obtained or through which the driver's indirect field of view is obtained by means of interior and exterior rear-view mirrors complying with the requirements of Directive 71/127/EEC, do not bear the additional symbol provided for in item 4.5.2 of Annex II.
 - 2.3. The opening roof glazing bears the EEC component type-approval mark specified in item 4.4 of Annex II. Opening roofs may bear the additional symbol provided in item 4.5.2 of Annex II.
 - 2.4. A check must be made that glazing, other than that indicated in item from 2.1 to 2 above (for example internal partitions), bears the EEC component type-approval mark specified in item 4.4 of Annex II followed where appropriate by the additional symbol provided for in item 4.5.2 of Annex II.
3. For all vehicles in category 0, a check must be made that glazing bears the EEC component type-approval mark specified in item 4.4 of Annex II following where appropriate, by the additional symbol provided for in item 4.5.2 of Annex II.

▼B*Appendix***ANNEX TO THE EEC APPROVAL CERTIFICATE FOR A TYPE OF VEHICLE IN
RESPECT OF THE FITTING OF SAFETY GLAZING****(Articles 4 (2) and 10 of Council Directive 70/156/EEC of 6 February 1970 on the approximation
of the laws of the Member States relating to the EEC type-approval of motor vehicles and their
trailers)**

Name of administration:

EEC whole-vehicle type-approval No: Extension No:

1. Make (name of manufacturer) of vehicle:
2. Type, where appropriate, and trade description of vehicle:
.....
3. Name and address of manufacturer:
.....
4. Name and address of manufacturer's representative where applicable:
.....
5. Description of the types of glazing used:
 - 5.1. In the case of windscreens:
 - 5.2. In the case of side windows:
 - 5.3. In the case of rear windows:
 - 5.4. In the case of opening roofs:
 - 5.5. In the case of glazing other than the above:
6. EEC component type-approval mark for a windscreen:
7. EEC component type-approval mark/s for
 - 7.1. side windows:
 - 7.2. rear windows:
 - 7.3. opening roofs:
 - 7.4. other glazing:
8. The fitting requirements have/have not ⁽¹⁾ been met:
9. Date of submission of vehicle for EEC type-approval:
10. Technical department responsible for carrying out EEC type-approval:
11. Date of test report issued by that department:
12. Number of test report issued by that department:
13. EEC type-approval granted/refused ⁽¹⁾ in respect of the fitting of safety glazing.

⁽¹⁾ Delete whichever is inapplicable.

▼B

14. Place:

15. Date:

16. Signature:

17. A list is attached of the documents submitted to the administrative department in the Member State having granted EEC whole-vehicle type-approval.

These documents may be obtained, on request by administrative departments in the other Member States.

.....
.....
.....
.....

18. Remarks, if any:

.....
.....
.....
.....
.....