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II

(Acts whose publication is not obligatory)

COUNCIL

COUNCIL DIRECTIVE 92/21/EEC

of 31 March 1992

on the masses and dimensions of motor vehicles of category M₁

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 it is important to adopt measures 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 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 technical requirements which motor vehicles must satisfy pursuant to national laws relate, *inter alia*, to their masses and dimensions;

Whereas those requirements differ from one Member State to another; whereas it is therefore necessary that all Member States adopt the same requirements, either in addition to or in place of their existing rules in order to allow, in particular, the EEC type-approval procedure which was the subject of 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⁾, to be applied in respect of each type of vehicle;

Whereas this Directive will be supplemented by Directives relating to the masses and dimensions of all categories of motor vehicles and their trailers;

Whereas it is not necessary to lay down requirements concerning the dynamic stability of combinations of motor vehicles and trailers since the manufacturers of motor vehicles take this aspect into account when stating the maximum technically permissible towable mass,

HAS ADOPTED THIS DIRECTIVE:

Article 1

For the purposes of this Directive, 'vehicle' means any motor vehicle in category M₁ as defined in Annex I to Directive 70/156/EEC, intended for use on the road, having at least four wheels and a maximum design speed exceeding 25 km/h.

Article 2

No Member State may refuse EEC type-approval or national type-approval of a type of vehicle, or refuse or prohibit the

⁽¹⁾ OJ No C 95, 12. 4. 1990, p. 92.

⁽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.

sale, registration, entry into service or use of a vehicle on grounds relating to its masses and dimensions if these satisfy the requirements set out in Annex I.

Article 3

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

Article 4

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 provisions, they shall contain a reference to this Directive or 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 domestic law which they adopt in the field covered by this Directive.

Article 5

This Directive is addressed to the Member States.

Done at Brussels, 31 March 1992.

For the Council

The President

Vitor MARTINS

ANNEX I

1. SCOPE

This Directive applies to the masses and dimensions of motor vehicles in category M₁ as defined in Article 1.

1.1. Definitions

'Mass of the vehicle in running order' means the mass of the vehicle with bodywork in running order (including coolant, oils, fuel, spare wheels, tools and driver).

'Maximum authorized laden mass of a vehicle': see point 4.2.1.

'Maximum authorized laden mass of a vehicle suitable for drawing a trailer' means the mass as defined at point 4.2.1, which includes:

- the maximum mass of the towing device, and
- the maximum authorized drawbar load on the coupling point of the coupling device when the vehicle is stationary, as specified by the vehicle manufacturer.

2. APPLICATION FOR EEC TYPE-APPROVAL

2.1. Any application for the type-approval of a vehicle in respect of its masses and dimensions submitted by the manufacturer of the vehicle or by a duly authorized representative.

2.2. It is accompanied by the following documents, in triplicate, and the following information: a description of the type of vehicle, specifying the characteristics listed in Annex II, together with the documents requested in accordance with Article 3 of Directive 70/156/EEC.

2.3. A vehicle representative of the type to be type-approved must be presented to the technical department responsible for the type-approval tests.

3. EEC TYPE-APPROVAL

A certificate identical with the model set out in Annex III is attached to the EEC type-approval form.

4. REQUIREMENTS

4.1. Dimensions

4.1.1. The maximum authorized dimensions of a vehicle are as follows:

4.1.1.1. Length: 12 000 mm

4.1.1.2. Width: 2 500 mm

4.1.1.3. Height: 4 000 mm

4.1.1.4. The dimensions are measured according to the provisions of the notes of Annex I to Directive 70/156/EEC.

4.2. Mass

4.2.1. The maximum authorized mass of a vehicle must not exceed the maximum technically permissible laden mass as defined by the manufacturer.

4.2.2. The technically permissible maximum mass of the vehicle and of its axles must be determined by its manufacturer, bearing in mind, in particular, the strength of the materials used and provided that the technically permissible maximum mass thus determined is not lower than the mass of the vehicle in running order, plus 75 kg for every passenger seat. The number of seats must be stated by the manufacturer. The masses of the passengers and the luggage must be positioned in the correct place to determine the technically permissible maximum mass of the vehicle and the axles. The number of passenger seats must be indicated by the manufacturer. If the vehicle is intended to draw a trailer, the manufacturer may indicate a second permissible value on the rear axle(s) to apply only for this particular usage. In this case, both the maximum mass of the towing device as specified by the vehicle manufacturer and the maximum permitted drawbar load on the coupling point of the coupling device when the vehicle is stationary have to be taken into account for the determination of the maximum masses mentioned above. The method for verifying the masses is described in the Appendix. If the vehicle manufacturer equips his vehicle with a coupling device, he must indicate on the towing device in the vicinity of the coupling device the maximum permitted drawbar load on the coupling point of the coupling device.

4.2.2.1. The sum of the technically permissible maximum masses of the axles must not be less than the technically permissible maximum mass of the vehicle. Where the vehicle and, at the same time, its rear axle are laden to the technically permissible maximum mass, the mass bearing on the front axle must not be less than 30 % of the technically permissible maximum mass of the vehicle.

4.3. Towable mass and drawbar load on the coupling device**4.3.1. Towable mass of a vehicle intended to draw a trailer fitted with a service braking device.****4.3.1.1. The maximum authorized towable mass of vehicle is the lower value of either:**

- (a) the technically permissible maximum towable mass based on the construction of the vehicle and/or the strength of the mechanical coupling device; or
- (b) the maximum authorized mass of the drawing vehicle (motor vehicle).

For the off-road vehicle as defined in Directive 70/156/EEC the maximum authorized towable mass may be increased to 1,5 times the maximum authorized mass of the drawing vehicle subject to it not exceeding the technically permissible maximum towable mass.

However, the maximum towable mass may in the case exceed 3 500 kg.

4.3.1.2. The technically permissible maximum towable mass is that stated by the manufacturer, the towable mass being the total actual mass of the trailer drawn including the actual drawbar load on the coupling device.**4.3.2. Towable mass of a vehicle intended to draw a trailer without a service braking device.****4.3.2.1. The authorized towable mass is the technically permissible maximum towable mass or half of the mass of the drawing vehicle in running order; the lower mass value applies.**

The maximum towable mass must in no case exceed 750 kg.

4.3.3. The maximum authorized drawbar load at the coupling device of the vehicle is the technically permissible drawbar load, the drawbar load being the actual vertical load transmitted when the vehicle is stationary by the drawbar of the trailer to the vehicle coupling and acting via the centre of the coupling device.**4.3.3.1. The technically permissible drawbar load is that stated by the manufacturer; this load must be not less than 25 kg and must be increased for greater towable masses. The manufacturer must specify in the maintenance manual: the maximum permissible vertical load on the coupling device, the mounting point of the coupling device on the motor vehicle, and the rear overhang of the coupling device.****4.3.4. The motor vehicle towing a trailer must be able to start the vehicle combination — laden to its maximum mass — five times on an uphill gradient of at least 12 % within five minutes.**

Appendix

METHOD FOR VERIFYING THE MASSES OF MOTOR VEHICLES OF CATEGORY M₁

1. The mass of the vehicle will be verified as follows:
 - 1.1. empty, in running order and without driver;
 - 1.2. fully laden (under the conditions referred to in point 4.2.2), by means of calculation, taking the following into account:
 - the seat, if adjustable, must in particular be moved to the furthest back normal driving or seating position as indicated by the manufacturer taking into account only the longitudinal adjustment of the seat and excluding seats used otherwise than for normal driving or seating positions. Where there are other possibilities for adjusting the seat (vertical, angled, seat back, etc.) the adjusted positions must be as specified by the vehicle manufacturer. In the case of suspension seats, the seat must be locked in the normal driving position as specified by the manufacturer,
 - the mass for each occupant (driver included) is taken to be 75 kg (68 kg + 7 kg of luggage);
 - the mass of each occupant is to be applied to the R point of each seat. Luggage is to be evenly distributed in the luggage compartment;
 - any load in excess of the conventional load must be distributed on the seats and in the luggage compartment in the proportions laid down in the second indent.
 - 1.3. The masses specified are determined according to the following table:

Conditions of vehicle				
Masses	(a) empty	(b) fully laden	(c) fully laden with load on coupling device	(d) maximum permissible mass on the axles
Front axle				
Rear axle				
Combined				

2. RESULTS OF VERIFICATION

The results are considered satisfactory if:

- the masses of the empty vehicle (column (a)) correspond to those declared by the manufacturer, with a tolerance of $\pm 5\%$; (in this case, the value of the mass stated by the manufacturer is adopted for calculating the masses in columns (b) and (c)),
- the masses verified under the conditions referred to in columns (b) and (c) do not exceed the maximum permissible masses stated by the manufacturer,
- the requirements set out in point 4.2.2.1 of Annex I are fulfilled,
- the masses stated by the manufacturer are compatible with the load characteristics of the tyres specified for the motor vehicle.

ANNEX II

MODEL INFORMATION DOCUMENT (a)

The information relating to the vehicle, technical unit or component to be type-approved must be supplied in triplicate and include a list of contents. Drawings, if any, shall be supplied in appropriate scale and in sufficient detail on size A4 or folded to that size. Photographs, if any, must also show sufficient detail. In the case of microprocessor-controlled functions, relevant performance-related information should be provided.

0. GENERAL

0.1. Make (trade name of manufacturer):

0.2. Type and commercial description (mention any variants):

0.3. Means of identification of type, if marked on the vehicle (b):

0.3.1. Location of that marking:

0.4. Category of vehicle (c):

0.5. Name and address of manufacturer:

0.6. Name and address of manufacturer's authorized representative (if any):

0.7. Location of statutory plates and inscriptions and method of affixing:

0.7.1. On the chassis:

0.7.2. On the bodywork:

0.8. The serial numbers of the chassis of this type commence at number:

1. GENERAL CONSTRUCTION CHARACTERISTICS OF THE VEHICLE

1.1. Photographs and/or drawings of a representative vehicle:

1.2. Dimensional drawing of the whole vehicle:

1.3. Number of axles and wheels:

1.3.2. Number and position of steered axles:

- 1.3.3. Powered axles (number, position, interconnection):
- 1.6. Position and arrangement of the engine:
2. MASSES AND DIMENSIONS (e) (refer to drawing where applicable)
- 2.1. Wheel base(s) (fully loaded) (f):
- 2.3. Axle track(s) and width(s):
- 2.3.1. Track of each steered axle (l):
- 2.3.2. Track of all the other axles:
- 2.3.3. Width of the widest rear axle:
- 2.3.4. Width of the rearmost axle:
- 2.4. Range of vehicle dimensions (overall):
- 2.4.1. For chassis with bodywork:
- 2.4.2.1. Length (j):
- 2.4.2.2. Width (k):
- 2.4.2.3. Height (unladen) (l) (for suspension adjustable for height, indicate normal running position):
- 2.4.2.4. Front overhang (m):
- 2.4.2.4.1. Approach angle (off-road vehicles) (c): (degrees)
- 2.4.2.5. Rear overhang (n):
- 2.4.2.5.1. Departure angle (off-road vehicles) (c): (degrees)
- 2.4.2.6. Ground clearance (c):
- 2.4.2.6.1. Ramp angle (off-road vehicles) (c): (degrees)
- 2.6. Mass of the vehicle with bodywork in running order, or mass of the chassis with cab if the manufacturer does not fit the bodywork (including coolant, oils, fuel, tools, spare wheel and driver) (p):
- 2.6.1. Distribution of this mass among the axles:
- 2.8. Technically permissible maximum mass stated by the manufacturer:
- 2.8.1. Distribution of this mass among the axles:
- 2.9. Technically permissible maximum mass on each axle:
- 2.9.1. Maximum technically permissible mass on the rear axle(s) when a trailer is used:
- 2.10. Maximum mass of trailers which may be coupled:
- 2.10.4. Maximum mass of the combination:
- 2.10.5. The vehicle is/is not ⁽¹⁾ suitable for towing loads/trailers.
- 2.10.6. Maximum mass of unbraked trailer:

- 2.11. Maximum vertical load at the coupling point of the trailer other than the fifth kingpin:
- 2.12. Swept path:
- 2.13. Engine power/maximum mass ratio (in kW/kg):
- 2.14. Hill starting ability (with trailer): (%)
- 2.15. Capacity to climb a gradient of (%) (off-road vehicles)

11. LINKS BETWEEN DRAWING VEHICLES AND TRAILERS AND SEMI-TRAILERS

- 11.1. Instructions for attaching the coupling device:
- 11.2. Class and type of coupling device:
- 11.4. Maximum vertical load at the coupling point ⁽¹⁾: kg
- 11.7. Instructions for mounting the coupling device on the vehicle together with photographs or drawings of the vehicle coupling points indicated by the manufacturer; further information in the event of use of the coupling device being limited to certain types of vehicles:
- 11.8. Information on the setting of towing brackets or mounting plates ⁽²⁾:

⁽¹⁾ Delete where inapplicable.

⁽²⁾ If necessary.

Note: For footnotes (a) to (p) see Annex I to Directive 70/156/EEC, as last amended by Directive 87/403/EEC.

ANNEX III

MODEL

(maximum format: A4 (210 × 297 mm))

EEC TYPE-APPROVAL CERTIFICATE

(Vehicle)

Name of administration

Communication relating to:

- type-approval ⁽¹⁾
- extension of type-approval ⁽¹⁾
- refusal of type-approval ⁽¹⁾

of a type of vehicle in pursuance of the provisions of Directive 92/21/EEC on the masses and dimensions of motor vehicles of category M₁.

EEC type-approval No:

Extension No:

SECTION I

- 0.1. Make (name of undertaking):
- 0.2. Type and commercial description (mention any variants):
.....
- 03. Means of identifying the type attached to the vehicle (a):
- 0.3.1. Location of that information:
- 0.4. Category of vehicle (b):
- 0.5. Name and address of manufacturer:
.....
- 0.6. Name and address of manufacturer's authorized representative (if any):
.....

⁽¹⁾ Delete where inapplicable.
(a) Where used the means of identification can only appear on vehicles covered by the scope of the separate directive covering type-approval. Where the means of identifying the type consists of characters not relating to the description of the types of vehicles referred to in this information document these characters shall be replaced, in any such documents by the sign '?' (example: ABC?? 123??).
(b) As referred to in note (b) to Annex 1 to Directive 70/156/EEC, as last amended by Directive 87/403/EEC.

SECTION II

1. Additional information
 - 1.1. Length: (mm)
 - 1.2. Width: (mm)
 - 1.3. Height: (mm)
 - 1.4. Mass of vehicle in running order: (kg)
 - 1.5. Maximum authorized mass: (kg)
 - 1.6. Technically permissible maximum axle masses:
 - 1.6.1. 1. Axle: (kg)
 2. Axle: (kg)
 3. Axle: (kg)
 - 1.6.2. Maximum technically permissible mass on the rear axle⁶ when a trailer is used: (kg)
 - 1.7. Number of passenger seats (without driver):
 - 1.8. Towable mass:
 - 1.8.1. Trailer without service brake: (kg)
 - 1.8.2. Trailer with service brake: (kg)
 - 1.8.3. Technically permissible drawbar load: (kg)
 - 1.8.4. Rear overhang of the coupling device: (cm)
 - 1.8.5. Photographs or drawings of the mounting point of the coupling device on the vehicle:
2. Technical department conducting tests:
.....
3. Date of test report:
4. Number of test reports:
5. Grounds justifying extension of type approval (if any):
.....
6. Comments (if any):
.....
7. Place:
8. Date:
9. Signature:
10. The list of the various components of the type-approval file maintained by the administrative department having carried out type-approval, and which may be obtained on request, are set out in the Annex.

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,

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.

⁽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.

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, 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.

Done at Brussels, 31 March 1992.

For the Council
The President
Vitor MARTINS

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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 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.

- 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 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.

- 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.

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.

⁽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 and EL for Greece.

- 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) ⁽¹⁾;
 - III: if it is made of treated laminated glass (III/P if it is coated) ⁽¹⁾;
 - 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.
- 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 ⁽²⁾ 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).

⁽¹⁾ In accordance with the definition set out in item 2.3 of Annex I.

⁽²⁾ The results of the fragmentation tests shall be recorded, even if no photograph is required.

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

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 $\pm 1\%$ 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.

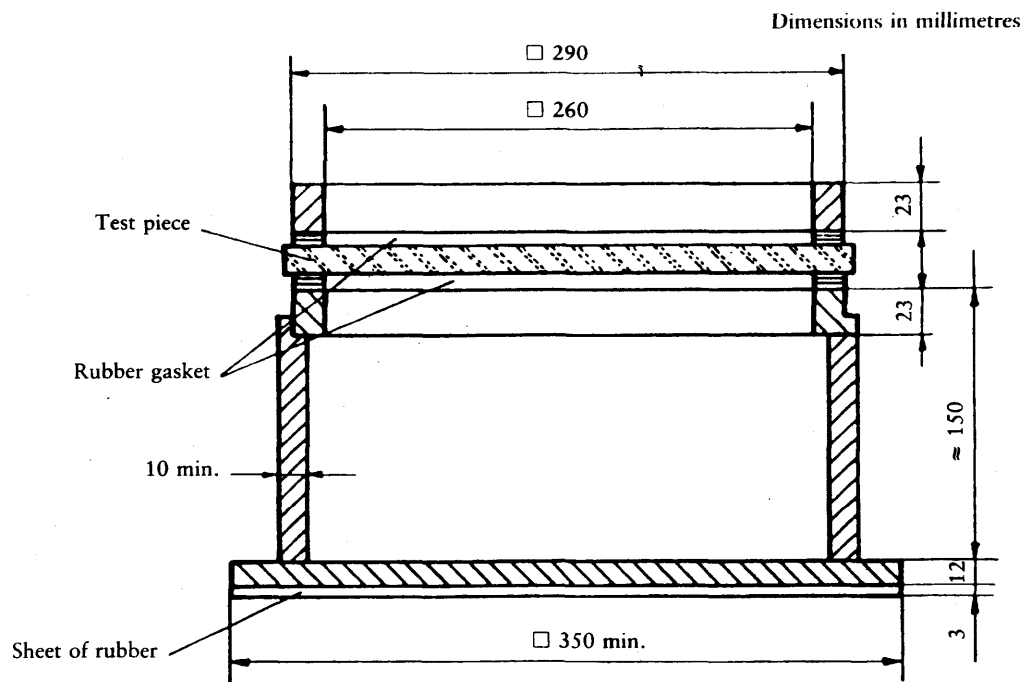


Figure 1

Support for ball tests

2.1.2. 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,
- 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.

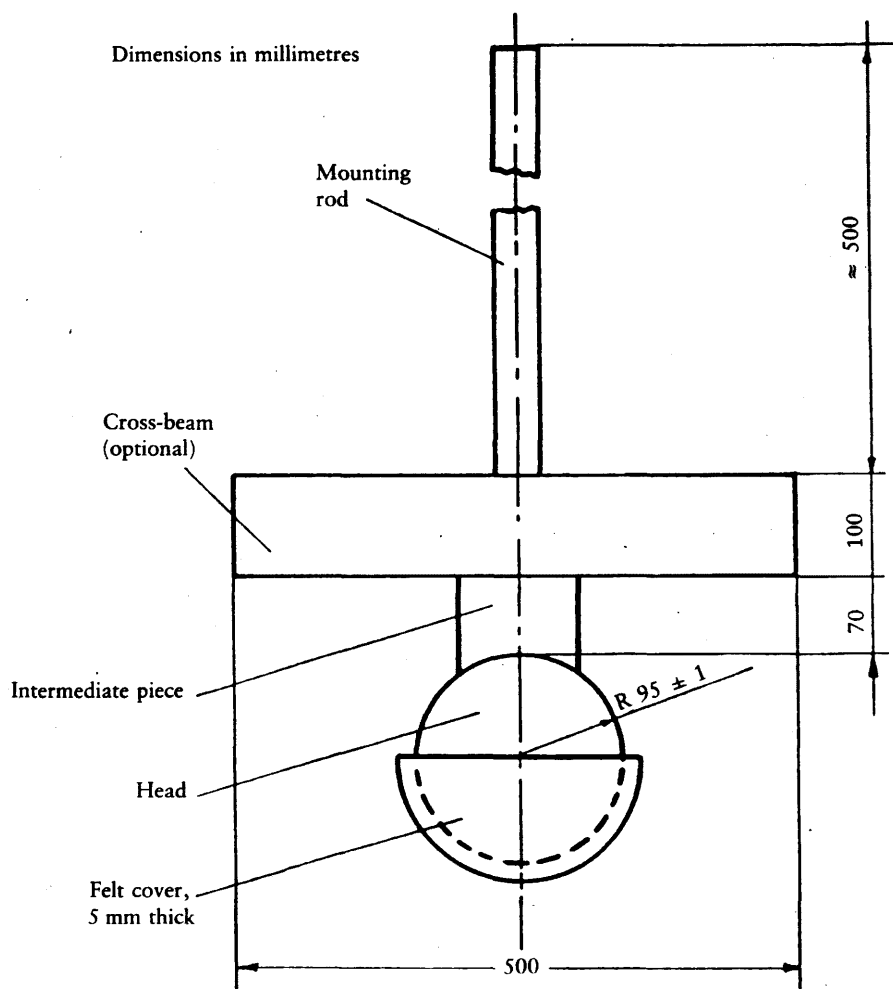


Figure 2
Headform weight

- 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: $60 \pm 20\%$.

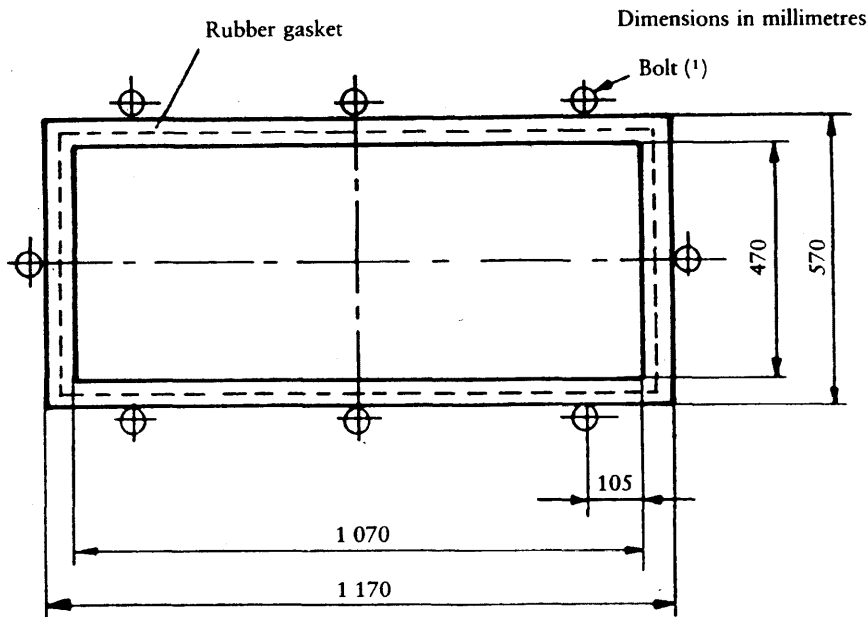


Figure 3

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.

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,

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

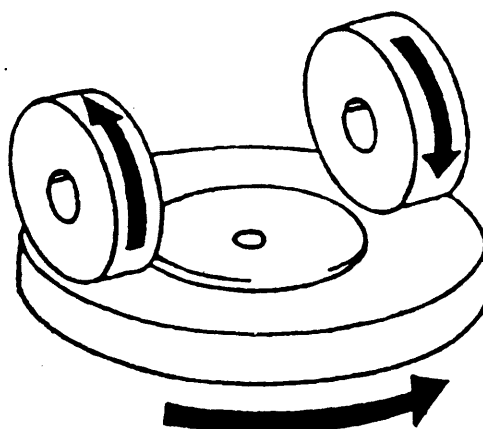


Figure 4

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 ⁽¹⁾, 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 × 1,5 × 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.

- 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 $2 \cdot a \cdot \tan 4^\circ$, 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 mapped 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.

⁽¹⁾ Suitable abrasive wheels may be obtained from Teledyne Taber (United States of America).

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.

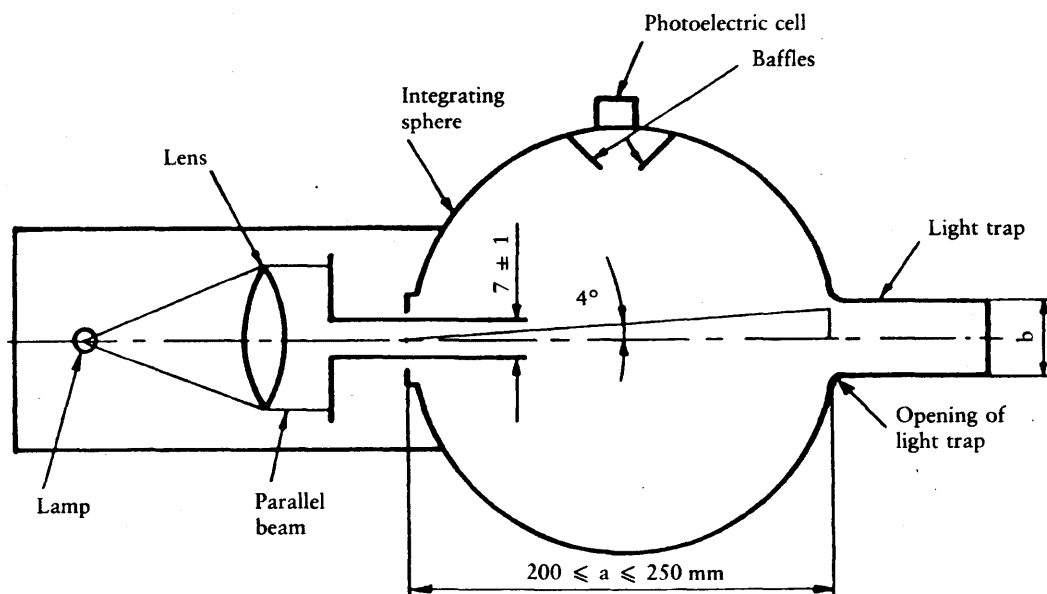


Figure 5

Hazameter

4.2. Test conditions

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

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 T₁, T₂, T₃ and T₄ 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.

- 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 interlayer 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 windscreens 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.

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;
- 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 °C 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.

8.2. Indices of difficulty of the secondary characteristics

	Colourless	Tinted
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 x 1,5 x 3 mm. The voltage at the lamp filament shall be such that the colour temperature is 2 856 ± 50 K. This voltage shall be stabilized within ± 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 ± 5°. 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 T_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 characteristics identical to those of the actual windscreen, the measurements being taken normal (perpendicular) to the glass pane.

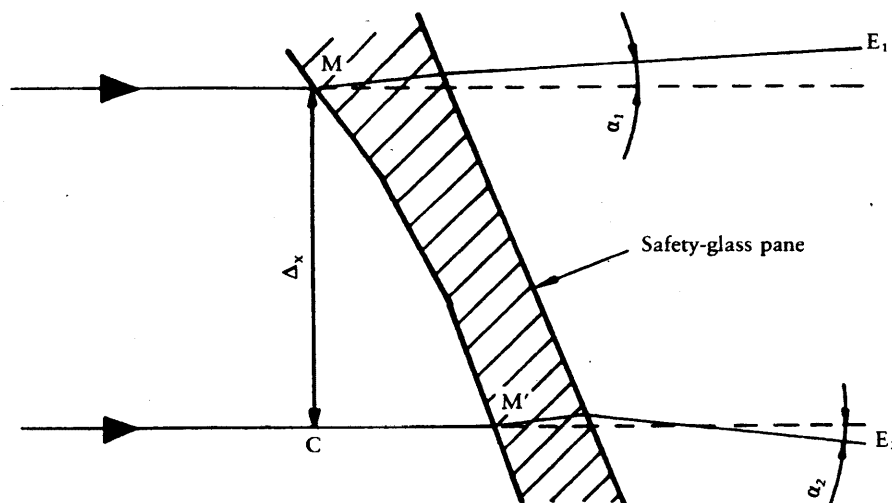
9.1.2.2. In the case of windscreens intended for category-M₁ vehicles, the test shall be carried out in the zone B defined in Annex II F. In the case of all other vehicles the test shall be carried out in zone I provided for in item 9.2.5.2.3 in this Annex.

9.1.3. Indices of difficulty of the secondary characteristics

	Colourless	Tinted
Colouring of the glass:	1	2
Colouring of the interlayer (in the case of laminated windscreens):	1	2

⁽¹⁾ International Commission on Illumination.

		Not included	Included
	Shade and/or obscuration bands:	1	2
	The other secondary characteristics are not involved.		
9.1.4.	<i>Interpretation of results</i>		
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.	<i>Optical-distortion test</i>		
9.2.1.	<i>Scope</i>		
	The method specified is a projection method which permits evaluation of the optical distortion of a safety-glass pane.		
9.2.1.1.	<i>Definitions</i>		
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_α 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.	<i>Apparatus</i>		
	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.		



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

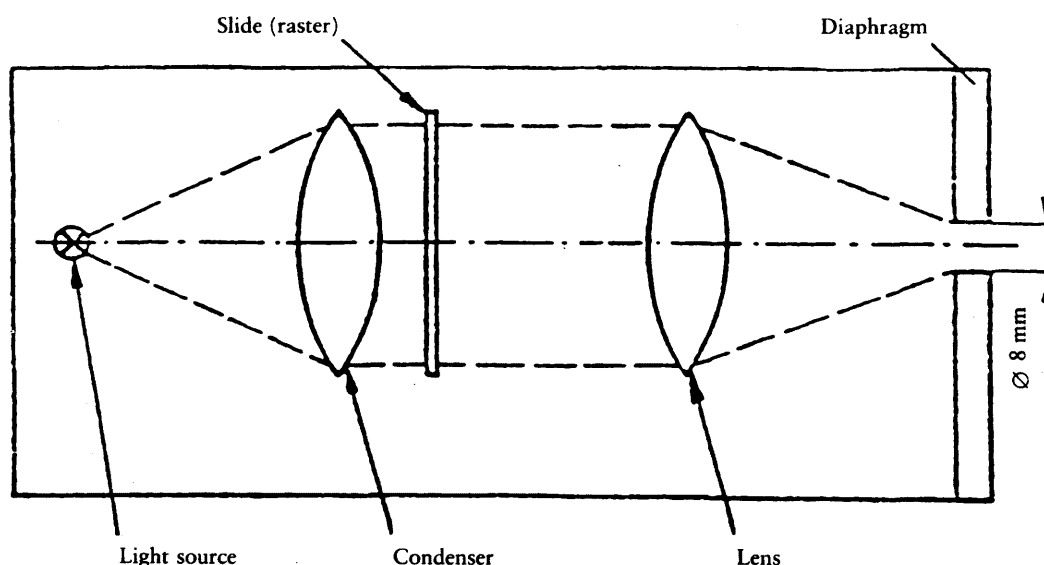


Figure 7

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).

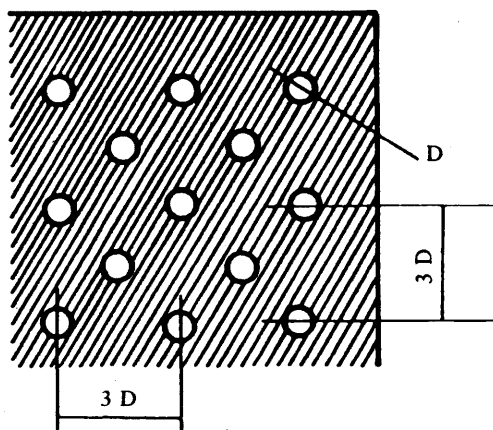


Figure 8

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

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

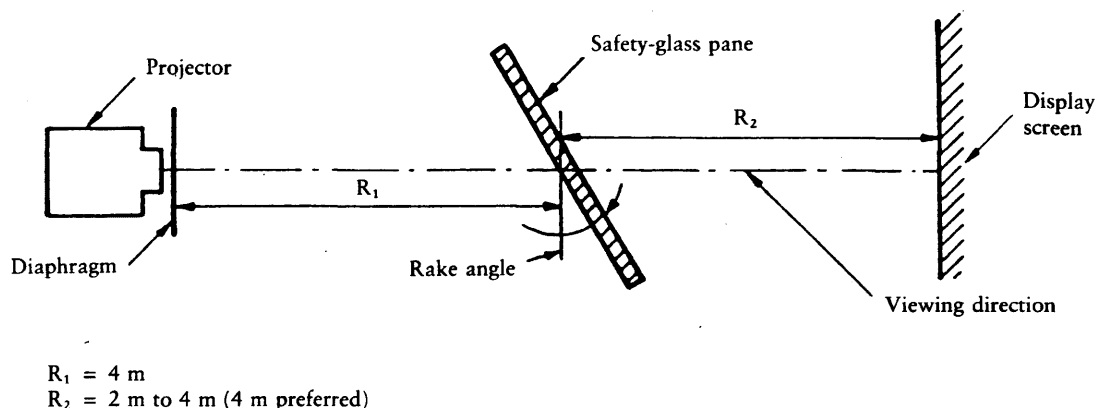


Figure 9

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.

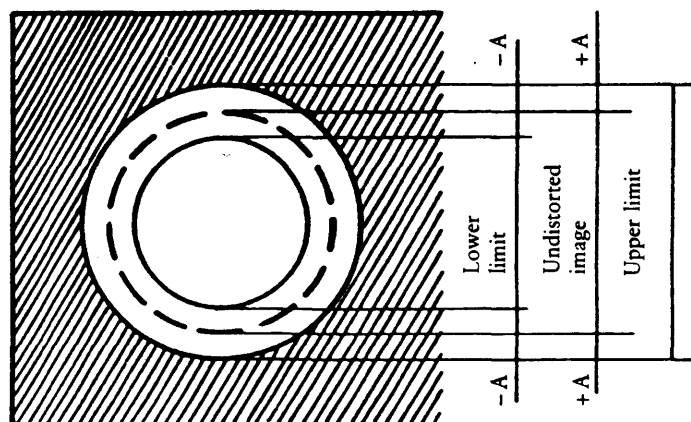


Figure 10

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 $\Delta d_{\max}$.

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.

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

Polished plate glass

Float glass

Sheet glass

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:

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 $300 \times 300 \times 150$ mm, whose front is most conveniently 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.

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.

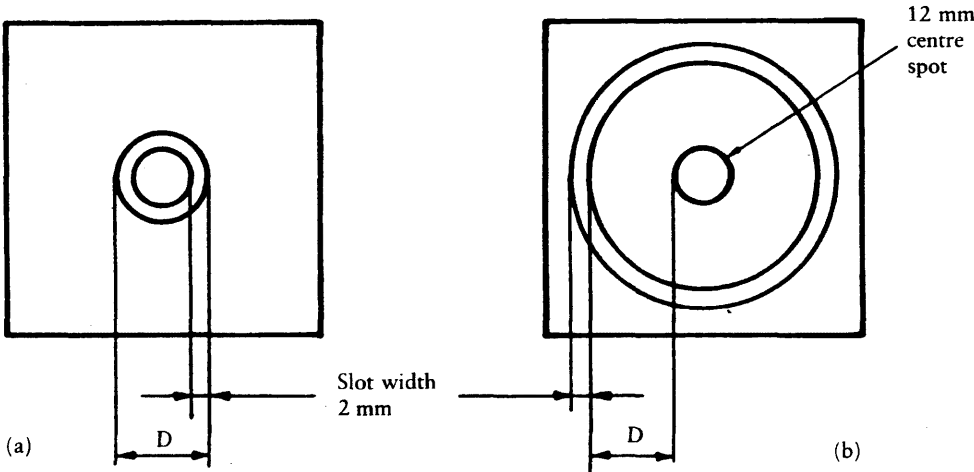


Figure 11

Dimensions of targets

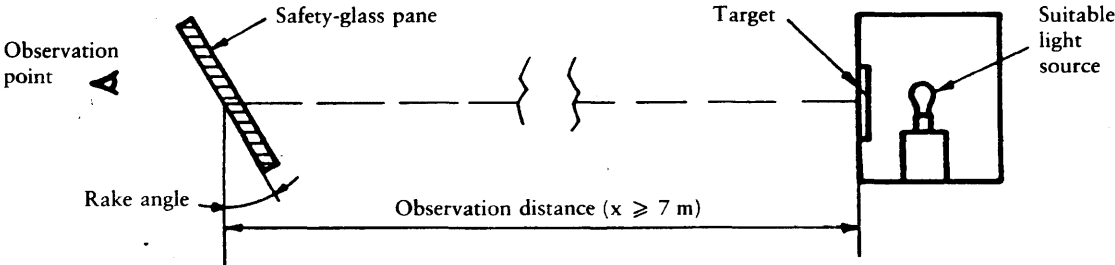
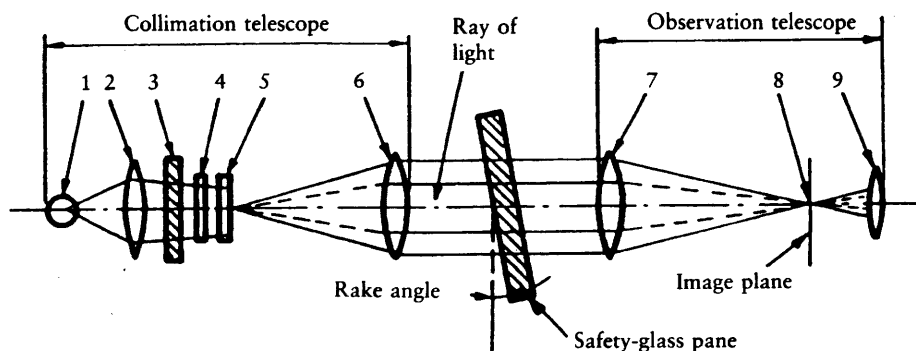


Figure 12

Arrangement of apparatus



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.

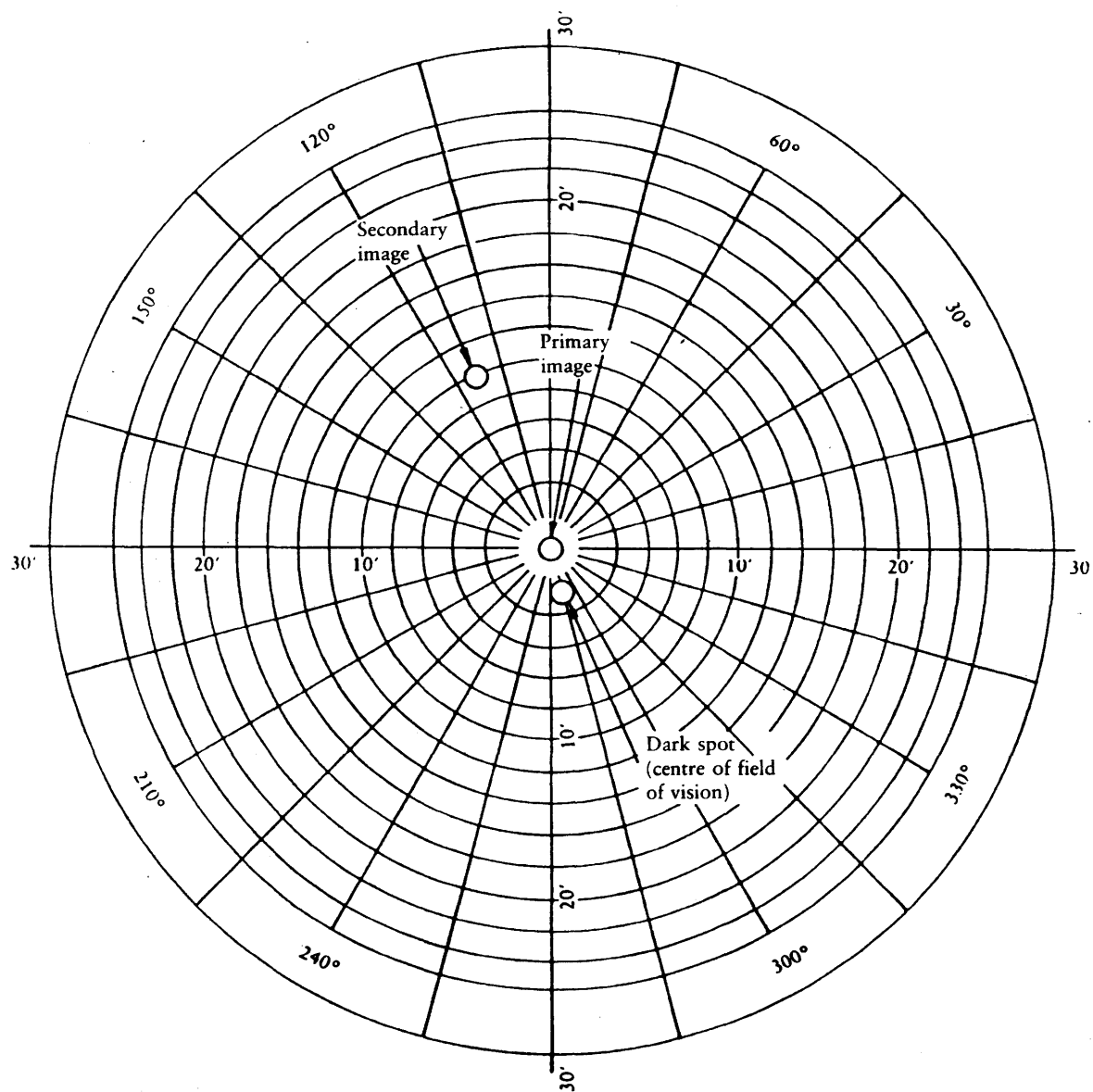


Figure 14

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

Polished plate glass	Float glass	Sheet glass
1	1	2

9.3.3.2. Other secondary characteristics

No other secondary characteristics are involved.

9.3.4. 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.

- 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.

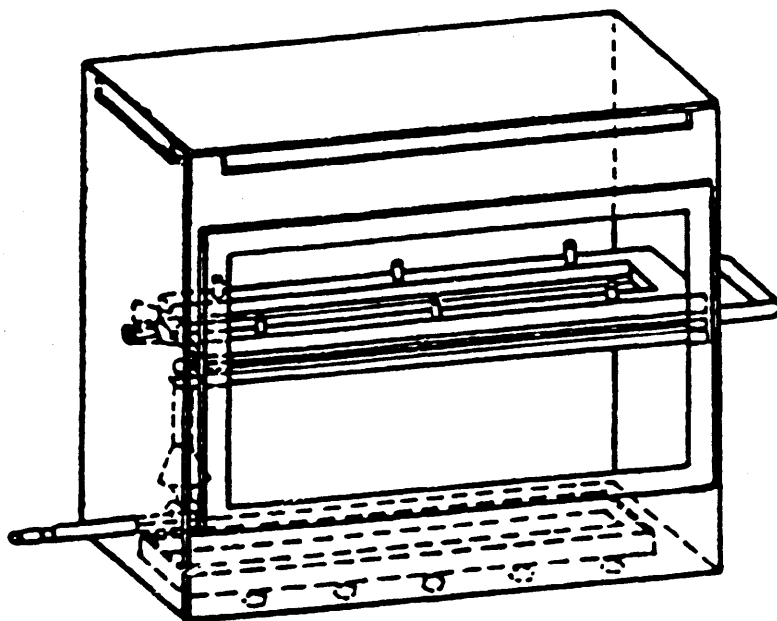


Figure 15

Example of combustion chamber with sample holder and drip pan

Dimensions in millimetres — tolerances according to ISO 2768

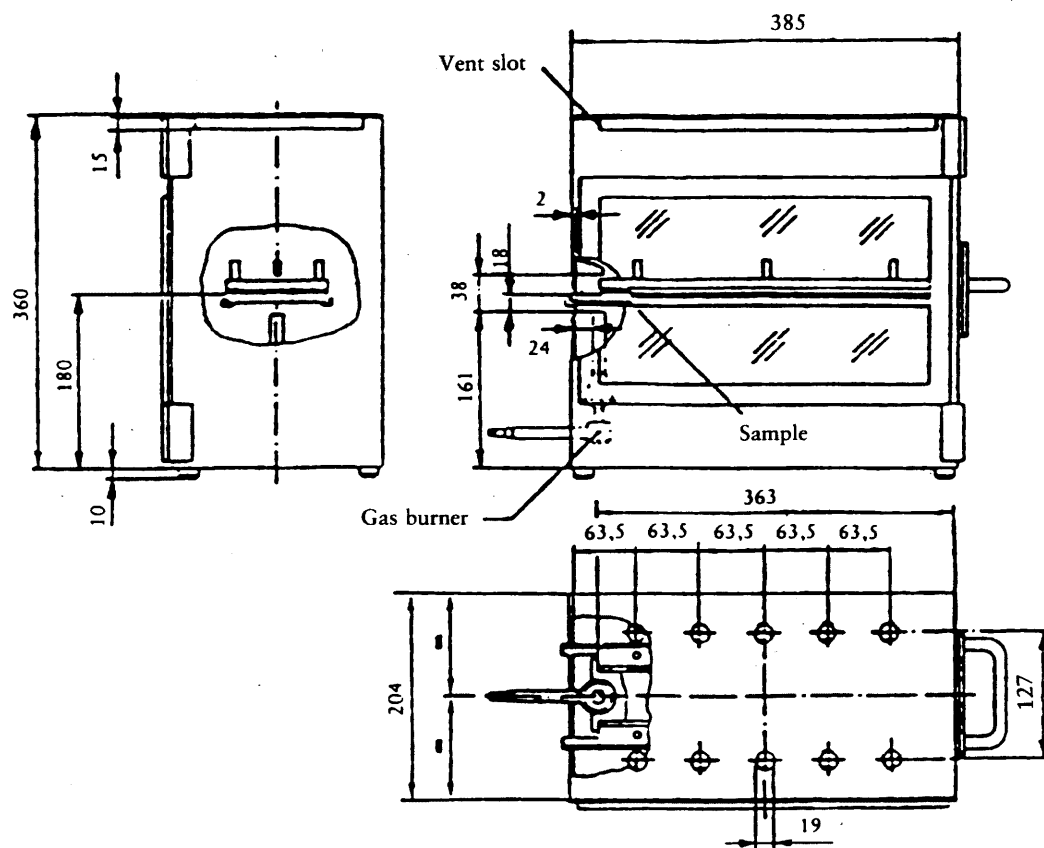


Figure 16

Example of combustion chamber

Dimensions in millimetres — tolerances according to ISO 2768

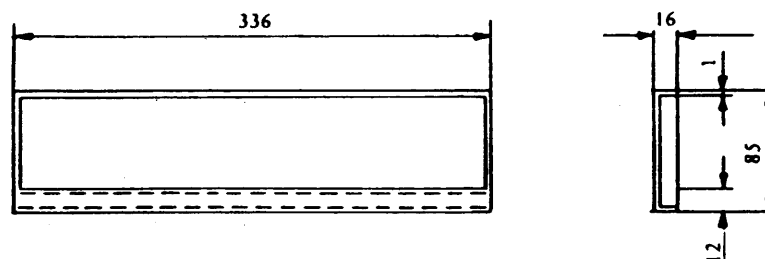


Figure 17

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).

Dimensions in millimetres — tolerances according to ISO 2768

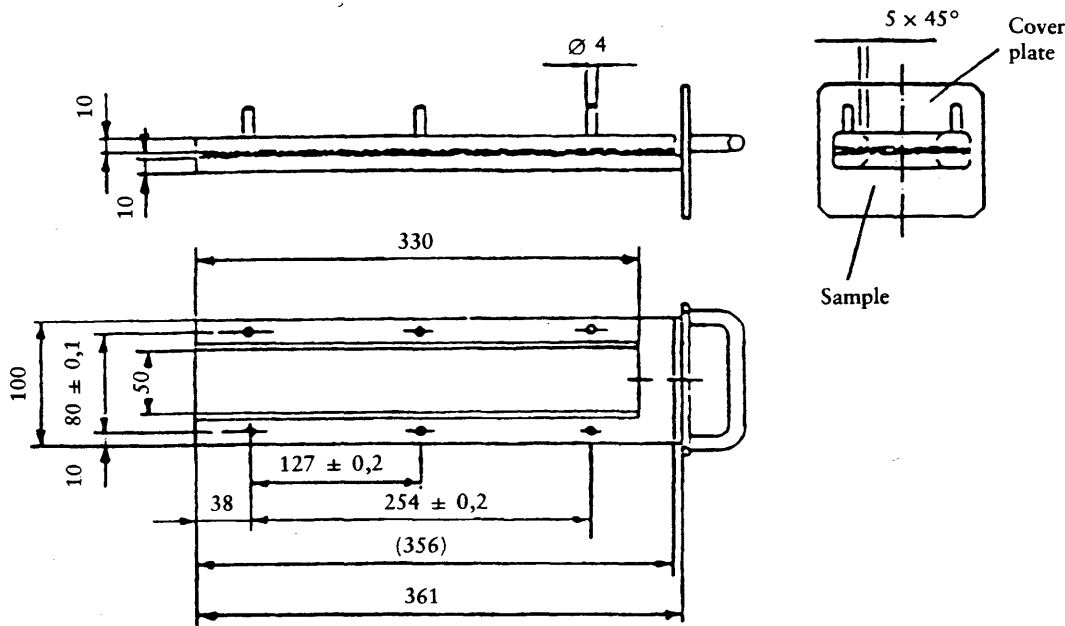


Figure 18

Example of sample holder

Dimensions in millimetres — tolerances according to ISO 2768

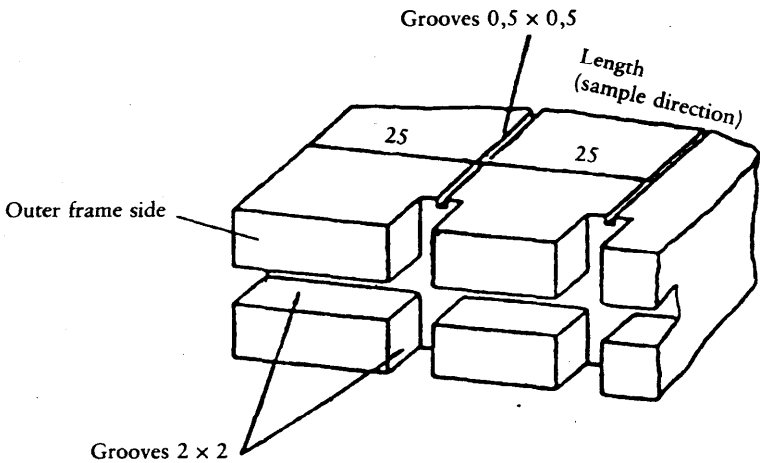


Figure 19

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.

10.4.7. *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 $2\frac{1}{2}$ 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:

- 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;
- 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;
- 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.

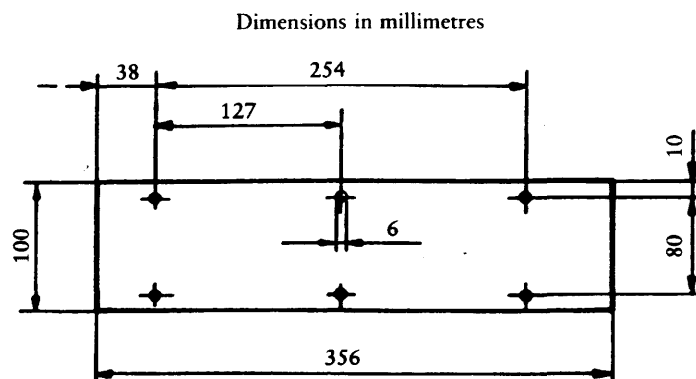


Figure 20

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.

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 of 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-l-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 transparence.

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 $1,5 \text{ m} \pm 0,5 \text{ mm}$.

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 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 mm × 500 + 5/ - 2 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 m + 25/ - 0 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 mm per side should be subjected to testing.

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 m + 25/ - 0 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 ± 0 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 $+40 \pm 2$ °C and 10 at a temperature of -20 ± 2 °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 ≤ 4,5	9	12	8,5	12
4,5 < e ≤ 5,5	10	15	9	15
5,5 < e ≤ 6,5	11	20	9,5	20
e > 6,5	12	25	10	25

(*) A tolerance of +25/ - 0 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.

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
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 M₁ 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 M₁, 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.

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.

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 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.
-

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	Seat back rake angle (degrees)	Horizontal coordinates X	Vertical coordinates Z
5	- 186 mm	28 mm	23	- 17 mm	5 mm
6	- 176 mm	27 mm	24	- 9 mm	2 mm
7	- 167 mm	27 mm	25	0 mm	0 mm
8	- 157 mm	26 mm	26	9 mm	- 3 mm
9	- 147 mm	26 mm	27	17 mm	- 5 mm
10	- 137 mm	25 mm	28	26 mm	- 8 mm
11	- 128 mm	24 mm	29	34 mm	- 11 mm
12	- 118 mm	23 mm	30	43 mm	- 14 mm
13	- 109 mm	22 mm	31	51 mm	- 17 mm
14	- 99 mm	21 mm	32	59 mm	- 21 mm
15	- 90 mm	20 mm	33	67 mm	- 24 mm
16	- 81 mm	18 mm	34	76 mm	- 28 mm
17	- 71 mm	17 mm	35	84 mm	- 31 mm
18	- 62 mm	15 mm	36	92 mm	- 35 mm
19	- 53 mm	13 mm	37	100 mm	- 39 mm
20	- 44 mm	11 mm	38	107 mm	- 43 mm
21	- 35 mm	9 mm	39	115 mm	- 47 mm
22	- 26 mm	7 mm	40	123 mm	- 52 mm

2. TEST ZONES

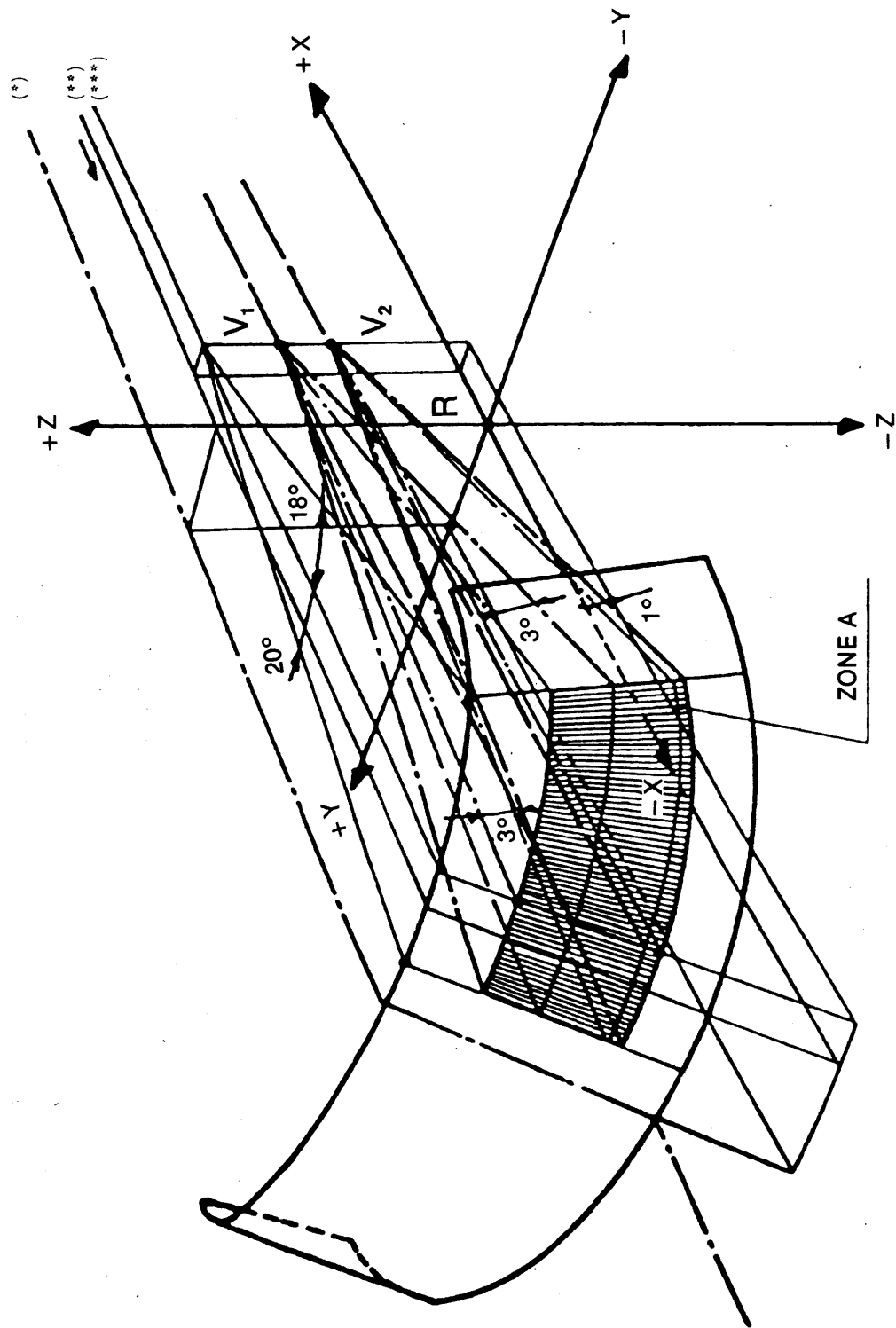
- 2.1. Two test zones are determined, starting from the 'V' points.
- 2.2. Test zone A is the zone on the outer apparent surface of the windscreen delimited by the four following planes projecting forwards from the 'V' points (see Figure 1).

- 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 V_1 and V_2 .

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

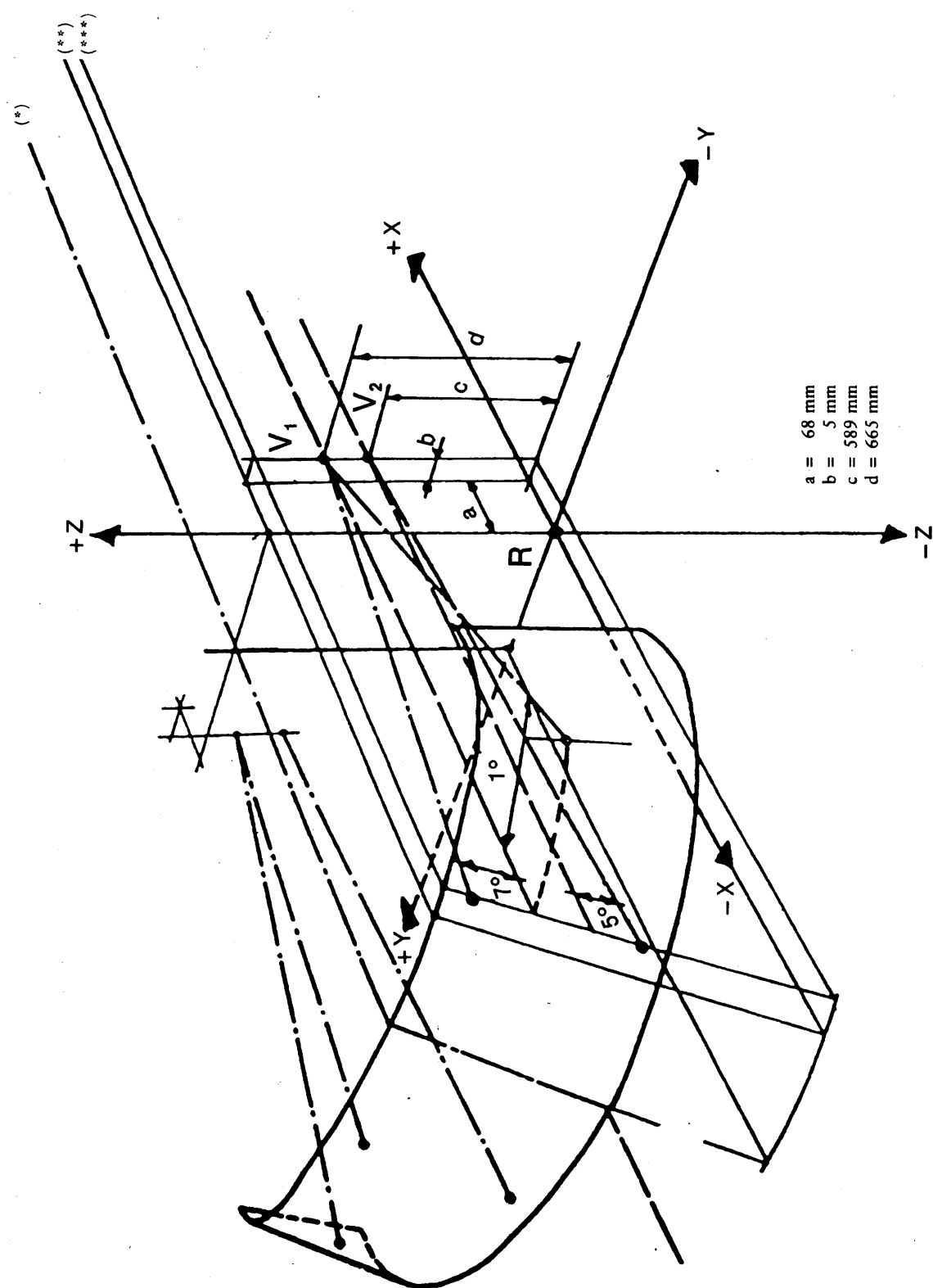


Figure 3

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

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: $3,5 \text{ mm} < e \leq 6,5 \text{ mm}$,Category III: $4,5 \text{ mm} < e \leq 6,5 \text{ mm}$,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.

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
- 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
$e \leq 3,5 \text{ mm}$	2,0 m + 5/ - 0 mm
$3,5 \text{ mm} < e$	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:

- 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: $e < 5,5$ 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 $1,50 \text{ mm} + 0 / - 5 \text{ mm}$.

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	} + 25/-0 mm
$5,5$ mm $\leq e \leq 6,5$ mm	6 m	
$6,5$ mm $\leq e$	7 m	

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.

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 interlayer.

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.

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.

- 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.

8. RESISTANCE-TO-CHEMICAL AGENTS TEST

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

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:
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 windscreens:
 - 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.

ANNEX II M

MEASUREMENTS OF SEGMENT HEIGHTS AND POSITION OF IMPACT POINTS

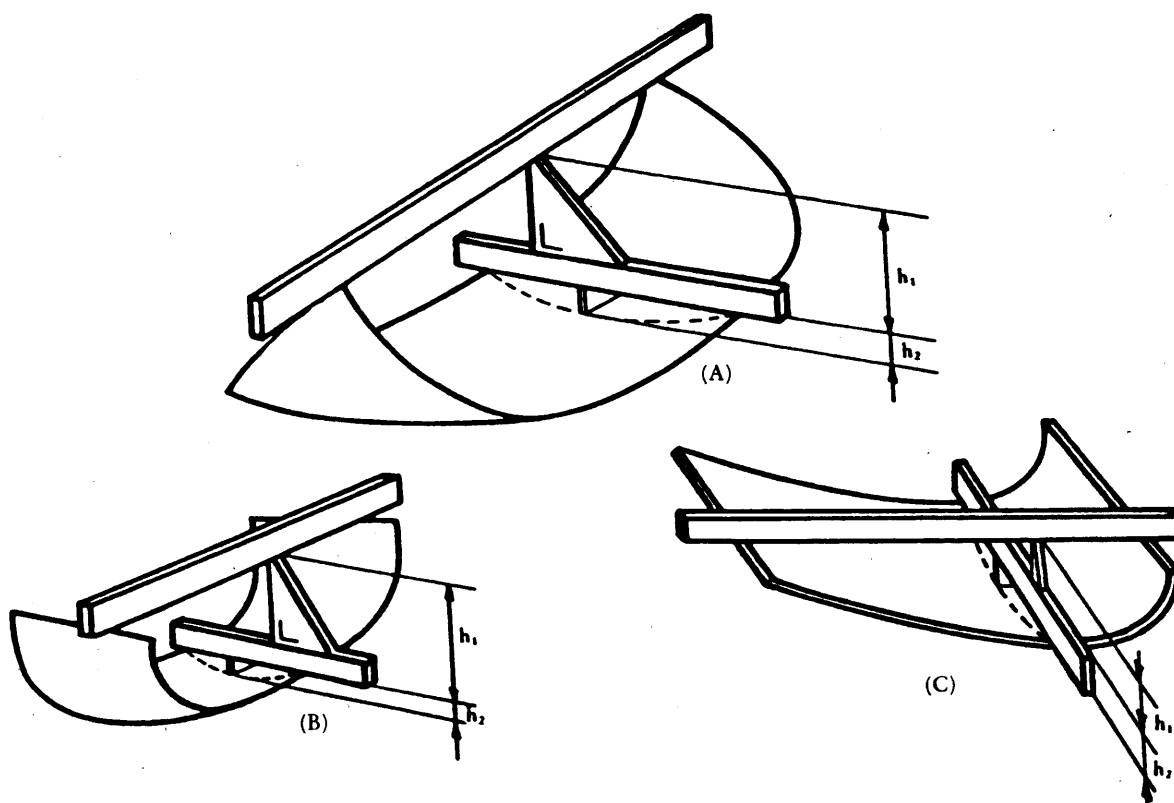


Figure 1

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.

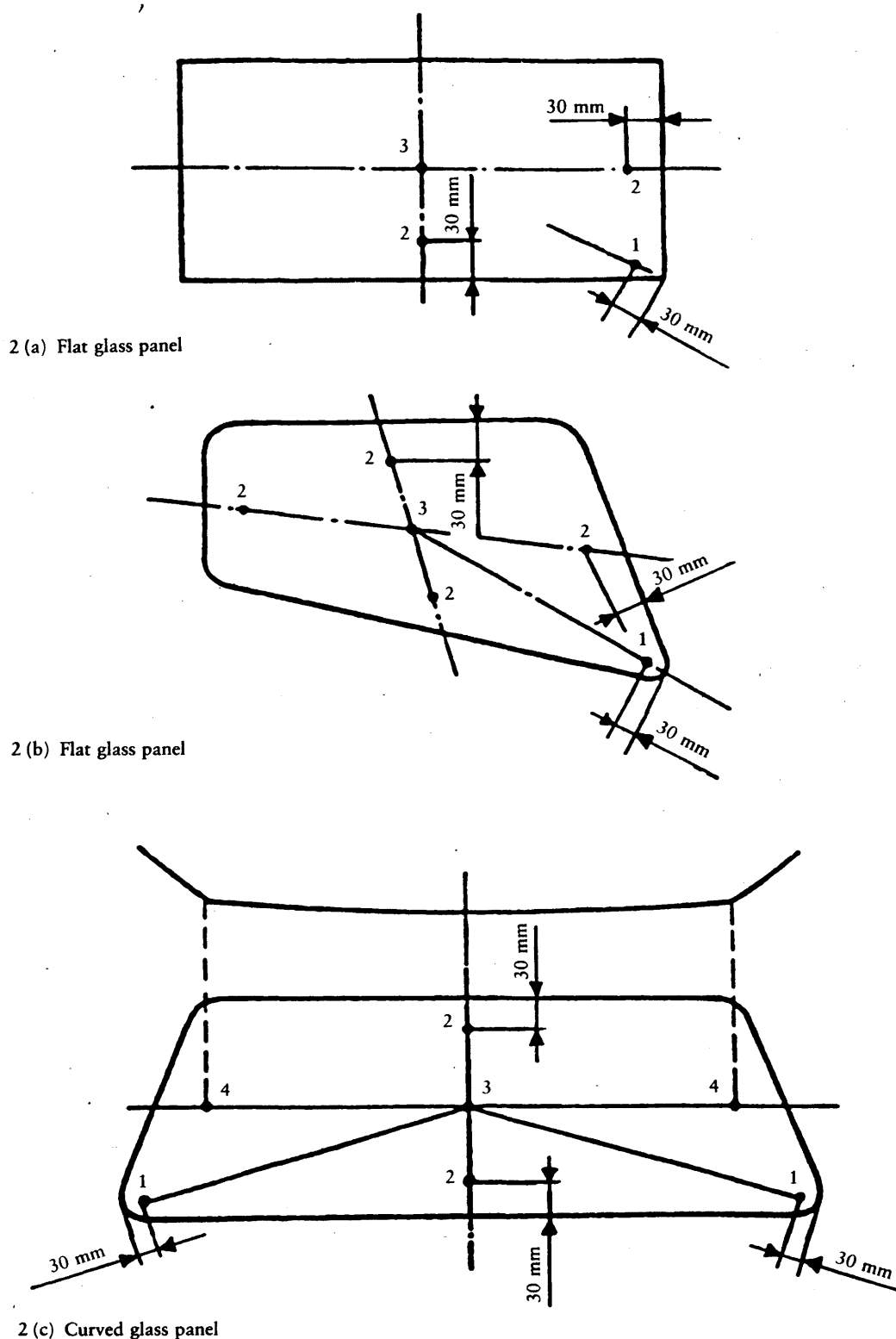


Figure 2 (a), (b) and (c)

Prescribed points of impact for panes of uniformly toughened glass

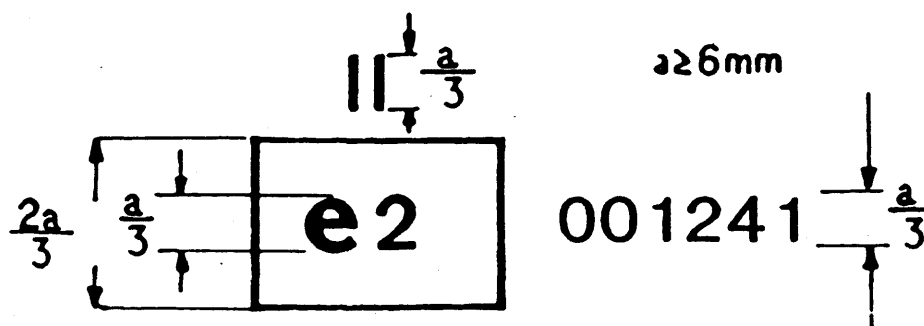
The points '2' shown in figure 2 (a), (b) and (c) are examples of the sites for point '2' prescribed in Annex II H, item 2.5.

ANNEX II N

EXAMPLES OF EEC COMPONENT TYPE-APPROVAL MARKS

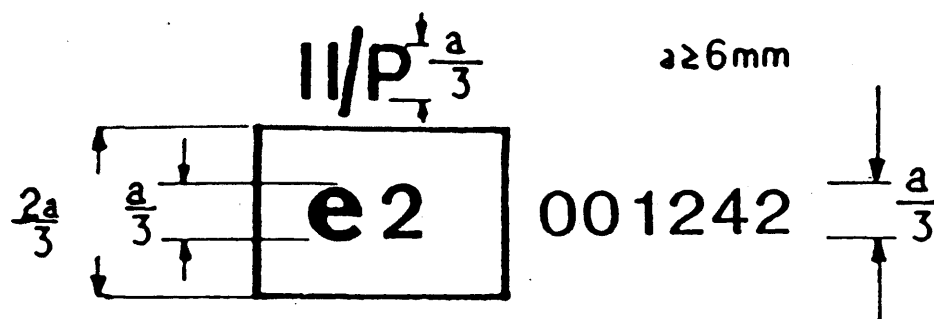
(see item 4.7 in Annex II)

Ordinary toughened-glass windscreen:



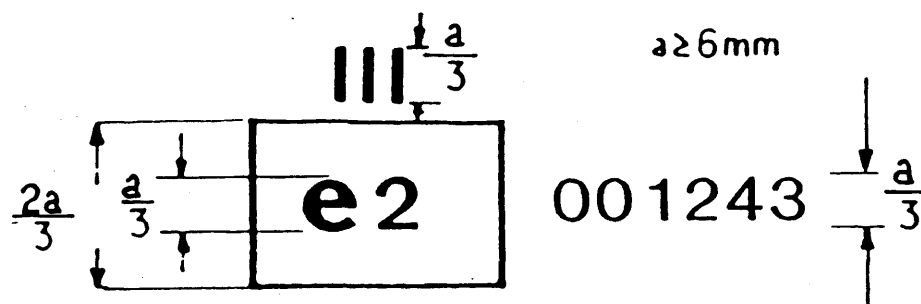
The above component type-approval mark, affixed to an ordinary toughened-glass windscreen, shows that the component concerned was approved in France (e2) pursuant to this Directive under component type-approval No 001241.

Toughened-glass windcreens faced with plastic material:



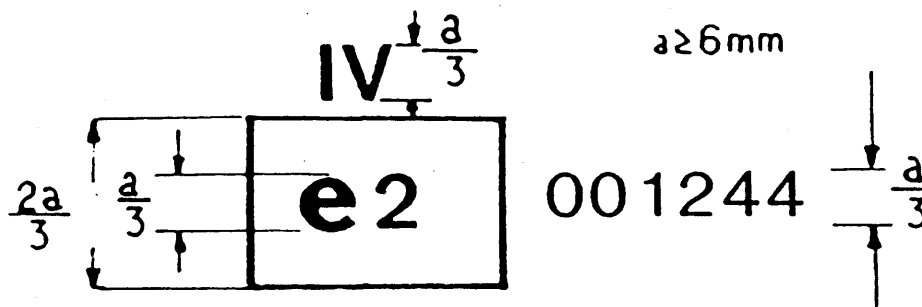
The above component type-approval mark affixed to an ordinary toughened-glass windscreen faced with plastic material shows that the component concerned was approved in France (e2) pursuant to this Directive under component type-approval No 001242.

Treated laminated-glass windcreens:



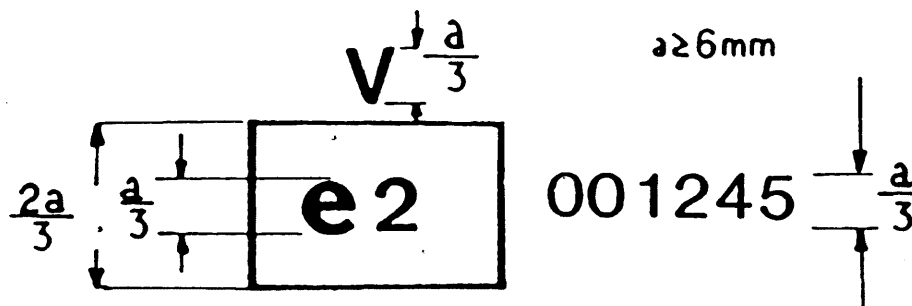
The above component type-approval mark affixed to a treated laminated-glass windscreen shows that the component concerned was approved in France (e2) pursuant to this Directive under component type-approval No 001243.

Glass-plastic windscreens:



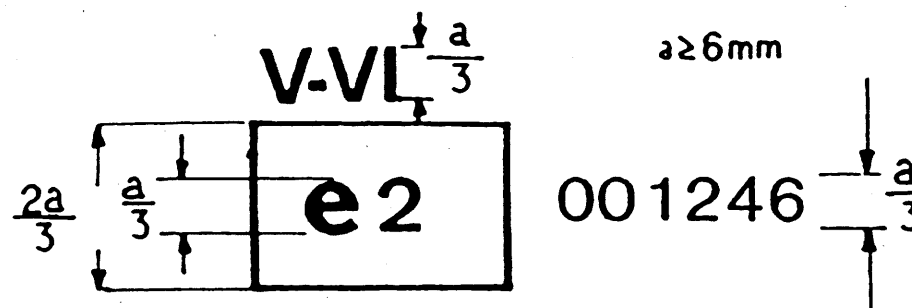
The above component type-approval mark affixed to a treated glass-plastic windscreen shows that the component concerned was approved in France (e2) pursuant to this Directive under component type-approval No 001244.

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



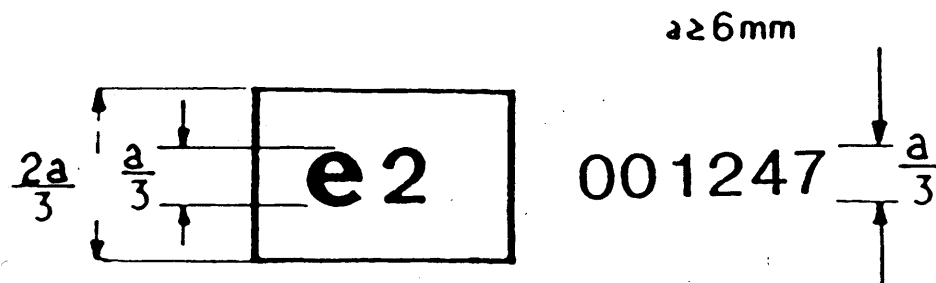
The above component type-approval mark affixed to a glass pane other than windscreen to which the requirements of Annex II A, item 9.1.4.2, are applicable shows that the component concerned was approved in France (e2) pursuant to this Directive under component type-approval No 001245.

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:



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.
 - 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 windscreens
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.
- 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.

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.

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.

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).

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).

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:

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:

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:

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:

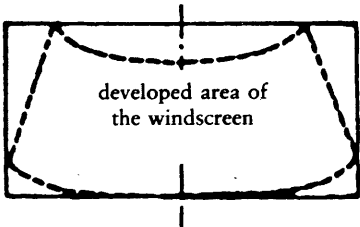
Appendix 7

CONTENTS OF THE LIST OF WINDSCREENS ⁽¹⁾

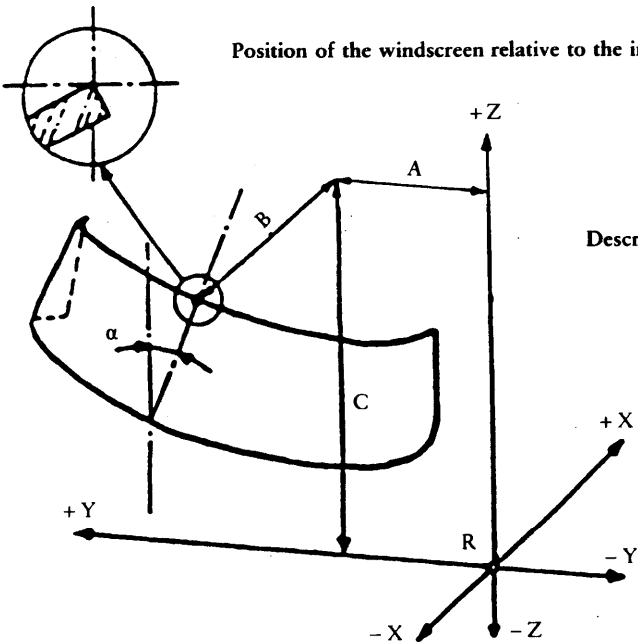
At least the following information shall be supplied for each of the windcreens covered by this component type-approval:

- 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:
.....
.....

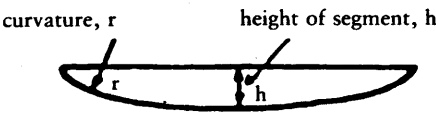
Description of the parameter, F, of the windscreen



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.

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 windscreen 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 of 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.

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 windcreens:
 - 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.

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:
-
-
-
-
-

COUNCIL DIRECTIVE 92/23/EEC

of 31 March 1992

relating to tyres for motor vehicles and their trailers and to their fitting

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 in order gradually to establish the internal market during a period expiring on 31 December 1992; whereas the internal market comprises an entity without internal frontiers within which the free movement of goods, persons, services and capital shall be guaranteed;

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 technical requirements which motor vehicles and their trailers must satisfy pursuant to national laws relate, *inter alia*, to pneumatic tyres;

Whereas these requirements differ from one Member State to another; whereas it is therefore necessary that all Member States adopt the same requirements either in addition to or in place of their existing rules in order to permit, in particular, the EEC type-approval procedure which was the subject of 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⁾, to be introduced in respect of each type of vehicle;

Whereas rules on tyres should lay down common requirements concerning not only their characteristics, but also the requirements for the equipment of vehicles and their trailers with regard to their tyres;

Whereas, consequently, a common procedure for granting an EEC mark to any tyre type complying with the common characteristics and test requirements should be established; whereas, at the Community level, to ensure the free movement of tyres, the conformity of the tyres with the common requirements is assured by the affixing on each tyre of an EEC mark which has been granted to the manufacturer in accordance with the abovementioned procedure; whereas any Member States may, in order to check the conformity of the tyres with the common requirements, carry out controls at any moment; whereas, in the case of a statement of non-conformity, the Member States need to take the necessary steps to ensure the conformity of the tyres with the requirements; whereas these measures may result in the withdrawal of the abovementioned EEC mark;

Whereas it is desirable to take into account the technical requirements adopted by the UN Economic Commission for Europe in its Regulation No 30 ('Uniform provisions concerning the approval of pneumatic tyres for motor vehicles and their trailers'), as amended ⁽⁶⁾, and in its Regulation No 54 ('Uniform provisions concerning the approval of pneumatic tyres for commercial vehicles and their trailers') ⁽⁷⁾ and in its Regulation No 64 ('Uniform provisions concerning the approval of vehicles equipped with temporary-use spare wheels/tyres') ⁽⁸⁾, which are annexed to the Agreement of 20 March 1958 concerning the adoption of uniform conditions for approval and reciprocal recognition of approval for motor vehicle equipment and parts;

Whereas the approximation of national laws relating to motor vehicles entails reciprocal recognition by Member States of the checks carried out by each of them on the basis of the common requirements,

HAS ADOPTED THIS DIRECTIVE:

Article 1

For the purposes of this Directive:

— 'tyre' means any new pneumatic tyre designed for the equipment of vehicles of which Council Directive 70/156/EEC applies;

⁽¹⁾ OJ No C 95, 12. 4. 1990, p. 101.

⁽²⁾ OJ No C 284, 12. 11. 1990, p. 81 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.

⁽⁶⁾ Economic Commission for Europe document E/ECE/324 (E3/ECE/TRANS/505) REV 1 — ADD 29, 1. 4. 1975 and its amendments 01, 02 and supplements.

⁽⁷⁾ Economic Commission for Europe document E/ECE/324 (E/ECE/TRANS/505) REV 1 — ADD 53 and supplements.

⁽⁸⁾ Economic Commission for Europe document E/ECE/324 (E/ECE/TRANS/505) REV 1 — ADD 63 and supplements.

- 'vehicle' means any vehicle to which Council Directive 70/156/EEC applies;
- 'manufacturer' means the holder of the trade name or mark of vehicles or tyres.

Article 2

1. Member States shall grant EEC component type-approval under the conditions of Annex I for any tyre type which satisfies the requirements of Annex II and shall grant a EEC component type-approval number as specified in Annex I.

2. Member States shall grant EEC type-approval for a vehicle with regard to its tyres under the conditions of Annex III for any vehicle for which all the tyres (including the spare tyre, if any) satisfy the requirements of Annex II and also the requirements with regard to vehicles of Annex IV and shall grant an EEC vehicle type-approval number as specified in Annex III.

Article 3

The approval authority of a Member State shall, within one month of issuing or refusing an EEC component (tyre) or vehicle type-approval, send a copy of the relevant certificate, models of which are given in the Appendices to Annex I and Annex III, to the other Member States and, if requested, send the test report on any type of tyre approved.

Article 4

No Member State may prohibit or restrict the placing on the market of tyres bearing the EEC component type-approval mark.

Article 5

No Member State may refuse to grant EEC type-approval or national type-approval to a vehicle on grounds relating to its tyres if these bear the EEC component type-approval mark and are fitted in accordance with the requirements laid down in Annex IV.

Article 6

No Member State may refuse or prohibit the sale, registration, entry into service or use of a vehicle on grounds relating to its tyres if these bear the EEC component type-approval mark and are fitted in accordance with the requirements laid down in Annex IV.

Article 7

1. If, on the basis of a substantiated justification, a Member State considers that a tyre type or a vehicle type is

dangerous although complying with the requirements of this Directive, it may, within its territory, provisionally prohibit the marketing of that product or subject it to special conditions. It shall immediately inform the other Member States and the Commission thereof, stating the grounds for its decision.

2. The Commission shall, within six weeks, consult the Member States concerned, following which it shall deliver its opinion without delay and take the appropriate steps.

3. If the Commission is of the opinion that technical adaptations to the Directives are necessary, such adaptations shall be adopted by either the Commission or the Council in accordance with the procedure laid down in Article 10. In this event, the Member State which has adopted safeguard measures may maintain them until the entry into force of the adaptations.

Article 8

1. The Member State which has granted the EEC component (tyre) or vehicle type-approval shall take the measures required in order to verify that production models conform to the approved type in so far as this is necessary and if need be in cooperation with the approval authorities in the other Member States. For this purpose, this Member State may at any time check the conformity of the tyres or vehicles to the requirements of this Directive. Such verification shall be limited to spot checks.

2. If this Member State finds that a number of tyres or vehicles with the same approval marking do not conform to the approved type, it shall take the necessary measures to ensure that production models so conform. Where there is a consistent failure to conform, these measures may extend to a withdrawal of EEC type-approval. The said authorities shall take the same measure if they are informed by the approval authorities of another Member State of such failure to conform.

3. The approval authorities of the Member States shall within one month notify each other using the relevant form shown in the Appendices to Annex I and Annex III of any withdrawal of EEC type-approval and of the reasons for such a measure.

Article 9

Any decision taken pursuant to the provisions adopted in implementation of this Directive to refuse or withdraw EEC component type-approval for a tyre or EEC type-approval of a vehicle with regard to the fitting of its tyres implying a prohibition of marketing or of use shall set out in detail the reasons on which it is based. Every 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 10

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 11

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 the Member States adopt these measures, they shall contain a reference to this Directive or shall be accompanied by such a 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 measures from 1 January 1993.

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 12

This Directive is addressed to the Member States.

Done at Brussels, 31 March 1992.

For the Council
The President
Vitor MARTINS

LIST OF ANNEXES

ANNEX I	Administrative provisions for the component type-approval of tyres
Appendix 1	Information document for a tyre
Appendix 2	EEC component type-approval certificate for a tyre
ANNEX II ⁽¹⁾	Requirements for tyres
Appendix 1	Explanatory figure
Appendix 2	List of symbols of load-capacity indices and corresponding maximum mass to be carried (kg)
Appendix 3	Arrangement of tyre markings
Appendix 4	Relationship between the pressure index and the units of pressure
Appendix 5	Measuring rim, outer diameter and section width of tyres of certain size designations
Appendix 6	Method of measuring tyre dimensions
Appendix 7	Load/speed test procedure
Appendix 8	Variation of load capacity index with speed; commercial-vehicle tyres radial and diagonal
ANNEX III	Administrative provisions for type-approval of vehicles with regard to the fitting of their tyres
Appendix 1	Information document for a vehicle
Appendix 2	EEC type-approval certificate for a vehicle
ANNEX IV	Requirements for vehicles with regard to the fitting of their tyres

⁽¹⁾ The technical requirements for tyres are similar to those of Regulations Nos 30 and 54 of the Economic Commission for Europe.

ANNEX I

ADMINISTRATIVE PROVISIONS FOR THE COMPONENT TYPE-APPROVAL OF TYRES

1. APPLICATION FOR THE EEC COMPONENT TYPE-APPROVAL OF A TYPE OF TYRE

- 1.1. Application for EEC component type-approval for a type of tyre is submitted by the tyre manufacturer or by his authorized representative.
- 1.2. It is accompanied, in triplicate, by a description of the tyre as described in the information document in Appendix 1.
- 1.3. On request of the approval authority, the tyre manufacturers or his representative must also submit a complete technical file for each tyre type containing in particular the test reports, drawings or photographs (three copies) of the side walls and of the tread of the tyre, as well as a dimensioned drawing of the cross-section of the tyre and/or one or two samples of each tyre type. The photographs or drawings must show the proposed position of the EEC component type-approval mark.
- 1.4. The manufacturer or his representative may apply for the EEC component type-approval to be extended to include modified tyre types.

2. INSCRIPTIONS

Specimens of a type of tyre submitted for EEC component type-approval must bear the applicant's clearly visible and indelible trade mark or name and must allow sufficient space for the inscription of the EEC component type-approval mark; this space must be indicated in the documents referred to in 1.2.

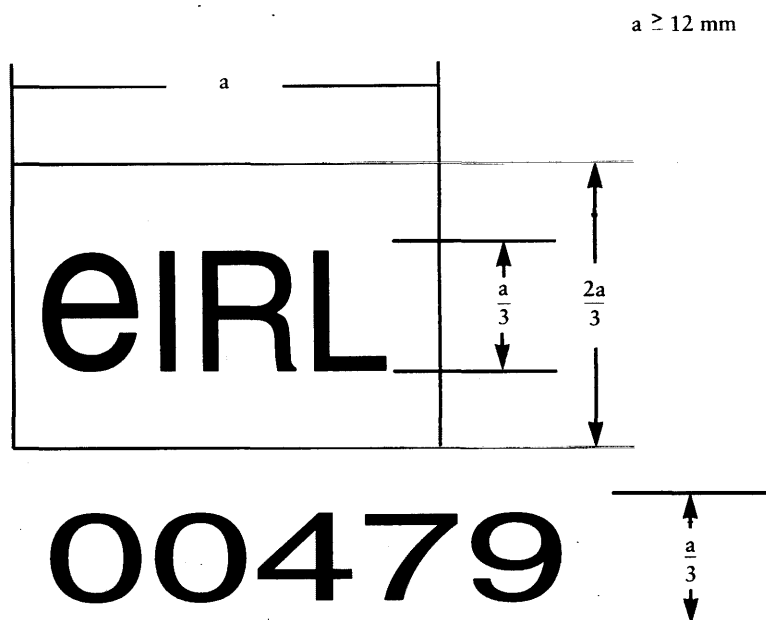
3. EEC COMPONENT TYPE-APPROVAL (TYRES)

- 3.1. EEC component type-approval is granted and a component type-approval number issued in respect of any tyre type submitted in accordance with 1.1 which satisfies the requirements of this Directive.
- 3.2. Notice of approval or of extension or of refusal of approval of a tyre type pursuant to this Directive must be communicated to the Member States by means of a form conforming to the model in Appendix 2.
- 3.3. An approval number is assigned to each tyre type approved. The same Member State must not assign the same number to another tyre type.

4. EEC COMPONENT TYPE-APPROVAL MARKING OF TYRES

- 4.1. Any tyre conforming to a type in respect of which component type-approval has been granted pursuant to this Directive must bear an EEC component type-approval mark.
- 4.2. The EEC component type-approval mark consists of a rectangle surrounding the lower case letter 'e' followed by the distinguishing letter(s) or number of the Member State which has granted the component type-approval: 1 for 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. The EEC component type-approval number consists of the component type-approval number shown on the certificate completed for the type, preceded by two figures indicating the sequence number of the latest amendment to this Council Directive on the date EEC component type-approval was granted. The amendment sequence number in this Directive is 00 for commercial vehicle tyres, 02 for passenger car tyres.
- 4.3. The EEC component type-approval mark and number, as well as additional markings required in Annex II, section 3 must be affixed as prescribed in that section.
- 4.4. The rectangle forming the EEC mark must have a minimum length of 12 mm and a minimum height of 8 mm. Letters and number(s) must be at least 4 mm in height.

- 4.5. An example of the EEC mark is given below:



The tyre bearing the EEC mark shown above is a tyre satisfying the EEC requirements (e), for which the EEC mark has been granted under the number (479) in Ireland (IRL) on the basis of this Directive.

Note: The number 479 (component type-approval number of the EEC mark) and the letters IRL (letters of the Member State which has granted the EEC mark) are for guidance only.

The approval number must be placed close to the rectangle and either above or below or to the left or the right. The digits of the approval number must all be on the same side of the 'e' and face in the same direction.

5. MODIFICATION OF A TYRE TYPE

- 5.1. Every modification of a tyre type must be notified to the approval authority which approved the tyre type. That approval authority may then either:
 - 5.1.1. consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the tyre still meets the requirements, or
 - 5.1.2. require a further test report from the technical service responsible for carrying out the tests.
- 5.2. A modification of the tread pattern of a tyre is deemed as not necessitating a repetition of the tests prescribed in Annex II.
- 5.3. Confirmation or refusal of approval, specifying the alterations, is communicated to the other Member States by the procedure specified in 3.2.

6. CONFORMITY OF PRODUCTION OF TYRES

- 6.1. Every production tyre bearing the EEC component type-approval mark in accordance with this Directive must be so manufactured that it conforms to all of the relevant requirements of this Directive.
- 6.2. In order to verify that the requirements of 6.1 are met, suitable checks on the production must be carried out.
- 6.3. The holder of the approval must in particular:
 - 6.3.1. ensure existence of procedures for the effective control of the quality of products,
 - 6.3.2. have access to the the control equipment necessary for checking the conformity to each approved type,

- 6.3.3. ensure that data of test results are recorded and that annexed documents remain available for a period to be determined in accordance with the approval authority,
- 6.3.4. analyse the results of each type of test, in order to verify and ensure the stability of the product characteristics making allowance for variation of an industrial production,
- 6.3.5. ensure that for each type of tyre at least the tests prescribed in this Directive are carried out,
- 6.3.6. ensure that any sampling of samples or test-pieces giving evidence of non-conformity with the type of test considered give rise to another sampling and another test. All the necessary steps must be taken to re-establish the conformity of the corresponding production.
- 6.4. The approval authority which has granted component type-approval may at any time verify the conformity control methods applicable to each production unit.
 - 6.4.1. In every inspection, the test books and production survey records must be presented to the visiting inspector.
 - 6.4.2. The inspector may take samples at random which will be tested in the manufacturer's laboratory. The minimum number of samples may be determined according to the results of the manufacturer's own verification.
 - 6.4.3. When the quality level appears unsatisfactory or when it seems necessary to verify the validity of the tests carried out in application of 6.4.2 the inspector must select samples to be sent to the technical service which has conducted the type-approval tests.
 - 6.4.4. The approval authority may carry out any test prescribed in this Directive.
 - 6.4.5. The normal frequency of inspections authorized by the approval authority is one per year. In the case where negative results are recorded during one of these visits, the approval authority must ensure that all necessary steps are taken to re-establish the conformity of production as rapidly as possible.

7. PRODUCTION DEFINITELY DISCONTINUED

If the holder of an approval completely ceases to manufacture a type of tyre approved in accordance with this Directive, he must so inform the authority which granted the approval. Upon receiving the relevant communication that authority must inform thereof the other approval authorities by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation 'PRODUCTION DISCONTINUED'.

Appendix 1

INFORMATION DOCUMENT No RELATING TO EEC COMPONENT TYPE-APPROVAL FOR A TYRE
(DIRECTIVE 92/23/EEC)

The following information, if applicable, must be supplied in triplicate and include a list of contents. Drawings, if any, must be supplied in appropriate scale and in sufficient detail on size A4 or folded to that size. In the case of microprocessor controlled functions supply relevant performance-related information.

0. GENERAL

- 0.1. Make (trade name of manufacturer):
- 0.2. Commercial description(s):
- 0.3. Means of identification (tyre-size designation):
- 0.5. Name and address of applicant:
- 0.7. Address(es) of manufacturing plant(s):

6. TYRES

- 6.1. The category of use:
- 6.2. The structure:
- 6.3. The speed category:
- 6.4. The load-capacity index (indices):
— single formation:
— dual (twin) formation:
- 6.5. Whether the tyre is to be fitted with or without an inner tube:
- 6.7. Whether the tyre is:
- 6.7.1. Passenger car 'standard' or 'reinforced' or 'T-type temporary use spare' tyre:
- 6.7.2. Commercial vehicle 'regroovable' tyre:
- 6.8. The ply-rating number (if applicable) of diagonal (bias-ply) tyres:
- 6.9. The overall dimensions: overall section width and outer diameter:
- 6.10. The rim(s) on which the tyre can be mounted:
- 6.11. The measuring rim and test rim:
- 6.12. The measuring pressure (bar):
- 6.13. The additional load/speed combinations in cases where section 6.2.5 of Annex II is applied:
- 6.14. The test pressure where the manufacturer requests the application of section 1.3 of Appendix 7, Part A of Annex II or the 'PSI' pressure index:
- 6.15. The factor x referred to in section 2.20 of Annex II or the applicable table of Appendix 5 to Annex II:

Appendix 2

MODEL

(maximum format: A 4 (210 × 297 mm))

EEC COMPONENT TYPE-APPROVAL CERTIFICATE
(tyre)

STAMP OF ADMINISTRATION

Communication concerning the:

- type-approval ⁽¹⁾
- extension of type-approval ⁽¹⁾
- refusal of type-approval ⁽¹⁾

of a component with regard to Directive 92/23/EEC relating to tyres.

EEC component type-approval No: Extension No:

SECTION I

0. General
- 0.1. Make (trade name of manufacturer):
- 0.2. Commercial description(s):
- 0.3. Means of identification marked on the component (tyre) ^(a):
- 0.4. List of applicable annexes:
- 0.5. Name and address of applicant:
- 0.6. Address(es) of manufacturing plant(s):

⁽¹⁾ Delete where inapplicable.

(a) The means of identification of type, if used, must appear only on those tyres covered by the individual approval.

If the means of identification of type contains characters not relevant to describe the tyre types covered by this component type-approval certificate (e.g. a date code) such characters must be represented in the documentation by the symbol: '?' (e.g. ABC ?? 123 ??)

- the size designation,
- the category of use,
- the load capacity index,
- the speed category,
- whether or not the tyre may be used tubeless,
- whether or not the tyre is 'reinforced' or 'T-type temporary use spare tyre' in the case of passenger car tyres,
- whether or not the tyre is 'regroovable' in the case of commercial vehicle tyres,
- additional load capacity index/indices and speed category symbol.

SECTION II

1. **Additional information**
 - 1.1. The list of rims on which the tyres may be fitted:
 2. Technical service responsible for carrying out the tests:
 3. Date of test report:
 4. Number of test report:
 5. Grounds for extending component type-approval (where appropriate):
.....
 6. Comments (if any):
 7. Place:
 8. Date:
 9. Signature:
 10. A list of documents making up the component type-approval file lodged with the authority that has granted the approval and which may be obtained on request, is attached.
-

ANNEX II

REQUIREMENTS FOR TYRES

1. DEFINITIONS

2. For the purposes of this Directive:

2.1. 'type of tyre' means a category of tyres which do not differ in such essential respects as:

2.1.1. manufacturer's name or trade mark;

2.1.2. tyre-size designation;

2.1.3. category of use:

— normal: normal road-use tyre,

— special: special-use tyre, e.g. tyre for mixed use (both on and off the road) and at restricted speed,

— snow tyre,

— temporary-use spare tyre;

2.1.4. structure (diagonal (bias-ply), bias-belted, radial-ply);

2.1.5. speed category;

2.1.6. load capacity index;

2.1.7. tyre cross-section;

2.2. 'snow tyre' means a tyre the tread pattern and structure of which are primarily designed to ensure in mud and fresh or melting snow a performance better than that of a normal tyre. The tread pattern of a snow tyre generally consists of groove (rib) and/or solid-block elements more widely spaced than on a normal tyre;

2.3. 'structure' of a tyre means the technical characteristics of the tyre's carcass. The following structures are distinguished in particular:

2.3.1. 'diagonal' or 'bias-ply' describes a tyre structure in which the ply cords extend to the bead and are laid at alternate angles of substantially less than 90° to the centreline of the tread;

2.3.2. 'bias-belted' describes a tyre structure of diagonal (bias-ply) type in which the carcass is restricted by a belt comprising two or more layers of substantially inextensible cord material laid at alternate angles close to those of the carcass;

2.3.3. 'radial' describes a tyre structure in which the ply cords extend to the beads and are laid substantially at 90° to the centreline of the tread, the carcass being stabilized by an essentially inextensible circumferential belt;

2.3.4. 'reinforce' describes a tyre structure in which the carcass is more resistant than that of the corresponding standard tyre;

2.3.5. 'temporary-use spare tyre' means a tyre different from a tyre intended to be fitted to any vehicle for normal driving conditions; but intended only for temporary use under restricted driving conditions;

2.3.6. 'T-type temporary-use spare tyre' means a type of temporary-use spare tyre designed for use at inflation pressure higher than those established for standard and reinforced tyres;

2.4. 'bead' means the part of a tyre which is of such shape and structure as to fit the rim and hold the tyre on it ⁽¹⁾;2.5. 'cord' means the strands forming the fabric of the plies in the tyre ⁽¹⁾;2.6. 'ply' means a layer of rubber-coated parallel cords ⁽¹⁾;2.7. 'carcass' means that part of a tyre other than the tread and the rubber sidewalls which, when inflated, bears the load ⁽¹⁾;2.8. 'tread' means that part of a tyre which comes into contact with the ground ⁽¹⁾;2.9. 'sidewall' means the part of the tyre, excluding the tread, which is visible when the tyre, fitted to a rim, is viewed from the side ⁽¹⁾;⁽¹⁾ See explanatory figure, Appendix 1.

- 2.10. 'lower sidewall' means the area below the line of maximum section width of the tyre, which is visible when the tyre, fitted to a rim, is viewed from the side ⁽¹⁾;
- 2.11. 'tread groove' means the space between the adjacent ribs or blocks in the tread pattern ⁽¹⁾;
- 2.12. 'section width' means the linear distance between the outsides of the sidewalls of an inflated tyre, excluding elevations due to labelling (marking), decoration or protective bands or ribs ⁽¹⁾;
- 2.13. 'overall width' means the linear distance between the outsides of the sidewalls of an inflated tyre, including labelling (marking), decoration and protective bands or ribs ⁽¹⁾;
- 2.14. 'section height' means a distance equal to half the difference between the outer diameter of the tyre and the nominal rim diameter ⁽¹⁾;
- 2.15. 'nominal aspect ratio Ra' means one hundred times the number obtained by dividing the number expressing the nominal section height in millimetres by the number expressing the nominal section width in millimeters;
- 2.16. 'outer diameter' means the overall diameter of an inflated new tyre ⁽¹⁾;
- 2.17. 'tyre-size designation':
- 2.17.1. means a designation showing:
- 2.17.1.1. the nominal section width. This width must be expressed in mm, except in the case of tyres for which the size designation is shown in the first column of the tables in Appendix 5;
- 2.17.1.2. the nominal aspect ratio, except in the case of tyres for which the size designation is shown in the first column of the tables in Appendix 5;
- 2.17.1.3. a conventional number 'd' (the 'd' symbol) denoting the nominal rim diameter and corresponding to the diameter of the rim expressed either in inches (number below 100 — see table) or in mm (numbers above 100) but not both.

The exhaustive range of values is shown in the table below:

Nominal rim diameter (the 'd' symbol)	
Expressed in inches (code)	Equivalence in mm (reference section 6.1.2.1)
10	254
11	279
12	305
13	330
14	356
15	381
16	406
17	432
18	457
19	483
20	508
21	533
22	559
24	610
25	635
14,5	368
16,5	419
17,5	445
19,5	495
20,5	521
22,5	572
24,5	622

⁽¹⁾ See explanatory figure, Appendix 1.

- 2.17.1.4. the letter 'T' in front of the nominal section width in case of T-type temporary-use spare tyres;
- 2.18. 'nominal rim diameter (d)' means the diameter of the rim on which a tyre is designed to be mounted ⁽¹⁾;
- 2.19. 'rim' means the support for a tyre-and-tube assembly, or for a tubeless tyre, on which the tyre beads are seated ⁽¹⁾;
- 2.20. 'theoretical rim' means the notional rim whose width would be equal to x times the nominal section width of a tyre; the value 'x' must be specified by the tyre manufacturer;
- 2.21. 'measuring rim' means the rim on which a tyre must be fitted for size measurements;
- 2.22. 'test rim' means the rim on which a tyre must be fitted for testing;
- 2.23. 'chunking' means the breaking away of pieces of rubber from the tread;
- 2.24. 'cord separation' means the parting of the cords from their rubber coating;
- 2.25. 'ply separation' means the parting of adjacent plies;
- 2.26. 'tread separation' means the pulling away of the tread from the carcass;
- 2.27. 'tread-wear indicators' mean projections within the tread-grooves designed to give a visual indication of the degree of wear of the tread;
- 2.28. 'load-capacity index' means one or two numbers which indicate the load the tyre can carry in single or in single and dual formation at the speed corresponding to the associated speed category and when operated in conformity with the requirements governing utilization specified by the manufacturer. The list of these indices and their corresponding masses is given in Annex II, Appendix 2;
- 2.28.1. on passenger car tyres there must be one load index only;
- 2.28.2. on commercial vehicle tyres there may be one or two load indices, the first one for single formation and the second one, when present, for dual (twin) formation in which case the two indices are divided by a slash (/);
- 2.28.3. a type of tyre may have either one or two sets of load capacity indices depending on whether or not the provisions of section 6.2.5 are applied;
- 2.29. 'speed category', expressed by the speed category symbol as shown in the table in 2.29.3;
- 2.29.1. in the case of a passenger car tyre, the maximum speed which the tyre can sustain;
- 2.29.2. in the case of a commercial vehicle tyre, the speed at which the tyre can carry the mass corresponding to the load capacity index;
- 2.29.3. The speed categories are as shown in the table below:

Speed category symbol	Corresponding speed (km/h)
F	80
G	90
J	100
K	110
L	120
M	130
N	140
P	150
Q	160
R	170
S	180
T	190
U	200
H	210
V	240

⁽¹⁾ See explanatory figure, Appendix 1.

- 2.29.4. tyres suitable for maximum speeds higher than 240 km/h are identified by means of the letter code 'Z' placed within the tyre size designation;
- 2.29.5. a type of tyre may have either one or two sets of speed category symbols depending on whether or not the provisions of section 6.2.5 are applied;
- 2.30. *'table: Variation of load capacity with speed'* means: the table, in Annex II Appendix 8, showing as a function of the load capacity indices and nominal speed category symbols the load variations which a tyre can withstand when used at speeds different from that corresponding to its speed category symbol;
- 2.30.1. the load variations do not apply in the case of passenger car tyres nor, in the case of commercial vehicle tyres, to the additional load capacity indices and speed category symbol when the provisions of section 6.2.5 are applied;
- 2.31. *'maximum load rating'* means the maximum mass the tyre is rated to carry:
- 2.31.1. in the case of passenger car tyres suitable for speeds not exceeding 210 km/h, the maximum load rating must not exceed the value associated with the load capacity index of the tyre;
- 2.31.2. in the case of passenger car tyres suitable for speeds exceeding 210 km/h, but not exceeding 240 km/h (tyres classified with speed category symbol 'V'), the maximum load rating must not exceed the percentage of the value associated with the load capacity index of the tyre, indicated in the table below, with reference to the speed capability of the vehicle to which the tyre is fitted;

Maximum speed (km/h)	Load (%)
215	98,5
220	97
225	95,5
230	94
235	92,5
240	91

for intermediate maximum speeds linear interpolations of the maximum load rating are allowed;

- 2.31.3. for speeds exceeding 240 km/h ('Z tyres') the maximum load rating must not exceed the value specified by the tyre manufacturer with reference to the maximum speed capability of the vehicle to which it is fitted;
- 2.31.4. in the case of commercial vehicle tyres, the maximum load rating, both for single and for dual formation, must not exceed the percentage of the value associated with the relevant load capacity index of the tyre as indicated in the table 'Load-capacity variation with speed' (see 2.30), with reference to the speed category symbol of the tyre and the speed capability of the vehicle to which the tyre is fitted. When additional load capacity indices and speed category symbols apply, those too are considered to determine the maximum load rating of the tyre;
- 2.32. *'passenger car tyre'* means a tyre designed primarily, but not only, for passenger cars (motor vehicles in category M1) and their trailers (01 and 02);
- 2.33. *'commercial vehicle tyre'* means a tyre designed primarily, but not only, for vehicles other than passenger cars (motor vehicles in categories M2, M3, N) and their trailers (03, 04);
- 2.34. *'tyre ground pressure (F/Ac)'* means the average until load transmitted by the tyre, through its contact area, to the road surface expressed as the ratio between the vertical force (F), in static conditions on the axis of the wheel and the tyre contact area (Ac) measured with the tyre inflated at the cold inflation pressure recommended for the intended type of service. It is expressed in kN/m²;
- 2.35. *'tyre contact area (Ac)'* means the area of the flat surface contained within the virtual perimeter of the tyre footprint. It is expressed in m²;
- 2.36. *'virtual perimeter of the tyre footprint'* means the convex polygonal curve circumscribing the smallest area containing all points of contact between the tyre and the ground;
- 2.37. *'cold inflation pressure'* means the internal pressure of the tyre with the tyre at ambient temperature and does not include any pressure build up due to tyre usage. It is expressed in bar kPa.

3. MARKING REQUIREMENTS

3.1. Tyres must bear:

- 3.1.1. the manufacturer's name or trade mark;
 - 3.1.2. the tyre-size designation as defined in section 2.17;
 - 3.1.3. an indication of the structure as follows:
 - 3.1.3.1. on diagonal (bias-ply) tyres, no marking or the letter 'D';
 - 3.1.3.2. on radial-ply tyres, the letter 'R' placed in front of the nominal in diameter marking and, optionally, the word 'RADIAL';
 - 3.1.3.3. on bias-belted tyres, the letter 'B' placed in front of the nominal rim diameter marking and, in addition, the words 'BIAS-BELTED';
 - 3.1.4. an indication of the tyre's speed category by means of the symbol shown in section 2.29; in the case of tyres suitable for speeds higher than 240 km/h the speed category of the tyre must be indicated by the letter code 'Z' placed in front of the indication of the structure (see section 3.1.3);
 - 3.1.5. the inscription 'M + S' (for alternatively 'M.S.' or 'M & S') in the case of a snow tyre;
 - 3.1.6. the load-capacity index as defined in section 2.28;
 - 3.1.6.1. however, in the case of tyres suitable for speeds higher than 240 km/h the indication of the load capacity index may be omitted;
 - 3.1.7. the word 'TUBELESS' if the tyre is designed for use without an inner tube;
 - 3.1.8. the word 'REINFORCED' if the tyre is a reinforced tyre;
 - 3.1.9. the date of manufacture in the form of a group of three digits, the first two showing the week and the last one the year of manufacture;
 - 3.1.10. in the case of commercial vehicle tyres which can be regrooved, the symbol 'U' at least 20 mm in diameter, or the word 'REGROOVABLE', moulded into or on to each sidewall;
 - 3.1.11. in the case of commercial vehicles tyres, an indication, by the 'PSI' index (see Appendix 4), of the inflation pressure to be adopted for the load/speed tests, as explained in Appendix 7 Part B;
 - 3.1.12. the additional load capacity index/indices and the speed category symbol in the case where the provisions of section 6.2.5 are applied.
- 3.2. Appendix 3 gives examples of the arrangement of tyre markings.
- 3.3. The tyre must also bear the EEC component tyre-approval mark, the model of which is given in Annex I, section 4.5.

POSITION OF MARKINGS

- 3.4. The markings referred to in section 3.1 and 3.3 must be clearly and legibly moulded into or on to both sidewalls, and at least on one side on the lower sidewall, as follows:
- 3.4.1. in the case of symmetrical tyres, all the markings referred to above must be located on both sidewalls except the markings referred to in sections 3.1.9, 3.1.11 and 3.3 which may be on one sidewall only;
 - 3.4.2. in the case of asymmetrical tyres all the markings must be located on at least the outer sidewall.

(4.)

(5.)

(6.)

6.1. Dimensional requirements

6.1.1. Section width of a tyre

- 6.1.1.1. Except as provided by section 6.1.1.2, the section width is calculated by the following formula:

$$S = S_1 + K (A - A_1),$$

where:

S = the 'section width' expressed in mm ⁽¹⁾ and measured on the measuring rim;

S_1 = the 'nominal section width' in mm as shown on the sidewall of the tyre in the tyre-size designation as prescribed;

A = the width (expressed in mm) of the measuring rim, as shown by the manufacturer in the descriptive note, (see section 6.11 of Annex I, Appendix 1);

A_1 = the width (expressed in mm) of the theoretical rim; it is taken to equal S_1 multiplied by the factor x as specified by the tyre manufacturer (see section 6.15 of Annex I, Appendix 1); and K is taken to equal 0.4.

6.1.1.2. However, for the types of tyre for which the size designation is given in the first column of the tables in Appendix 5 A or 5 B, the measuring rim width (A) and the section width (S) are those given opposite the tyre size designation in those tables.

6.1.2. *Outer diameter of a tyre*

6.1.2.1. Except as provided by section 6.1.2.2, the outer diameter of a tyre is calculated by the following formula:

$$D = d + 0,02 H$$

where:

— D is the outer diameter expressed in mm,

— d is the conventional number defined in section 2.17.1.3, expressed in mm,

— H is the nominal section height in mm and is equal to $S_1 \times 0,01 Ra$;

where:

— Ra is the nominal aspect ratio,

all as shown on the sidewall of the tyre in the tyre-size designation in conformity with the requirements of section 3.

6.1.2.2. However, for the types of tyres for which the size designation is given in the first column of the tables of Appendix 5 the outer diameter is that given opposite the tyre size designation in those tables.

6.1.3. *Method of measuring tyre dimensions*

The actual dimensions of tyres are measured as prescribed in Appendix 6.

6.1.4. *Tyre section width: specification of tolerance*

6.1.4.1. The overall width of a tyre may be less than the section width determined pursuant to section 6.1.1 or shown in Appendix 5;

6.1.4.2. It may not exceed that value by more than the following:

6.1.4.2.1. diagonal (bias-ply) tyres: 6 % for passenger car tyres, 8 % for commercial vehicle tyres;

6.1.4.2.2. radial-ply tyres: 4 %; and

6.1.4.2.3. in addition, if the tyre has a special protective band, the figure as increased by the above tolerances may be exceeded by 8 mm.

6.1.4.2.4. However, for tyres of a section width exceeding 305 mm intended for dual (twin) mounting the nominal value must not be exceeded by more than 2 % for radial-ply or 4 % for diagonal (bias-ply) tyres.

6.1.5. *Tyre outer diameter: specification of tolerance*

The outer diameter of a tyre must not be outside the values D_{min} and D_{max} obtained from the following formulae:

$$D_{min} = d + (2H \times a)$$

$$D_{max} = d + (2H \times b)$$

6.1.5.1. for sizes listed in Appendix 5:

$$H = 0,5 (D - d) \text{ — (for references see section 6.1.2.2).}$$

6.1.5.2. for other sizes not listed in Appendix 5:

' H ' and ' d ' are as defined in section 6.1.2.1.

6.1.5.3. coefficients ' a ' and ' b ' are respectively:

6.1.5.3.1. coefficient ' a ' = 0,97;

6.1.5.3.2. coefficient ' b ' for normal, special, snow or temporary-use spare tyres

⁽¹⁾ Equivalence factor from inches to mm is 25,4.

Category of use	Passenger car tyres		Commercial vehicle tyres	
	Radial	Bias	Radial	Bias
Normal	1,04	1,08	1,04	1,07
Special	—	—	1,06	1,09
Snow	1,04	1,08	1,04	1,07
Temporary-use	1,04	1,08	—	—

6.1.5.4. For snow tyres the outer diameter (Dmax) established in conformity with the above may be exceeded by 1 %.

6.2. Load/speed test requirement

6.2.1. The tyre must undergo a load/speed test carried out in accordance with the relevant procedure described in Appendix 7.

6.2.2. A tyre which, after undergoing the relevant load/speed test, does not exhibit any tread separation, ply separation, cord separation, chunking or broken cords is deemed to have passed the test.

6.2.3. The outer diameter of the tyre, measured six hours after the load/speed test, must not be more than 3,5 % greater than the outer diameter as measured before the test.

6.2.4. Where application is made for the approval of a type of commercial vehicle tyre the load/speed combinations given in the table in Appendix 8 apply and, the load/speed test prescribed in section 6.2.1 need not be carried out for load and speed values other than the nominal values.

6.2.5. Where application (see section 6.13 of Annex 1, Appendix 1) is made for the approval of a type of commercial vehicle tyre which has a load/speed combination in addition to the one that is subject to the variation of load with speed given in the table in Appendix 8, the load/speed test prescribed in section 6.2.1 must also be carried out on a second tyre of the same type at the additional load/speed combination.

6.2.6. Where a tyre manufacturer produces a range of tyres it is not considered necessary to carry out a load/speed test on every type of tyre in the range. Worst-case selection may be made, at the discretion of the approval authority.

6.3. Tread-wear indicators

6.3.1. In the case of passenger car tyres the tread of the tyre must include not less than six transverse rows of tread-wear indicators, approximately equally spaced and situated in the wide grooves in the central zone of the tread, which covers approximately three quarters of the tread width. The tread-wear indicators must be such that they cannot be confused with the rubber ridges between the ribs or blocks of the tread.

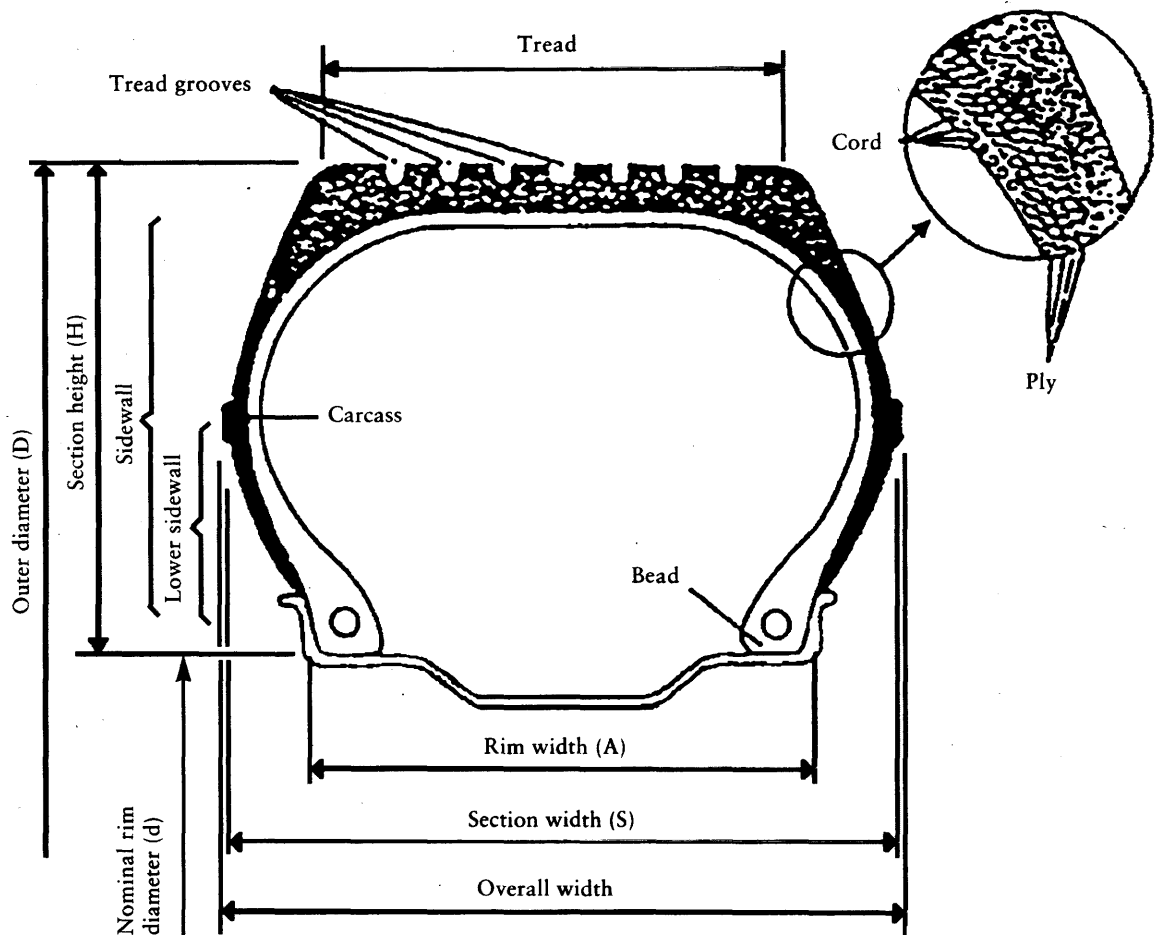
6.3.2. However, in the case of tyres of dimensions appropriate for mounting on rims of a nominal diameter of 12" or less, four rows of tread-wear indicators are acceptable.

6.3.3. The tread-wear indicators must give visual warning when the depth of the corresponding tread grooves has been reduced to 1,6 mm with a tolerance of + 0,6 / - 0 mm.

Appendix 1

Explanatory figure

(see Annex II, sections 2 and 6.1)



Appendix 2

LIST OF SYMBOLS OF LOAD-CAPACITY INDICES (LI)
AND CORRESPONDING MAXIMUM MASS TO BE CARRIED (GK)

(see Annex II, section 2.28)

LI	Maximum	LI	Maximum	LI	Maximum	LI	Maximum
0	45	51	195	101	825	151	3 450
1	46,2	52	200	102	850	152	3 550
2	47,5	53	206	103	875	153	3 650
3	48,7	54	212	104	900	154	3 750
4	50	55	218	105	925	155	3 875
5	51,5	56	224	106	950	156	4 000
6	53	57	230	107	975	157	4 125
7	54,5	58	236	108	1 000	158	4 250
8	56	59	240	109	1 030	159	4 375
9	58	60	250	110	1 060	160	4 500
10	60	61	257	111	1 090	161	4 625
11	61,5	62	265	112	1 120	162	4 750
12	63	63	272	113	1 150	163	4 875
13	65	64	280	114	1 180	164	5 000
14	67	65	290	115	1 215	165	5 150
15	69	66	300	116	1 250	166	5 300
16	71	67	307	117	1 285	167	5 450
17	73	68	315	118	1 320	168	5 600
18	75	69	325	119	1 360	169	5 800
19	77,5	70	335	120	1 400	170	6 000
20	80	71	345	121	1 450	171	6 150
21	82,5	72	355	122	1 500	172	6 300
22	85	73	365	123	1 550	173	6 500
23	87,5	74	375	124	1 600	174	6 700
24	90	75	387	125	1 650	175	6 900
25	92,5	76	400	126	1 700	176	7 100
26	95	77	412	127	1 750	177	7 300
27	97,5	78	425	128	1 800	178	7 500
28	100	79	437	129	1 850	179	7 750
29	103	80	450	130	1 900	180	8 000
30	106	81	462	131	1 950	181	8 250
31	109	82	475	132	2 000	182	8 500
32	112	83	487	133	2 060	183	8 750
33	115	84	500	134	2 120	184	9 000
34	118	85	515	135	2 180	185	9 250
35	121	86	530	136	2 240	186	9 500
36	125	87	545	137	2 300	187	9 750
37	128	88	560	138	2 360	188	10 000
38	132	89	580	139	2 430	189	10 300
39	136	90	600	140	2 500	190	10 600
40	140	91	615	141	2 575	191	10 900
41	145	92	630	142	2 650	192	11 200
42	150	93	650	143	2 725	193	11 500
43	155	94	670	144	2 800	194	11 800
44	160	95	690	145	2 900	195	12 150
45	165	96	710	146	3 000	196	12 500
46	170	97	730	147	3 075	197	12 850
47	175	98	750	148	3 150	198	13 200
48	180	99	775	149	3 250	199	13 600
49	185	100	800	150	3 350	200	14 000
50	190						

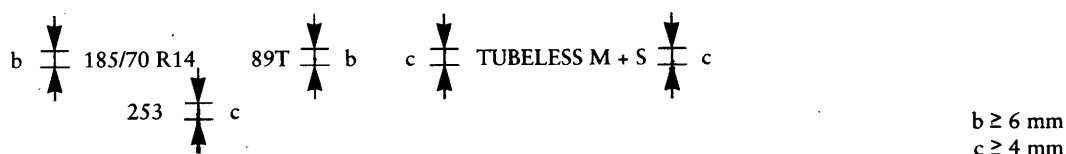
Appendix 3

ARRANGEMENT OF TYRE MARKINGS

(see Annex II, section 3.2)

PART A: PASSENGER CAR TYRES

Example of the markings to be borne by types of tyres placed on the market after notification of this Directive



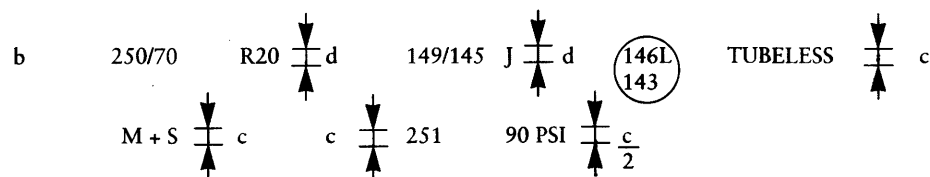
These markings define a tyre:

- having a nominal section width of 185,
- having a nominal aspect ratio of 70,
- of radial-ply structure (R),
- having a nominal rim diameter of 14,
- having a load capacity of 580 kg, corresponding to load index 89 in Appendix 2,
- classified in the speed category T (maximum speed 190 km/h),
- for fitting without an inner tube ('tubeless'),
- of 'snow' type,
- manufactured during the twenty-fifth week of the year 1993.

The positioning and order of the markings constituting the tyre designation are as follows:

- (a) the size designation, comprising the nominal section width, the nominal aspect ratio, the type of structure symbol (where applicable) and the nominal rim diameter, must be grouped as shown in the above example: 185/70 R 14;
- (b) the load index and the speed category symbol are placed near the size designation. They may either precede or follow it or be placed above or below it;
- (c) the symbols 'tubeless', 'reinforced', and 'M + S' may be at a distance from the size designation.

PART B: COMMERCIAL VEHICLE TYRES



MINIMUM HEIGHTS OF MARKINGS (mm)		
	Tyres of rim diameter <20" or <508 mm or of section width ≤235 mm or ≤9"	Tyres of rim diameter ≥20" or ≥508 mm or of section width >235 mm or >9"
b	6	9
c	4	
d	6	

These markings define a tyre:

- having a nominal section width of 250,
- having a nominal aspect ratio of 70,
- of racial-ply structure (R),
- having a nominal rim diameter of 508 mm, for which the symbol is 20,
- having load capacities of 3 250 kg when single and 2 900 kg when twinned (dual), corresponding respectively to the load capacity indices 149 and 145 shown in Appendix 2,
- classified in the nominal speed category J (reference speed 100 km/h),
- able to be used additionally in speed category L (reference speed 120 km/h) with a load capacity of 3 000 kg when single and 2 725 kg when twinned (dual), corresponding respectively to the load capacity indices 146 and 143 shown in Appendix 2,
- for fitting without an inner tube ‘tubeless’,
- of ‘snow’ type,
- manufactured during the twenty-fifth week of the year 1991, and
- requiring to be inflated to 620 kPa for load/speed endurance tests, for which the PSI symbol is 90.

The positioning and order of the markings constituting the tyre designation are as follows:

- (a) the size designation, comprising the nominal section width, the nominal aspect ratio, the type-of-structure symbol (where applicable) and the nominal rim diameter, must be grouped as shown in the above example: 250/70 R 20;
- (b) the load indices and the speed category symbol are placed together near the size designation. They may either precede or follow it or be placed above or below it;
- (c) the symbols ‘Tubeless’, ‘M + S’ and ‘REGROOVABLE’ may be at a distance from the size designation;
- (d) if section 6.2.5 of Annex II is applied the additional load-capacity indices and speed-category symbol must be shown inside a circle near the nominal load-capacity indices and speed category symbol appearing on the tyre sidewall.

Appendix 4

RELATIONSHIP BETWEEN THE PRESSURE INDEX AND THE UNITS OF PRESSURE

(see Annex II, Appendix 7, Part B, section 1.3)

Pressure Index (‘PSI’)	bar	kPa
20	1,4	140
25	1,7	170
30	2,1	210
35	2,4	240
40	2,8	280
45	3,1	310
50	3,4	340
55	3,8	380
60	4,2	420
65	4,5	450
70	4,8	480
75	5,2	520
80	5,5	550
85	5,9	590
90	6,2	620
95	6,6	660
100	6,9	690
105	7,2	720
110	7,6	760
115	7,9	790
120	8,3	830
125	8,6	860
130	9,0	900
135	9,3	930
140	9,7	970
145	10,0	1 000
150	10,3	1 030

Appendix 5

MEASURING RIM, OUTER DIAMETER AND SECTION WIDTH OF TYRES OF CERTAIN SIZE DESIGNATIONS

(see Annex II, sections 6.1.1.2 and 6.1.2.2)

PART A: PASSENGER CAR TYRES

TABLE 1

Tyres in diagonal construction

Tyre size designation	Measuring rim width (inches)	Outer diameter ⁽¹⁾ (mm)	Section width ⁽¹⁾ (mm)
<i>Super balloon series</i>			
4.80-10	3,5	490	128
5.20-10	3,5	508	132
5.20-12	3,5	558	132
5.60-13	4	600	145
5.90-13	4	616	150
6.40-13	4,5	642	163
5.20-14	3,5	612	132
5.60-14	4	626	145
5.90-14	4	642	150
6.40-14	4,5	666	163
5.60-15	4	650	145
5.90-15	4	668	150
6.40-15	4,5	692	163
6.70-15	4,5	710	170
7.10-15	5	724	180
7.60-15	5,5	742	193
8.20-15	6	760	213
<i>Low section series</i>			
5.50-12	4	552	142
6.00-12	4,5	574	156
7.00-13	5	644	178
7.00-14	5	668	178
7.50-14	5,5	688	190
8.00-14	6	702	203
6.00-15 L	4,5	650	156
<i>Super low section series ⁽²⁾</i>			
155-13/6.15-13	4,5	582	157
165-13/6.45-13	4,5	600	167
175-13/6.95-13	5	610	178
155-14/6.15-14	4,5	608	157
165-14/6.45-14	4,5	626	167
175-14/6.95-14	5	638	178
185-14/7.35-14	5,5	654	188
195-14/7.75-14	5,5	670	198
<i>Ultra low section</i>			
5.9-10	4,5	483	148
6.5-13	4,5	586	166
6.9-13	4,5	600	172
7.3-13	5	614	184

⁽¹⁾ Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.⁽²⁾ The following size designations are accepted:

185-14/7.35-14 or 185-14 or 7.35-14 or 7.35-14/185-14.

TABLE 2

Tyres in radial construction

Tyre size designation	Measuring rim width (inches)	Outer diameter ⁽¹⁾ (mm)	Section width ⁽¹⁾ (mm)
5.60 R 13	4	606	145
5.90 R 13	4,5	626	155
6.40 R 13	4,5	640	170
7.00 R 13	5	644	178
7.25 R 13	5	654	184
5.90 R 14	4,5	654	155
5.60 R 15	4	656	145
6.40 R 15	4,5	690	170
6.70 R 15	5	710	180
140 R 12	4	538	138
150 R 12	4	554	150
150 R 13	4	580	149
160 R 13	4,5	596	158
170 R 13	5	608	173
150 R 14	4	606	149
180 R 15	5	676	174

⁽¹⁾ Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 3

Millimetric series — radial

Tyre size designation ⁽²⁾	Measuring rim width (inches)	Outer diameter ⁽¹⁾ (mm)	Section width ⁽¹⁾ (mm)
125 R 10	3,5	459	127
145 R 10	4	492	147
125 R 12	3,5	510	178
135 R 12	4	522	184
145 R 12	4	542	
155 R 12	4,5	550	155
125 R 13	3,5	536	127
135 R 13	4	548	137
145 R 13	4	566	147
155 R 13	4,5	578	157
165 R 13	4,5	596	167
175 R 13	5	608	178
185 R 13	5,5	624	188
125 R 14	3,5	562	127
135 R 14	4	574	137
145 R 14	4	590	147
155 R 14	4,5	604	157
165 R 14	4,5	622	167
175 R 14	5	634	178
185 R 14	5,5	650	188
195 R 14	5,5	666	198
205 R 14	6	686	208
215 R 14	6	700	218
225 R 14	6,5	714	228
125 R 15	3,5	588	127
135 R 15	4	600	137
145 R 15	4	616	147
155 R 15	4,5	630	157
165 R 15	4,5	646	167
175 R 15	5	660	178
185 R 15	5,5	674	188
195 R 15	5,5	690	198
205 R 15	6	710	208
215 R 15	6	724	218
225 R 15	6,5	738	228
235 R 15	6,5	752	238
175 R 16	5	686	178
185 R 16	5,5	698	188
205 R 16	6	736	208

⁽¹⁾ Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

⁽²⁾ On certain tyres the rim diameter can be expressed in mm:

10" = 255 12" = 305 13" = 330 14" = 355
 15" = 380 16" = 405 (example: 125 R 225).

TABLE 4
70 Series — Radial (*)

Tyre size designation	• Measuring rim width (inches)	Outer diameter ⁽¹⁾ (mm)	Section width ⁽¹⁾ (mm)
145/70 R 10	3,5	462	139
155/70 R 10	3,5	474	146
165/70 R 10	4,5	494	165
145/70 R 12	4	512	144
155/70 R 12	4	524	151
165/70 R 12	4,5	544	165
175/70 R 12	5	552	176
145/70 R 13	4	538	144
155/70 R 13	4	550	151
165/70 R 13	4,5	568	165
175/70 R 13	4,5	580	176
185/70 R 13	5	598	186
195/70 R 13	5,5	608	197
205/70 R 13	5,5	625	204
145/70 R 14	4	564	144
155/70 R 14	4	576	151
165/70 R 14	4,5	592	165
175/70 R 14	5	606	176
185/70 R 14	5	624	186
195/70 R 14	5,5	636	197
205/70 R 14	5,5	652	206
215/70 R 14	6	665	217
225/70 R 14	6	677	225
235/70 R 14	6,5	694	239
245/70 R 14	6,5	705	243
145/70 R 15	4	590	144
155/70 R 15	4	602	151
165/70 R 15	4,5	618	165
175/70 R 15	5	632	176
185/70 R 15	5	648	186
195/70 R 15	5,5	656	197
205/70 R 15	5,5	669	202
215/70 R 15	6	682	213
225/70 R 15	6	696	220
235/70 R 15	6,5	712	234
245/70 R 15	6,5	720	239

(*) Dimensional data applicable to some tyres in existence. For new approvals, dimensions calculated according to sections 6.1.1.1 and 6.1.2.1 of Annex II apply.

⁽¹⁾ Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 5
60 Series radial (*)

Tyre size designation	Measuring rim width (inches)	Outer diameter ⁽¹⁾ (mm)	Section width ⁽¹⁾ (mm)
165/60 R 12	5	504	167
165/60 R 13	5	530	167
175/60 R 13	5,5	536	178
185/60 R 13	5,5	548	188
195/60 R 13	6	566	198
205/60 R 13	6	578	208
215/60 R 13	6	594	218
225/60 R 13	6,5	602	230
235/60 R 13	6,5	614	235
165/60 R 14	5	554	167
175/60 R 14	5,5	562	178
185/60 R 14	5,5	574	188
195/60 R 14	6	590	198
205/60 R 14	6	604	208
215/60 R 14	6	610	215
225/60 R 14	6	620	220
235/60 R 14	6,5	630	231
245/60 R 14	6,5	642	237
265/60 R 14	7	670	260
185/60 R 15	5,5	600	188
195/60 R 15	6	616	198
205/60 R 15	6	630	208
215/60 R 15	6	638	216
225/60 R 15	6,5	652	230
235/60 R 15	6,5	664	236
255/60 R 15	7	688	255
205/60 R 16	6	654	208
215/60 R 16	6	662	215
225/60 R 16	6	672	226
235/60 R 16	6,5	684	232

(*) Dimensional data applicable to some tyres in existence. For new approvals, dimensions calculated according to sections 6.1.1.1 and 6.1.2.1 of Annex III apply.

(¹) Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 6
High flotation tyres — radial

Tyre size designation	Measuring rim width (inches)	Outer diameter ⁽¹⁾ (mm)	Section width ⁽¹⁾ (mm)
27 × 8.50 R 14	7	674	218
30 × 9.50 R 15	7,5	750	240
31 × 10.50 R 15	8,5	775	268
31 × 11.50 R 15	9	775	290
32 × 11.50 R 15	9	801	290
33 × 12.50 R 15	10	826	318

(¹) Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

PART B: COMMERCIAL VEHICLE TYRES

TABLE 1

Commercial vehicle tyres

RADIAL
NORMAL SECTION SIZES MOUNTED
ON 5°-TAPERED OR FLAT BASE RIMS

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (mm)	Section width (mm)
6.50 R 20	5.00	860	181
7.00 R 16	5.50	784	198
7.00 R 18	5.50	842	198
7.00 R 20	5.50	892	198
7.50 R 16 and/or A16 or 1-16	6.00	802	210
7.50 R 17 and/or A17 or 1-17	6.00	852	210
7.50 R 20 and/or A20 or 1-20	6.00	928	210
8.25 R 16 and/or B16 or 2-16	6.50	860	230
8.25 R 17 and/or B17 or 2-17	6.50	886	230
8.25 R 20 and/or B20 or 2-20	6.50	962	230
9.00 R 16 and/or C16 or 3-16	6.50	912	246
9.00 R 20 and/or C20 or 3-20	7.00	1 018	258
10.00 R 20 and/or D20 or 4-20	7.50	1 052	275
10.00 R 22 and/or D22 or 4-22	7.50	1 102	275
11.00 R 16	6.50	980	279
11.00 R 20 and/or E20 or 5-20	8.00	1 082	286
11.00 R 22 and/or E22 or 5-22	8.00	1 132	286
11.00 R 24 and/or E24 or 5-24	8.00	1 182	286
12.00 R 20 and/or F20 or 6-20	8.50	1 122	313
12.00 R 22	8.50	1 174	313
12.00 R 24 and/or F24 or 6-24	8.50	1 226	313
13.00 R 20	9.00	1 176	336
14.00 R 20 and/or G20 or 7-20	10.00	1 238	370
14.00 R 22	10.00	1 290	370
14.00 R 24	10.00	1 340	370

Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 2

Commercial vehicle tyres

DIAGONAL
NORMAL SECTION SIZES MOUNTED ON
5°-TAPERED OR FLAT BASE RIMS

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
7.00-16	5.50	774	198
7.00-20	5.50	898	198
7.50-16 and/or A16 or 1-16	6.00	806	210
7.50-17 and/or A17 or 1-17	6.00	852	210
7.50-20 and/or A20 or 1-20	6.00	928	213
8.25-16 and/or B16 or 2-16	6.50	860	234
8.25-17 and/or B17 or 2-17	6.50	895	234
8.25-20 and/or B20 or 2-20	6.50	970	234
9.00-16	6.50	900	252
9.00-20 and/or C20 or 3-20	7.00	1 012	256
9.00-24 and/or C24 or 3-24	7.00	1 114	256
10.00-20 and/or D20 or 4-20	7.50	1 050	275
10.00-22 and/or D22 or 4-22	7.50	1 102	275
11.00-20 and/or E20 or 5-20	8.00	1 080	291
11.00-22 and/or E22 or 5-22	8.00	1 130	291
11.00-24 and/or E24 or 5-24	8.00	1 180	291
12.00-18	8.50	1 070	312
12.00-20 and/or F20 or 6-20	8.50	1 120	312
12.00-22 and/or F22 or 6-22	8.50	1 172	312
12.00-24 and/or F24 or 6-24	8.50	1 220	312
13.00-20	9.00	1 170	342
14.00-20 and/or G20 or 7-20	10.00	1 238	375
14.00-22 and/or G22 or 7-22	10.00	1 290	375
14.00-24 and/or G24 or 7-24	10.00	1 340	375
15.00-20	11.25	1 295	412
16.00-20	13.00	1 370	446

Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 3

Commercial vehicle tyres

RADIAL
NORMAL SECTION SIZES
MOUNTED ON 15°-TAPERED RIMS
(DROP-CENTRE)

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
8 R 17.5	6.00	784	208
8.5 R 17.5	6.00	802	215
9 R 17.5	6.75	820	230
9.5 R 17.5	6.75	842	240
10 R 17.5	7.50	858	254
11 R 17.5	8.25	900	279
7 R 19.5	5.25	800	185
8 R 19.5	6.00	856	208
8 R 22.5	6.00	936	208
9 R 19.5	6.75	894	230
9 R 22.5	6.75	970	230
9.5 R 19.5	6.75	916	240
10 R 19.5	7.50	936	254
10 R 22.5	7.50	1 020	254
11 R 19.5	8.25	970	279
11 R 22.5	8.25	1 050	279
11 R 24.5	8.25	1 100	279
12 R 19.5	9.00	1 008	300
12 R 22.5	9.00	1 084	300
13 R 22.5	9.75	1 124	320

TABLE 4

DIAGONAL
NORMAL SECTION SIZES
MOUNTED ON 15°-TAPERED RIMS
(DROP-CENTRE)

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
8-19.5	6.00	856	208
9-19.5	6.75	894	230
9-22.5	6.75	970	230
10-22.5	7.50	1 020	254
11-22.5	8.25	1 054	279
11-24.5	8.25	1 100	279
12-22.5	9.00	1 084	300

Tolerance: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 5
Commercial vehicle tyres
RADIAL
'WIDE BASE' SIZES MOUNTED ON 15°-TAPERED RIMS
(DROP-CENTRE)

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
14 R 19.5	10.50	962	349
15 R 19.5	11.75	998	387
15 R 22.5	11.75	1 074	387
16.5 R 19.5	13.00	1 046	425
16.5 R 22.5	13.00	1 122	425
18 R 19.5	14.00	1 082	457
18 R 22.5	14.00	1 158	457
19.5 R 19.5	15.00	1 134	495
21 R 22.5	16.50	1 246	540

TABLE 6
DIAGONAL
'WIDE BASE' SIZES MOUNTED ON 15°-TAPERED RIMS
(DROP-CENTRE)

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
15 -19.5	11.75	1 004	387
15 -22.5	11.75	1 080	387
16.5-19.5	13.00	1 052	425
16.5-22.5	13.00	1 128	425
18 -19.5	14.00	1 080	457
18 -22.5	14.00	1 156	457
19.5-19.5	15.00	1 138	495
21 -22.5	16.50	1 246	540

Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 7

Commercial vehicle tyres

RADIAL
'80' SERIES MOUNTED ON 5° TAPERED OR FLAT-BASE RIMS

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
12/80 R 20	8.50	1 008	305
13/80 R 20	9.00	1 048	326
14/80 R 20	10.00	1 090	350
14/80 R 24	10.00	1 192	350
14.75/80 R 20	10.00	1 124	370
15.5 /80 R 20	10.00	1 158	384

TABLE 8

RADIAL
'70' SERIES MOUNTED ON 15° TAPERED RIMS
(DROP-CENTRE)

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
9/70 R 22.5	6.75	892	229
10/70 R 22.5	7.50	928	254
11/70 R 22.5	8.25	962	279
12/70 R 22.5	9.00	999	305
13/70 R 22.5	9.75	1 033	305

TABLE 9

RADIAL
'80' SERIES MOUNTED ON 15° TAPERED RIMS
(DROP-CENTRE)

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
12/80 R 22.5	9.00	1 046	305

Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 10

Commercial vehicle tyres

RADIAL
TYRES FOR LIGHT COMMERCIAL VEHICLES MOUNTED ON RIM OF
16" DIAMETER AND OVER

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
6.00 R 16 C	4.50	728	170
6.00 R 18 C	4.00	782	165
6.50 R 16 C	4.50	742	176
6.50 R 17 C	4.50	772	176
6.50 R 17 LC	4.50	726	166
6.50 R 20 C	5.00	860	181
7.00 R 16 C	5.50	778	198
7.50 R 16 C	6.00	802	210
7.50 R 17 C	6.00	852	210

TABLE 11

DIAGONAL
TYRES FOR LIGHT COMMERCIAL VEHICLES MOUNTED ON RIM OF
16" DIAMETER AND OVER

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
6.00-16 C	4.50	730	170
6.00-18 C	4.00	786	165
6.00-20 C	5.00	842	172
6.50-20 C	4.50	748	176
6.50-17 LC	4.50	726	166
6.50-20 C	5.00	870	181
7.00-16 C	5.50	778	198
7.00-18 C	5.50	848	198
7.00-20 C	5.50	898	198
7.50-16 C	6.00	806	210
7.50-17 C	6.00	852	210
8.25-16 C	6.50	860	234
8.90-16 C	6.50	885	250
9.00-16 C	6.50	900	252

Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 12

Commercial vehicle tyres

RADIAL

TYRES FOR LIGHT COMMERCIAL VEHICLES MOUNTED ON 5° TAPERED RIMS
Rim diameter 12" — 15"
(DROP-CENTRE)

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
'Super balloon' series			
5.60 R 12 C	4.00	570	150
6.40 R 13 C	5.00	648	172
6.70 R 13 C	5.00	660	180
6.70 R 14 C	5.00	688	180
6.70 R 15 C	5.00	712	180
7.00 R 15 C	5.50	744	195
'Low section' series			
6.50 R 14 C	5.00	640	170
7.00 R 14 C	5.00	650	180
7.50 R 14 C	5.50	686	195

TYRES FOR LIGHT COMMERCIAL VEHICLES
MOUNTED ON 15° TAPERED RIMS
(DROP-CENTRE)

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
7 R 17.5 C	5.25	752	185
8 R 17.5 C	6.00	784	208

Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 13

Commercial vehicle tyres

DIAGONAL
TYRES FOR LIGHT COMMERCIAL VEHICLES
MOUNTED ON 5° TAPERED RIMS
(DROP CENTRE)
Rim diameter 12" — 15"

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
'Super balloon' series			
5.20-12 C	3.50	560	136
5.60-12 C	4.00	572	148
5.60-13 C	4.00	598	148
5.90-13 C	4.50	616	158
5.90-14 C	4.50	642	158
5.90-15 C	4.50	668	158
6.40-13 C	5.00	640	172
6.40-14 C	5.00	666	172
6.40-15 C	5.00	692	172
6.40-16 C	4.50	748	172
6.70-13 C	5.00	662	180
6.70-14 C	5.00	688	180
6.70-15 C	5.00	714	180
'Low section' series			
5.50-12 C	4.00	552	142
6.00-12 C	4.50	574	158
6.00-14 C	4.50	626	158
6.50-14 C	5.00	650	172
6.50-15 C	5.00	676	172
7.00-14 C	5.00	668	182
7.50-14 C	5.50	692	192
'Balloon' series			
7.00-15 C	5.50	752	198
7.50-15 C	6.00	780	210
'Millimetric' series			
125-12 C	3.50	514	127
165-15 C	4.50	652	167
185-14 C	5.50	654	188
195-14 C	5.50	670	198
245-16 C	7.00	798	248
17-15 C or	5.00	678	178
17-380 C	5.00	678	178
17-400 C	19 × 400 mm	702	186
19-400 C	19 × 400 mm	736	200
21-400 C	19 × 400 mm	772	216

Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 14

Commercial vehicle tyres

RADIAL
TYRES FOR LIGHT COMMERCIAL
VEHICLES MOUNTED ON 5° TAPERED RIMS (DROP-CENTRE) RIMS

'Millimetric' series

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
125 R 12 C	3.50	510	127
125 R 13 C	3.50	536	127
125 R 14 C	3.00	562	127
125 R 15 C	3.50	588	127
135 R 12 C	4.00	522	137
135 R 13 C	4.00	548	137
135 R 14 C	4.00	574	137
135 R 15 C	4.00	600	137
145 R 10 C	4.00	492	147
145 R 12 C	4.00	542	147
145 R 13 C	4.00	566	147
145 R 14 C	4.00	590	147
145 R 15 C	4.00	616	147
155 R 12 C	4.50	550	157
155 R 13 C	4.50	578	157
155 R 14 C	4.50	604	157
155 R 15 C	4.50	630	157
155 R 16 C	4.50	656	157
165 R 13 C	4.50	596	167
165 R 14 C	4.50	622	167
165 R 15 C	4.50	646	167
165 R 16 C	4.50	672	167
175 R 13 C	5.00	608	178
175 R 14 C	5.00	634	178
175 R 15 C	5.00	660	178
175 R 16 C	5.00	684	178
185 R 13 C	5.50	624	188
185 R 14 C	5.50	650	188
185 R 15 C	5.50	674	188
185 R 16 C	5.50	700	188
195 R 14 C	5.50	666	198
195 R 15 C	5.50	690	198
195 R 16 C	5.50	716	198
205 R 14 C	6.00	686	208
205 R 15 C	6.00	710	208
205 R 16 C	6.00	736	208
215 R 14 C	6.00	700	218
215 R 15 C	6.00	724	218
215 R 16 C	6.00	750	218
225 R 14 C	6.50	714	228
225 R 15 C	6.50	738	228
225 R 16 C	6.50	764	228
235 R 14 C	6.50	728	238
235 R 15 C	6.50	752	238
235 R 16 C	6.50	778	238
17 R 15 C or	5.00	678	178
17 R 380 C	5.00	678	178
17 R 400 C	19 × 400 mm	698	186
19 R 400 C	19 × 400 mm	728	200

Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 15

Commercial vehicle tyres

DIAGONAL

WIDE-BASE TYRES FOR MULTIPURPOSE TRUCKS ON HIGHWAY, OFF-THE-ROAD
AND AGRICULTURAL SERVICES

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
10.5-18 MPT	9	905	270
10.5-20 MPT	9	955	270
12.5-18 MPT	11	990	325
12.5-20 MPT	11	1 040	325
14.5-20 MPT	11	1 095	355
14.5-24 MPT	11	1 195	355
7.50-18 MPT	5.50	885	208

TABLE 16

RADIAL

WIDE-BASE TYRES FOR MULTIPURPOSE TRUCKS ON HIGHWAY, OFF-THE-ROAD
AND AGRICULTURAL SERVICES

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
10.5 R 20 MPT	9	955	276
12.5 R 20 MPT	11	1 040	330
14.5 R 20 MPT	11	1 095	362
14.5 R 24 MPT	11	1 195	362

Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 17

Commercial vehicle tyres

RADIAL

'FREE-ROLLING' TYRES IN HIGHWAY SERVICE

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
5.00 R 8	3.00	467	132
6.00 R 9	4.00	540	160
7.00 R 12	5.00	672	192
7.50 R 15	6.00	772	212
8.25 R 15	6.50	836	234
10.00 R 15	7.50	918	275

TABLE 18

DIAGONAL

'FREE-ROLLING' TYRES IN HIGHWAY SERVICE

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
6.00- 9	4.00	540	160
7.00-12	5.00	672	192
7.00-15	5.00	746	192
7.50-15	6.00	772	212
8.25-15	6.50	836	234
10.00-15	7.50	918	275
200 -15	6.50	730	205

TABLE 19

DIAGONAL

'75' SERIES MOUNTED ON 15° TAPERED RIMS

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
7.25/75-16.5 or 7.25-16.5	5.25	695	182
8.00/75-16.5 or 8.00-16.5	6.00	724	203
8.75/75-16.5 or 8.75-16.5	6.75	752	224
9.50/75-16.5 or 9.50-16.5	7.50	781	245

Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 20
Commercial vehicle tyres
DIAGONAL
DIAGONAL AND RADIAL TYRES MOUNTED ON FLAT BASE OR DIVIDED RIMS

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
3.00-4	2.10	255	81
4.00-4	2.50	312	107
4.00-8	2.50	414	107
5.00-8	3.00	467	132
6.50-10	5.00	588	177
7.00-9	5.00	562	174
7.50-10	5.50	645	207
8.25-10	6.50	698	240
10.50-13	6.00	889	275
10.50-16	6.00	965	275
11.00-16	6.00	952	272
14.00-16	10.00	1 139	375
15 × 4.5-2	3.25	385	122
16 × 6-8	4.33	425	152
18 × 7-8 ⁽¹⁾	4.33	462	173
21 × 4	2.32	565	113
21 × 8-9	6.00	535	200
23 × 9-10	6.50	595	225
22 × 4.5	3.11	595	132
23 × 5	3.75	635	155
25 × 6	3.75	680	170
27 × 6	4.33	758	188
27 × 10-12	8.00	690	255
28 × 6	3.75	760	170
28 × 9-15	7.00	707	216
(8.15-15)	7.00	707	216
29 × 7	5.00	809	211
29 × 8	6.00	809	243
9.00-15	6.00	840	249
2.50-15	7.50	735	250
3.00-15	8.00	840	300

⁽¹⁾ Also marked 18 × 7.

RADIAL

Tyre size designation	Measuring-rim width (in inches)	Outer diameter (in mm)	Section width (in mm)
6.50 R 10	5.00	588	177
7.00 R 15	5.50	746	197
7.50 R 10	5.50	645	207
15 × 4.5 R 8	3.25	385	122
16 × 6 R 8	4.33	435	152
18 × 7 R 8	4.33	462	173
560 × 165 R 11	5.00	560	175
680 × 180 R 15	5.00	680	189

Tolerances: see sections 6.1.4 and 6.1.5 of Annex II.

TABLE 21

Tyres for trucks, buses, trailers and multipurpose passenger vehicles in normal highway service

DIAGONAL AND RADIAL
TYRES MOUNTED ON 5° DROP-CENTRE OR SEMI-DROP-CENTRE RIMS

Tyre size designation		Measuring-rim width (in inches)	Section width (in mm) ⁽¹⁾	Outer diameter	
Diagonal	Radial			Highway tread (in mm) ⁽²⁾	Mud and snow (in mm) ⁽²⁾
6.00-16 LT	6.00 R 16 LT	4.50	173	732	743
6.50-16 LT	6.50 R 16 LT	4.50	182	755	767
6.70-15 LT	6.70 R 15 LT	5.00	191	722	733
7.00-13 LT	7.00 R 13 LT	5.00	187	647	658
7.00-14 LT	7.00 R 14 LT	5.00	187	670	681
7.00-15 LT	7.00 R 15 LT	5.50	202	752	763
7.00-16 LT	7.00 R 16 LT	5.50	202	778	788
7.10-15 LT	7.10 R 15 LT	5.00	199	738	749
7.50-15 LT	7.50 R 15 LT	6.00	220	782	794
7.50-16 LT	7.50 R 16 LT	6.00	220	808	819
8.25-16 LT	8.25 R 16 LT	6.50	241	859	869
9.00-16 LT	9.00 R 16 LT	6.50	257	890	903
D78-14 LT	DR 78-14 LT	5.00	192	661	672
E78-14 LT	ER 78-14 LT	5.50	199	667	678
C78-15 LT	CR 78-15 LT	5.00	187	672	683
G78-15 LT	GR 78-15 LT	6.00	212	711	722
H78-15 LT	HR 78-15 LT	6.00	222	727	739
L78-15 LT	LR 78-15 LT	6.50	236	749	760
F78-16 LT	FR 78-16 LT	5.50	202	721	732
H78-16 LT	HR 78-16 LT	6.00	222	753	764
L78-16 LT	LR 78-16 LT	6.50	236	775	786

⁽¹⁾ Overall tyre widths may exceed the above section widths by 8 %.⁽²⁾ Tolerance + 8 % of the difference between the above outer diameter and the nominal rim diameters.

TABLE 22

Tyres for trucks, buses, trailers and multipurpose passenger vehicles in normal highway service

DIAGONAL AND RADIAL
TYRES MOUNTED ON 15° DROP-CENTRE RIMS

TABLE 22.1

Tyre size designation		Measuring-rim width (inches)	Section width (mm) ⁽¹⁾	Outer diameter	
Diagonal	Radial			Highway tread (mm) ⁽²⁾	Mud and snow (mm) ⁽²⁾
7-14.5 LT	—	6.00	185	677	—
8-14.5 LT	—	6.00	203	707	—
9-14.5 LT	—	7.00	241	711	—
7-17.5 LT	7 R 17.5 LT	5.25	189	758	769
8-17.5 LT	8 R 17.5 LT	5.25	199	788	799

(¹) Overall tyre widths may exceed the above section widths by 8 %.
(²) Tolerance + 8 % of the difference between the above outer diameters and the nominal rim diameters.

TABLE 22.2

Tyre size designation		Measuring-rim width (inches)	Section width (mm) ⁽¹⁾	Outer diameter	
Diagonal	Radial			Highway tread (mm) ⁽²⁾	Mud and snow (mm) ⁽²⁾
8.00-16.5 LT	8.00 R 16.5 LT	6.00	203	720	730
8.75-16.5 LT	8.75 R 16.5 LT	6.75	222	748	759
9.50-16.5 LT	9.50 R 16.5 LT	6.75	241	776	787
10-16.5 LT	10 R 16.5 LT	8.25	264	762	773
10-17.5 LT	10 R 17.5 LT	8.25	264	787	798
12-16.5 LT	12 R 16.5 LT	9.75	307	818	831
30 × 9.50-16.5 LT	30 × 9.50 R 16.5 LT	7.50	240	750	761
31 × 10.50-16.5 LT	31 × 10.50 R 16.5 LT	8.25	266	775	787
33 × 10.50-16.5 LT	33 × 12.50 R 16.5 LT	9.75	315	826	838
37 × 10.50-16.5 LT	37 × 14.50 R 16.5 LT	11.25	365	928	939

(¹) Overall tyre widths may exceed the above section widths by 7 %.
(²) Tolerance + 8 % of the difference between the above outer diameter and the nominal rim diameters.

TABLE 23

Tyres for trucks, buses, trailers in normal highway service
 DIAGONAL AND RADIAL
 TYRES MOUNTED ON 15° DROP-CENTRE RIMS

Tyre size designation		Measuring-rim width (inches)	Section width (mm) ⁽¹⁾	Outer diameter		
Diagonal	Radial			Highway tread (mm) ⁽²⁾	Heavy tread (mm) ⁽²⁾	Mud and snow (mm) ⁽²⁾
Normal-section tyres						
7 -22.5	7 R 22.5	5.25	178	878	—	894
8 -19.5	8 R 19.5	6.00	203	859	—	876
8 -22.5	8 R 22.5	6.00	203	935	—	952
9 -22.5	9 R 22.5	6.75	229	974	982	992
10 -22.5	10 R 22.5	7.50	254	1 019	1 031	1 038
11 -22.5	11 R 22.5	8.25	279	1 054	1 067	1 037
11 -24.5	11 R 24.5	8.25	279	1 104	1 118	1 123
12 -22.5	12 R 22.5	9.00	300	1 085	1 099	1 104
12 -24.5	12 R 24.5	9.00	300	1 135	1 150	1 155
12.5-22.5	12.5 R 22.5	9.00	302	1 085	1 099	1 104
12.5-22.5	12.5 R 24.5	9.00	302	1 135	1 150	1 155
Wide-base tyres						
14 -17.5	14 R 17.5	10.50	349	907	—	921
15 -19.5	15 R 19.5	11.75	389	1 005	—	1 019
15 -22.5	15 R 22.5	11.75	389	1 082	—	1 095
16.5-19.5	16.5 R 19.5	13.00	425	1 052	—	1 068
16.5-22.5	16.5 R 22.5	13.00	425	1 128	—	1 144
18 -19.5	18 R 19.5	14.00	457	1 080	—	1 096
18 -22.5	18 R 22.5	14.00	457	1 158	—	1 172
19.5-19.5	19.5 R 19.5	15.00	495	1 138	—	1 156

⁽¹⁾ Overall tyre widths may exceed the above section widths by 6%.
⁽²⁾ Tolerance + 5% of the difference between the above outer diameter and the nominal rim diameters.

TABLE 24

Tyres for trucks, buses, trailers in normal highway service
DIAGONAL AND RADIAL
TYRES MOUNTED ON 5° DROP-CENTRE RIMS

Tyre size designation		Measuring-rim width (inches)	Section width (mm) ⁽¹⁾	Outer diameter		
Diagonal	Radial			Highway tread (mm) ⁽²⁾	Heavy tread (mm) ⁽²⁾	Mud and snow (mm) ⁽²⁾
—	8R14LT	7.00	216	667	—	—
9-15LT	—	8.00	254	744	755	—
10-15LT	10R15LT	8.00	264	773	783	—
10-16LT	—	8.00	264	798	809	—
11-14LT	—	8.00	279	752	763	—
11-15LT	11R15LT	8.00	279	777	788	—
11-16LT	—	8.00	279	803	813	—
12-15LT	—	10.00	318	823	834	—
—	9R15LT	8.00	254	744	755	752
24 × 7.50-13LT	24 × 7.50R13LT	6.00	191	597	609	604
27 × 8.50-14LT	27 × 8.50-14LT	7.00	218	674	685	680
28 × 8.50-15LT	28 × 8.50-15LT	7.00	218	699	711	705
29 × 9.50-15LT	29 × 9.50-15LT	7.50	240	724	736	731
30 × 9.50-15LT	30 × 9.50-15LT	7.50	240	750	761	756
31 × 10.50-15LT	31 × 10.50-15LT	8.50	268	775	787	781
31 × 11.50-15LT	31 × 11.50-15LT	9.00	290	775	787	781
32 × 11.50-15LT	32 × 11.50-15LT	9.00	290	801	812	807
33 × 12.50-15LT	33 × 12.50-15LT	10.00	318	826	838	832
35 × 12.50-15LT	35 × 12.50-15LT	10.00	318	877	888	883
37 × 12.50-15LT	37 × 12.50-15LT	10.00	318	928	939	934
31 × 13.50-15LT	31 × 13.50-15LT	11.00	345	775	787	781
37 × 14.50-15LT	37 × 14.50-15LT	12.00	372	928	939	934
31 × 15.50-15LT	31 × 15.50-15LT	12.00	390	775	787	781

(¹) Overall tyre widths may exceed the above section widths by 6%.
(²) Tolerance + 6% of the difference between the above outer diameter and the nominal rim diameters.

TABLE 25

Tyres for trucks, buses and trailers in normal highway service

DIAGONAL AND RADIAL
TYRES MOUNTED ON MULTI-PIECE BYMS

Tyre size designation		Measuring-rim width (inches)	Section width (mm) ⁽¹⁾	Outer diameter		
Diagonal	Radial			Highway tread (mm) ⁽²⁾	Heavy tread (mm) ⁽²⁾	Mud and snow (mm) ⁽²⁾
6.50-20	6.50R20	5.00	184	878	—	1 049
7.00-15TR	7.00R15TR	5.50	199	777	—	962
7.00-17	7.00R17	5.50	199	828	—	843
7.00-18	7.00R18	5.50	199	853	—	868
7.00-20	7.00R20	5.50	199	904	—	919
7.50-15TR	7.50R15TR	6.00	215	808	—	825
7.50-17	7.50R17	6.00	215	859	—	876
7.50-18	7.50R18	6.00	215	884	—	981
7.50-20	7.50R20	6.00	215	935	—	952
8.25-15TR	8.25R15TR	6.50	236	847	855	865
8.25-17	8.25R17	6.50	236	898	906	915
8.25-20	8.25R20	6.50	236	974	982	992
9.00-15TR	9.00R15TR	7.00	259	891	904	911
9.00-20	9.00R20	7.00	259	1 019	1 031	1 038
10.00-15TR	10.00R15TR	7.50	278	927	940	946
10.00-20	10.00R20	7.50	278	1 054	1 067	1 073
10.00-22	10.50R22	7.50	278	1 104	1 118	1 123
11.00-15TR	11.00R15TR	8.00	293	958	972	977
11.00-20	11.00R20	8.00	293	1 085	1 099	1 104
11.00-22	11.00R22	8.00	293	1 135	1 150	1 155
11.00-24	11.00R24	8.00	293	1 186	1 201	1 206
11.50-20	11.50R20	8.00	296	1 085	1 099	1 104
11.50-22	11.50R22	8.00	296	1 135	1 150	1 155
12.50-20	12.00R20	8.50	315	1 125	—	1 146
12.50-24	12.00R24	8.50	315	1 226	—	1 247

⁽¹⁾ Overall tyre widths may exceed the above section widths by 6%.⁽²⁾ Tolerance + 6% of the difference between the above outer diameter and the nominal rim diameters.

TABLE 26

Tyres for trucks and trailers in highway service at restricted speeds

DIAGONAL AND RADIAL
TYRES MOUNTED ON MULTI-PIECE RIMS

Tyre size designation		Measuring- rim width (inches)	Section width (mm) ⁽¹⁾	Outer diameter	
Diagonal	Radial			Highway tread (mm) ⁽²⁾	Mud and snow (mm) ⁽²⁾
13.00-20	13.00R20	9.00	340	1 177	1 200
14.00-20	14.00R20	10.00	375	1 241	1 266
14.00-24	14.00R24	10.00	375	1 343	1 368

⁽¹⁾ Overall tyre widths may exceed the above section widths by 6%.

⁽²⁾ Tolerance + 6% of the difference between the above outer diameter and the nominal rim diameters.

TABLE 27

Tyres for mobile homes in highway service

DIAGONAL

Tyre size designation	Measuring- rim width (inches)	Section width (mm) ⁽¹⁾	Outer diameter (mm) ⁽²⁾
Tyres mounted on 15° drop-centre rims			
7-14.5 MH	6.00	185	677
8-14.5 MH	6.00	203	707
9-14.5 MH	7.00	241	711

Tyres mounted on 5° drop-centre and semi-drop-centre rims

7.00-15 MH	5.50	202	752
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⁽¹⁾ Overall tyre widths may exceed the above section widths by 8%.

⁽²⁾ Tolerance + 8% of the difference between the above outer diameter and the nominal rim diameters.

TABLE 28

Mining and logging tyres in intermittent highway service

DIAGONAL

Tyre size designation	Measuring-rim width (inches)	Section width (mm) ⁽¹⁾	Outer diameter	
			Traction tread (mm) ⁽²⁾	Extra tread (mm) ⁽²⁾
Tyres mounted on 15° drop-centre rims				
7.00-20 ML	5.50	199	919	—
7.50-20 ML	6.00	215	952	—
8.25-20 ML	6.50	236	992	—
9.00-20 ML	7.00	259	1 038	1 063
10.00-20 ML	7.50	278	1 073	1 099
10.00-22 ML	7.50	278	1 123	1 150
10.00-20 ML	7.50	278	1 174	1 200
11.00-20 ML	8.00	293	1 104	1 131
11.00-22 ML	8.00	293	1 155	1 182
11.00-24 ML	8.00	293	1 206	1 233
12.00-20 ML	8.50	315	1 146	1 173
12.00-24 ML	8.50	315	1 247	1 275
13.00-20 ML	9.00	340	1 200	—
13.00-24 ML	9.00	340	1 302	—
14.00-20 ML	10.00	375	1 266	—
14.00-24 ML	10.00	375	1 368	—
Tyres mounted on full-tapered bead seat rims				
11.00-25 ML	8.50	298	1 206	1 233
12.00-21 ML	8.50	315	1 146	1 175
12.00-25 ML	8.50	315	1 247	1 275
13.00-25 ML	10.00	351	1 302	—
14.00-21 ML	10.00	375	1 266	—
14.00-25 ML	10.00	375	1 368	—
Tyres mounted on 15° drop-centre rims				
9-22.5 ML	6.75	229	992	—
10-22.5 ML	7.50	254	1 038	—
11-22.5 ML	8.25	279	1 073	—
11-24.5 ML	8.25	279	1 123	—
12-22.5 ML	9.00	300	1 104	—
Tyres mounted on 15° drop-centre rims				
14-17.5 ML	10.50	349	921	—
15-19.5 ML	11.75	389	1 019	—
15-22.5 ML	11.75	389	1 095	—
16.5-19.5 ML	13.00	425	1 068	—
16.5-22.5 ML	13.00	425	1 144	—
18-19.5 ML	14.00	457	1 096	—
18-22.5 ML	14.00	457	1 172	—
19.5-19.5 ML	15.00	495	1 156	—
23-23.5 ML	17.00	584	1 320	—

⁽¹⁾ Overall tyre widths may exceed the above section widths by 8%.

⁽²⁾ Tolerance + 6% of the difference between the above outer diameter and the nominal rim diameters.

Appendix 6

METHOD OF MEASURING TYRE DIMENSIONS

(see Annex II section 6.1.3)

PART A: PASSENGER CAR TYRES

- 1.1. The tyre is mounted on the measuring rim specified by the manufacturer pursuant to section 6.11 of Annex I, Appendix 1.
- 1.2. The pressure in the tyre is then adjusted as follows:
 - 1.2.1. in standard bias — belted tyres to 1,7 bar;
 - 1.2.2. in diagonal (bias-ply) tyres to the pressure shown below (bar):

Ply-rating	Speed category		
	L, M, N	P, Q, R, S	T, U, H, V
4	1,7	2,0	—
6	2,1	2,4	2,6
8	2,5	2,8	3,0

- 1.2.3. in standard radial tyres to 1,8 bar,
 - 1.2.4. in reinforced tyres to 2,3 bar, and
 - 1.2.5. in T-type temporary-use spare tyres: to 4,2 bar.
- 2. The tyre, mounted on its rim, is conditioned at the ambient room temperature for not less than 24 hours, with the exception referred to in section 6.2.3 of Annex II.
- 3. The pressure is readjusted to that specified in section 1.2.
- 4. The overall width is measured by caliper at six equally-spaced points, account being taken of the thickness of the protective ribs or bands. The highest measurement so obtained is taken as the overall width.
- 5. The outer diameter is determined by measuring the maximum circumference and dividing the figure so obtained by π (3,1416).

PART B: COMMERCIAL VEHICLE TYRES

- 1. The tyre is mounted on the measuring rim specified by the manufacturer pursuant to section 6.11 of Appendix 1 to Annex I and is inflated to a pressure specified by the manufacturer pursuant to section 6.12 of Annex I, Appendix 1.
- 2. The tyre fitted on its rim is conditioned to the ambient temperature of the laboratory for at least 24 hours.
- 3. The pressure is readjusted to the value specified in section 1.
- 4. The overall width is measured by caliper at six equally-spaced points, account being taken of the thickness of the protective ribs or bands. The highest measurement so obtained is taken as the overall width.
- 5. The outer diameter is determined by measuring the maximum circumference and dividing the figure so obtained by π (3,1416).

Appendix 7

LOAD/SPEED TEST-PROCEDURE ⁽¹⁾

(see Annex II, section 6.2)

PART A: PASSENGER CAR TYRES

1. Preparing the tyre

1.1. A new tyre is mounted on the test rim specified by the manufacturer pursuant to section 6.11 of Annex I, Appendix 1.

1.2. It is inflated to the appropriate pressure as given in the table below:

Test pressure (bar)

Speed category	Diagonal (bias-ply) tyres			Radial tyres		Bias-belted tyres
	Ply-rating			Standard	Reinforced	Standard
	4	6	8			
L, M, N	2,3	2,7	3,0	2,4	—	—
P, Q, R, S	2,6	3,0	3,3	2,6	3,0	2,6
T, U, H	2,8	3,2	3,5	2,8	3,2	2,8
V	3,0	3,4	3,7	3,0	—	—

T-type temporary use spare tyres: to 4,2 bars.

1.3. The manufacturer may request, giving reasons, the use of an inflation pressure differing from those under section 1.2. In such a case the tyre is inflated to that pressure (see section 6.14 of Appendix 1 to Annex I).

1.4. The tyre-and-wheel assembly is conditioned at test-room temperature for not less than three hours.

1.5. The tyre pressure is readjusted to that specified in section 1.2 or 1.3.

2. Carrying out the test

2.1. The tyre-and-wheel assembly is mounted on a test axle and pressed against the outer face of a smooth wheel $1,70\text{ m} \pm 1\%$ or $2\text{ m} \pm 1\%$ in diameter.

2.2. Apply to the test axle a load equal to 80 % of:

2.2.1. the maximum load rating equated to the load capacity index for tyres with speed symbols L to H inclusive;

2.2.2. the maximum load rating associated with a maximum speed of 240 km/h for tyres with speed symbol 'V' (see section 2.31.2 of Annex II).

2.3. Throughout the test the tyre pressure must not be corrected and the test load must be kept constant.

2.4. During the test the temperature in the test-room must be maintained at between 20 °C and 30 °C or at a higher temperature if the manufacturer agrees.

2.5. The test is carried out without interruption in conformity with the following particulars:

2.5.1. time taken to pass from zero speed to initial test speed: 10 minutes;

⁽¹⁾ In the case of passenger car tyres intended for vehicles designed for a maximum speed greater than 240 km/h (Z rated tyres), until uniform test procedures have been agreed the manufacturer of the tyre must satisfy the technical service that his test procedure and results are acceptable.

- 2.5.2. initial test speed: prescribed maximum speed for the type of tyre, less 40 km/h in the case of the smooth wheel having $1,70 \text{ m} \pm 1\%$ in diameter or less 30 km/h in the case of the smooth wheel having $2 \text{ m} \pm 1\%$ in diameter;
- 2.5.3. successive speed increments: 10 km/h;
- 2.5.4. duration of test at each speed step except the last: 10 minutes;
- 2.5.5. duration of test at last speed step: 20 minutes;
- 2.5.6. maximum test speed: prescribed maximum speed for the type of tyre, less 10 km/h in the case of the smooth wheel having $1,7 \text{ m} \pm 1\%$ in diameter or equal to prescribed maximum speed in the case of the smooth wheel having $2 \text{ m} \pm 1\%$ in diameter.

3. Equivalent test methods

If a method other than that described in section 2 is used, its equivalence must be demonstrated.

PART B: COMMERCIAL VEHICLE TYRES ⁽¹⁾

1. Preparing the tyre

- 1.1. Mount a new tyre on the test rim specified by the manufacturer pursuant to section 6.11 of Appendix 1 to Annex I.
- 1.2. Use a new inner tube or combination of inner tube, valve and flap (as required) when testing tyres with inner tubes.
- 1.3. Inflate the tyre to the pressure corresponding to the pressure index specified by the tyre manufacturer, pursuant to section 6.14 of Appendix 1 to Annex I.
- 1.4. Condition the tyre and wheel assembly at test room temperature for not less than three hours.
- 1.5. Readjust the tyre pressure to that specified in section 1.3.

2. Test procedure

- 2.1. Mount the tyre and wheel assembly on the test axle and press it against the outer face of a smooth power-driven test drum $1,70 \text{ m} \pm 1\%$ in diameter having a surface at least as wide as the tyre tread.
- 2.2. Apply to test axle a series of test loads expressed as a percentage of the load indicated in Appendix 2, opposite the load index moulded on the sidewall of the tyre, in accordance with the load/speed test programme shown in the Table below. When the tyre has load capacity indices for both single and twin utilization, the reference load for single utilization is taken as the basis for the test loads.
- 2.3. The tyre pressure must not be corrected throughout the test and the test load must be kept constant throughout each of the three test stages.
- 2.4. During the test the temperature in the test room must be maintained at between 20 °C and 30 °C or at a higher temperature if the manufacturer so agrees.
- 2.5. The load/speed test programme must be carried out without interruption.

3. Equivalent test methods

If a method other than that described in section 2 is used, its equivalence must be demonstrated.

⁽¹⁾ In the case of commercial vehicle tyres intended for vehicles designed for a maximum speed greater than 150 km/h, until uniform test procedures have been agreed the manufacturer of the tyre must satisfy the technical service that his test procedure and results are acceptable.

LOAD/SPEED TEST PROGRAMME

Load index	Tyre speed category symbol	Test-drum speed (rev/min) ⁽¹⁾		Load placed on the wheel as a percentage of the load corresponding to the load index		
		Radial-ply tyre	Diagonal (bias-ply) tyre	7 h.	16 h.	24 h.
122 or more	F	100	100	66 %	84 %	101 %
	G	125	100			
	J	150	125			
	K	175	150			
	L	200	—			
	M	225	—			
121 or less	F	100	100			
	G	125	125			
	J	150	150			
	K	175	175			
	L	200	175	70 %	88 %	106 %
				4 h.	6 h.	
	M	250	200	75 %	97 %	114 %
	N	275	—	75 %	97 %	114 %
	P	300	—	75 %	97 %	114 %

⁽¹⁾ 'Special-use' tyres (see section 2.1.3. of Annex II) should be tested at a speed equal to 85 % of the test-drum speed prescribed above for equivalent normal tyres.

Appendix 8

VARIATION OF LOAD CAPACITY WITH SPEED

Commercial-vehicle tyres

RADIAL AND DIAGONAL

(see Annex II, sections 2.30, 2.31 and 6.2.4)

Speed (km/h)	Variation of load capacity (%)									
	All load indices				Load indices ⁽¹⁾ ≥ 122		Load indices ⁽¹⁾ ≤ 121			
	Speed category symbol				Speed category symbol		Speed category symbol			
	F	G	J	K	L	M	L	M	N	P ⁽²⁾
0	+ 150	+ 150	+ 150	+ 150	+ 150	+ 150	+ 110	+ 110	+ 110	+ 110
5	+ 110	+ 110	+ 110	+ 110	+ 110	+ 110	+ 90	+ 90	+ 90	+ 90
10	+ 80	+ 80	+ 80	+ 80	+ 80	+ 80	+ 75	+ 75	+ 75	+ 75
15	+ 65	+ 65	+ 65	+ 65	+ 65	+ 65	+ 60	+ 60	+ 60	+ 60
20	+ 50	+ 50	+ 50	+ 50	+ 50	+ 50	+ 50	+ 50	+ 50	+ 50
25	+ 35	+ 35	+ 35	+ 35	+ 35	+ 35	+ 42	+ 42	+ 42	+ 42
30	+ 25	+ 25	+ 25	+ 25	+ 25	+ 25	+ 35	+ 35	+ 35	+ 35
35	+ 19	+ 19	+ 19	+ 19	+ 19	+ 19	+ 29	+ 29	+ 29	+ 29
40	+ 15	+ 15	+ 15	+ 15	+ 15	+ 15	+ 25	+ 25	+ 25	+ 25
45	+ 13	+ 13	+ 13	+ 13	+ 13	+ 13	+ 22	+ 22	+ 22	+ 22
50	+ 12	+ 12	+ 12	+ 12	+ 12	+ 12	+ 20	+ 20	+ 20	+ 20
55	+ 11	+ 11	+ 11	+ 11	+ 11	+ 11	+ 17,5	+ 17,5	+ 17,5	+ 17,5
60	+ 10	+ 10	+ 10	+ 10	+ 10	+ 10	+ 15,0	+ 15,0	+ 15,0	+ 15,0
65	+ 7,5	+ 8,5	+ 8,5	+ 8,5	+ 8,5	+ 8,5	+ 13,5	+ 13,5	+ 13,5	+ 13,5
70	+ 5,0	+ 7,0	+ 7,0	+ 7,0	+ 7,0	+ 7,0	+ 12,5	+ 12,5	+ 12,5	+ 12,5
75	+ 2,5	+ 5,5	+ 5,5	+ 5,5	+ 5,5	+ 5,5	+ 11,0	+ 11,0	+ 11,0	+ 11,0
80	0	+ 4,0	+ 4,0	+ 4,0	+ 4,0	+ 4,0	+ 10,0	+ 10,0	+ 10,0	+ 10,0
85	- 3	+ 2,0	+ 3,0	+ 3,0	+ 3,0	+ 3,0	+ 8,5	+ 8,5	+ 8,5	+ 8,5
90	- 6	0	+ 2,0	+ 2,0	+ 2,0	+ 2,0	+ 7,5	+ 7,5	+ 7,5	+ 7,5
95	- 10	- 2,5	+ 1,0	+ 1,0	+ 1,0	+ 1,0	+ 6,5	+ 6,5	+ 6,5	+ 6,5
100	- 15	- 5	0	0	0	0	+ 5,0	+ 5,0	+ 5,0	+ 5,0
105		- 8	- 2	0	0	0	+ 3,75	+ 3,75	+ 3,75	+ 3,75
110		- 13	- 4	0	0	0	+ 2,5	+ 2,5	+ 2,5	+ 2,5
115			- 7	- 3	0	0	+ 1,25	+ 1,25	+ 1,25	+ 1,25
120			- 12	- 7	0	0	0	0	0	0
125						0	- 2,5	0	0	0
130						0	- 5	0	0	0
135							- 7,5	- 2,5	0	0
140							- 10	- 5	0	0
145								- 7,5	- 2,5	0
150								- 10	- 5	0
155									- 7,5	- 2,5
160									- 10	- 5

⁽¹⁾ The load capacity indices refer to single operations (see section 2.28.2 of Annex II).

⁽²⁾ Load variations are not allowed above 160 km/h. For speed category symbols Q and above, the speed category corresponding to the speed category symbol (see section 2.29.3 of Annex II) specifies the maximum speed permitted for the tyre.

ANNEX III

ADMINISTRATIVE PROVISIONS FOR THE TYPE-APPROVAL OF VEHICLES WITH REGARD TO THE FITTING OF THEIR TYRES

1. APPLICATION FOR THE EEC TYPE-APPROVAL OF A VEHICLE TYPE

- 1.1. The application for EEC type-approval of a vehicle type with regard to its tyres is submitted by the vehicle manufacturer or by his authorized representative.
- 1.2. It is accompanied, in triplicate, by a description of the vehicle type and of its tyres in terms of their tyre-size designation, speed category and load-capacity index, including any temporary-use spare unit(s), with which it may be fitted as described in the information document in Appendix 1.
- 1.3. A vehicle representative of the vehicle type to be approved must be submitted to the technical service responsible for conducting the approval tests.
- 1.4. The vehicle manufacturer or his representative may apply for the EEC vehicle type-approval to be extended to include tyres of additional tyre-size designations, speed categories or load-capacity indices or additional temporary-use spare unit(s).

2. EEC TYPE-APPROVAL OF A VEHICLE

- 2.1. EEC type-approval is granted and an EEC type-approval number issued in respect of any vehicle type submitted in accordance with section 1 which satisfied the requirements of this Directive.
- 2.2. Notice of approval or of extension or of refusal of approval of a vehicle type pursuant to this Directive is communicated to the Member States by means of a form conforming to the model in Appendix 2.
- 2.3. An approval number is assigned to each vehicle type approved. The same Member State must not assign the same number to another vehicle type.

3. MODIFICATION OF VEHICLE TYPE

- 3.1. Every modification of a vehicle type must be notified to the approval authority which approved it. That approval authority may then either:
 - 3.1.1. consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the vehicle still meets the requirements; or
 - 3.1.2. refuse to approve the modification.
- 3.2. Confirmation or refusal of approval, specifying the alterations, is communicated to the other Member States by the procedure specified in sections 2.2.

4. CONFORMITY OF PRODUCTION

- 4.1. Every production vehicle to which this Directive applies must be so manufactured that it conforms to all of the relevant requirements of this Directive.
- 4.2. In order to verify that the requirements of section 4.1 are met, suitable controls of the production must be carried out.
- 4.3. The holder of the approval must in particular ensure the existence of procedures for effectively checking on compatibility between the characteristics of the vehicle and the characteristics of the tyres fitted as laid down within the framework of this Directive.
- 4.4. The approval authority which has granted type-approval may at any time verify the conformity control methods applicable to each production unit.
 - 4.4.1. In every inspection, the test books and productions survey records must be presented to the visiting inspector.
- 4.5. The normal frequency of inspections authorized by the approval authority is one per year. In the case where negative results are recorded during one of these visits, the approval authority must ensure that all necessary steps are taken to re-establish the conformity of production as rapidly as possible.

5. PRODUCTION DEFINITELY DISCONTINUED

If the holder of an approval completely ceases to manufacture a type of vehicle approved in accordance with this Directive, he must so inform the authority which granted the approval. Upon receiving the relevant communication that authority must inform thereof the other approval authorities by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation 'PRODUCTION DISCONTINUED'.

Appendix 1

INFORMATION DOCUMENT No . . .

IN ACCORDANCE WITH ANNEX I TO COUNCIL DIRECTIVE 70/156/EEC RELATING TO EEC TYPE-APPROVAL
OF A VEHICLE TYPE WITH REGARD TO THE FITTING OF ITS TYRES

(DIRECTIVE 92/23/EEC)

The following information, if applicable, must be supplied in triplicate and must include a list of contents. Drawings, if any, must be supplied in appropriate scale and in sufficient detail on size A4 or folded to that size. In the case of microprocessor-controlled functions supply relevant performance-related information.

0. GENERAL

- 0.1. Make (trade name of manufacturer):
- 0.2. Type and commercial description(s):
- 0.3. Means of identification of type, if marked on the vehicle (b):
- 0.3.1. Location of that marking:
- 0.4. Category of vehicle (c):
- 0.5. Name and address of applicant:
- 0.6. Location of statutory plates and inscriptions and methods of affixing:
- 0.6.1. On the chassis:
- 0.6.2. On the bodywork:
- 0.7. Address(es) of assembly plant(s):

1. GENERAL CONSTRUCTION CHARACTERISTICS OF THE VEHICLE

- 1.3. Number of axles and wheels:
- 1.3.1. Number and position of axles with tyres in dual (twin) formation:
- 1.3.2. Number and position of steered axles:
- 1.3.3. Powered axles (number, position, interconnection):
- 1.4. Maximum design speed (for each variant, if any):

2. MASSES AND DIMENSIONS (e) (in kg and mm) (refer to drawing where applicable)

- 2.1. Maximum technically permissible mass for each axle:

6. SUSPENSION:

- 6.2. Tyres and wheels normally fitted:
- 6.2.1. Attached is a list presented by the vehicle manufacturer of all the relevant variants (if any) of the vehicle type and the corresponding tyres for use on each. The description of the tyres must include the following information:
- the tyre-size designation,
 - the minimum load-capacity index compatible with the maximum axle load (each axle to be stated separately if more than one tyre size designation is fitted to the vehicle),
 - the minimum speed category symbol compatible with the maximum design speed.
- 6.2.4. Tyre pressure(s) as recommended by the vehicle manufacturer (kPa):
- 6.2.5. Tyre/wheel combination(s):
- 6.2.6. Brief description of temporary-use spare unit(s), if any:

Appendix 2

MODEL

[(maximum format: A4 (210 × 297 mm)]

EEC TYPE-APPROVAL CERTIFICATE
(vehicle)

Stamp of Administration

Communication concerning the:

- type-approval ⁽¹⁾,
- extension of type-approval ⁽¹⁾,
- refusal of type-approval ⁽¹⁾,

of a type of vehicle with regard to Directive 92/23/EEC.

EEC type-approval No: Extension No:

SECTION I

0. General
- 0.1. Make (trade name of manufacturer):
- 0.2. Commercial description(s):
- 0.3. Means of identification of type, if marked on the vehicle (b):
- 0.3.1. Location of that marking:
- 0.4. Category of vehicle (c):
- 0.5. Name and address of applicant:
- 0.6. Location of statutory plates and inscriptions and methods of affixing:
- 0.6.1. On the chassis:
- 0.6.2. On the bodywork:
- 0.7. Address(es) of assembly plant (s):

⁽¹⁾ Delete where inapplicable.

Footnotes, see Annex to Directive 70/156/EEC, as last amended by Directive 87/403/EEC.

SECTION II

- 1. **Additional information**
- 1.1. Attached is a list presented by the vehicle manufacturer of all the relevant variants (if any) of the vehicle type and the corresponding tyres for use on each. The description of the tyres must include only the following information:
 - the tyre size designation,
 - the minimum speed category symbol compatible with the maximum design speed,
 - the minimum load-capacity index compatible with the maximum axle load (each axle to be stated separately if more than one tyre size designation is fitted to the vehicle).
- 1.2. Brief description of temporary-use spare unit(s), if any:
- 1.2.1. Technical service responsible for carrying out the tests:
- 1.2.2. Date of test report:
- 1.2.3. Number of test report:
- 1.2.4. Grounds for extending type-approval (where appropriate):
- 1.2.5. Comments (if any):
- 1.2.6. Place:
- 1.2.7. Date:
- 1.2.8. Signature:
- 1.2.9. A list of documents making up the type-approval file lodged with the approval authority that has granted type-approval, which may be obtained on request, is attached.

ANNEX IV

REQUIREMENTS FOR VEHICLES WITH REGARD TO THE FITTING OF THEIR TYRES

1. DEFINITIONS

2. *For the purpose of this Directive:*

- 2.1. 'approval of a vehicle' means the approval of a vehicle type with regard to its tyres, including temporary-use spare tyres;
- 2.2. 'vehicle type' means a range of vehicles which do not differ significantly, at least as regards each variant of the vehicle type, in such essential aspects as would affect the tyre size designation, the speed category symbol or the load capacity index;
- 2.3. 'wheel' means a complete wheel consisting of a rim and a wheel disc;
- 2.4. 'temporary-use spare wheel' means a wheel different from one of the normal wheels on the vehicle type;
- 2.5. 'unit' means an assembly of a wheel and tyre;
- 2.6. 'normal unit' means a unit which is capable of being fitted to the vehicle for normal operation;
- 2.7. 'spare unit' means a unit which is intended to be exchanged for a normal unit in case of malfunction of the latter. A 'spare unit' may be either of the following:
 - 2.7.0. 'normal spare unit', which is a unit that conforms to the normal unit of the vehicle type;
 - 2.7.1. 'temporary-use spare unit', which is a unit that differs from the normal units of the vehicle type with regard to their principal characteristics (e.g. their tyre-size designation, functional dimensions, conditions of use or structure). It is intended for temporary use under restricted conditions. Temporary-use spare units may be of the following categories:
 - 2.7.1.1. category 1
a unit consisting of a wheel which conforms to a wheel of a normal unit and a tyre which has principal characteristics (e.g. dimensions, structure) different to the normal tyre;
 - 2.7.1.2. category 2
a unit consisting of a wheel and a tyre both having principal characteristics different to the normal unit and intended to be carried on the vehicle with the tyre inflated to the pressure specified for temporary use;
 - 2.7.1.3. category 3
a unit consisting of a normal wheel and a tyre having principal characteristics different to a normal tyre and intended to be carried on the vehicle with the tyre folded and not inflated;
 - 2.7.1.4. category 4
a unit consisting of a wheel and tyre both having principal characteristics different to a normal unit and intended to be carried on the vehicle with the tyre folded and not inflated;
- 2.8. 'maximum mass' means the maximum value stated by the vehicle manufacturer to be technically permissible for the vehicle;
- 2.9. 'maximum axle load' means the maximum value stated by the vehicle manufacturer to be technically permissible for the total vertical force between the contact surfaces of the tyres of the axle in question and the ground and resulting from the part of the vehicle mass supported by that axle. The sum of the axle loads may be greater than the value corresponding to the maximum mass of the vehicle;
- 2.10. 'functional dimensions' means dimensions derived from the size designation of the wheels and/or tyres (e.g. diameter, width, aspect ratio) and from the mounting of the unit to the vehicle (e.g. wheel offset);
- 2.11. 'maximum design speed' means the maximum speed approved for the vehicle type inclusive of the tolerance allowed for the conformity checks of the series production.

3. REQUIREMENTS FOR VEHICLES WITH REGARD TO THE FITTING OF THEIR TYRES

3.1. General

- 3.1.1. Subject to the provisions of section 3.7.4, every tyre fitted to a vehicle, including any spare, must bear the EEC component type-approval mark or the type-approval mark indicating compliance with EEC Regulations Nos 30 or 54 as referred to in the recitals of this Directive.

3.2. Tyre fitment

- 3.2.1. All of the tyres fitted to a vehicle, excluding any temporary use spare, must have the same structure (see Annex II section 2.3).
- 3.2.2. All of the tyres fitted to one axle must be of the same type (see Annex II section 2.1).
- 3.2.3. The space in which the wheel revolves must be such as to allow unrestricted movement when using the maximum permissible size of tyres within the suspension and steering constraints provided by the vehicle manufacturer.

3.3. Load capacity

- 3.3.1. Subject to the provisions of section 3.7, the maximum load rating (see Annex II section 2.31) of every tyre, including a spare tyre (if provided) with which a vehicle is fitted is:
- 3.3.1.1. in the case of a vehicle fitted with tyres of the same type in single formation: at least equal to half of the maximum axle load (see section 2.9) for the most heavily loaded axle, as declared by the manufacturer of the vehicle;
- 3.3.1.2. in the case of a vehicle fitted with tyres of more than one type, in single formation: at least equal to half of the maximum axle load (see section 2.9), as declared by the manufacturer of the vehicle, in respect of the relevant axle;
- 3.3.1.3. in the case of a vehicle fitted with passenger car tyres in dual (twin) formation: at least equal to 0,27 times the maximum axle load, as declared by the manufacturer of the vehicle, in respect of the relevant axle;
- 3.3.1.4. in the case of axles fitted with commercial vehicle tyres in dual (twin) formation: at least equal to 0,25 times, with reference to the load capacity index for dual application, the maximum axle load as declared by the manufacturer of the vehicle, in respect of the relevant axle.

3.4. Speed capacity

- 3.4.1. Every tyre with which a vehicle is normally fitted must have a speed category symbol (see Annex II section 2.29) compatible with the maximum design speed of the vehicle (as declared by the vehicle manufacturer) or the applicable load/speed combination (see Annex II section 2.30).
- 3.4.2. The above specification does not apply:
- 3.4.2.1. in the case of temporary use spare units for which section 3.8 applies;
- 3.4.2.2. in the case of vehicles normally equipped with ordinary tyres and occasionally supplied with snow tyres.

However, in this case the speed category symbol of the snow tyres must correspond to a speed either greater than the maximum design speed of the vehicle (as declared by the vehicle manufacturer) or not less than 160 km/h (or both).

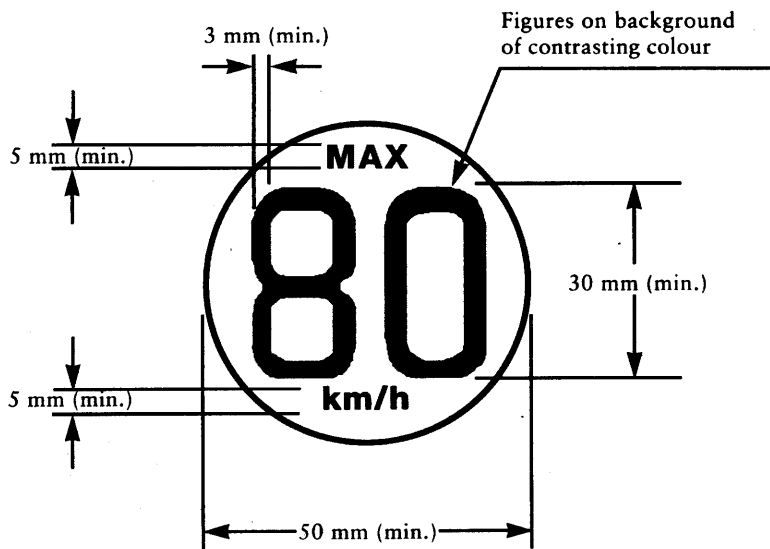
If, nevertheless, the maximum design speed of the vehicles (as declared by the vehicle manufacturer) is greater than the speed corresponding to the speed category symbol of the snow tyres a maximum speed warning label, specifying the maximum speed capability of the snow tyres, must be displayed inside the vehicle in a prominent position readily visible to the driver.

3.5. Spare tyre

- 3.5.1. In the case where a vehicle is provided with a spare wheel its tyre must be:
- 3.5.1.1. the same type as one of the tyres fitted to or approved for the vehicle, or
- 3.5.1.2. a temporary-use spare tyre of a type suitable for use on the vehicle, in any position. However, no vehicle other than a vehicle of category M₁ may be fitted with a temporary-use spare tyre.

- 3.5.2. Every vehicle provided with a temporary-use spare unit must be provided with supplementary information clearly and permanently displayed on the temporary-use spare unit or on the vehicle near the spare unit or in the driver's handbook. At least the following information must be given:
- 3.5.2.1. an instruction to drive with caution when the temporary-use spare unit is fitted, and to install a normal unit as soon as possible;
 - 3.5.2.2. a statement that operation of the vehicle is not permitted with more than one temporary-use spare unit fitted at the same time;
 - 3.5.2.3. a clear indication of the inflation pressure specified by the vehicle manufacturer for the tyre of the temporary-use spare unit;
 - 3.5.2.4. for vehicles equipped with category 3 or category 4 temporary-use spare units, a description of the procedure for inflating the tyre to the pressure specified for temporary use by means of the device referred to in section 3.6;
- 3.6. **Inflating device of temporary-use spare unit:**
- 3.6.1. if the vehicle is equipped with a category 3 or category 4 temporary-use spare unit, a device must be provided on the vehicle which permits the tyre to be inflated to the pressure specified for temporary use within a maximum of five minutes.
- 3.7. **Special cases**
- 3.7.1. In the case of trailers of categories 01 and 02 with operating speeds restricted to 100 km/h or less fitted with passenger car tyres in single formation, the maximum load rating of every tyre must be at least equal to 0,45 times the maximum mass for the most heavily loaded axle, as declared by the manufacturer of the trailer. For tyres in dual (twin) formation this factor is 0,24.
 - 3.7.2. In the case of some special vehicles fitted with commercial vehicle tyres, the table 'Variation of Load Capacity with Speed' (see section 2.30 and Appendix 8 to Annex II) is not to be applied. In those cases the tyre maximum load ratings to check against the maximum axle loads (see sections 3.3.1.2 and 3.3.1.4 of this Annex) are determined by multiplying the load corresponding to the load capacity index by an appropriate coefficient which is related to the type of vehicle and its use rather than to the maximum design speed of the vehicle. In such cases section 3.4.1 of this Annex does not apply. The appropriate coefficients are as follows:
 - 3.7.2.1. 1,10 in the case of vehicles of category M₃ when the vehicle is carrying standing passengers and the operating speed does not exceed 60 km/h. However, for operational reasons Member States may allow the operating speed to be increased to 80 km/h;
 - 3.7.2.2. 1,15 in the case of such vehicles (M₃) if they are intended for use only on urban routes with frequent stops;
 - 3.7.2.3. 1,10 in the case of public utility vehicles of category N used at slow speeds over short distances in urban and suburban applications such as road sweepers or refuse collectors.
 - 3.7.3. When a motor vehicle of category M₁ is towing a trailer, the additional load imposed at the trailer coupling device may cause the tyre maximum load ratings to be exceeded, but not by more than 15 %, provided that the operating speed is restricted to 100 km/h or less and the inflation pressure increased by at least 0,2 bar is applied.
 - 3.7.4. In the case of a vehicle which is fitted with tyres which are not passenger car tyres nor commercial vehicle tyres due to special conditions of use (e.g. agricultural tyres, industrial truck tyres, motor cycle tyres) the requirements of Annex II do not apply provided that the approval authority is satisfied that the tyres fitted are suitable for the operating conditions of the vehicle.
- 3.8. **Specifications for temporary-use spare units**
- 3.8.1. Every temporary-use spare tyre must have a speed category at least equal to 120 km/h (speed category symbol L).
 - 3.8.2. When fitted to the vehicle for temporary use the outward facing surface of the wheel must exhibit a distinctive colour or colour pattern which is clearly different from the colour(s) of the normal units. If it is possible to attach a wheel cover to the temporary-use spare unit the distinctive colour or colour pattern must not be obscured by this wheel cover.

3.8.3. A maximum speed warning symbol must be permanently displayed on the outer face of the wheel in a prominent position and in accordance with the diagram below:



Scale – full size (1:1)

COUNCIL DIRECTIVE 92/24/EEC

of 31 March 1992

relating to speed limitation devices or similar speed limitation on-board systems of certain categories of motor vehicles

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 it is important to adopt measures with the aim of progressively establishing the internal market over a period expiring on 31 December 1992; whereas the internal market shall comprise an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured;

Whereas the technical requirements which motor vehicles must satisfy pursuant to national laws relate, *inter alia*, to speed limitation of certain categories of vehicle;

Whereas these requirements differ from one Member State to another; whereas it is therefore necessary for all Member States to adopt the same requirements either in addition to, or in place of, their existing rules in order to allow, in particular, the EEC type-approval procedure which was the subject of Directive 70/156/EEC ⁽⁴⁾ to be applied in respect of each type of vehicle;

Whereas, with a view to improving road safety and reducing the severity of injuries in cases of accidents with heavy goods vehicles and buses, it is considered urgently necessary to fit speed limitation devices to these categories of motor vehicle;

Whereas in respect of environment and economy a reduction of air pollution and fuel consumption can be achieved;

Whereas, in all cases where the Council confers powers upon the Commission to implement rules laid down in the motor vehicle sector, it is appropriate to provide for a procedure of prior consultation between the Commission and the Member States within an Advisory Committee;

Whereas it is reasonable and useful to undertake research activities relating to the development of variable speed limitation devices activated in conformity with the speed limits warranted by the prevailing road and traffic conditions within the framework of the Drive-programme,

HAS ADOPTED THIS DIRECTIVE:

Article 1

For the purpose of this Directive:

- 'vehicle' shall mean any motor vehicle of categories N₂ and M₃ with a maximum authorized mass exceeding 10 tonnes and of category N₃, as defined in Annex I to Directive 70/156/EEC, intended for use on the road, having at least four wheels and a maximum design speed exceeding 25 km/h,
- 'speed limitation device' shall mean a speed-limiting appliance for which type-approval of a separate technical unit within the meaning of Article 9a of Directive 70/156/EEC may be granted. Built-in maximum vehicle speed limitation systems, incorporated into the design of vehicles from the outset, shall meet the same requirements as speed limitation devices.

Article 2

Member states may not refuse:

- EEC type-approval or national type-approval for a vehicle, or refuse or prohibit the sale, registration, entry into service or use of a vehicle on grounds relating to its equipment with speed limitation devices,
- EEC technical unit type-approval or national type-approval for a speed limitation device, or prohibit the sale or use of a speed limitation device,

if the requirements of the Annexes to this Directive are satisfied.

⁽¹⁾ OJ No C 229, 4. 9. 1991, p. 5.

⁽²⁾ OJ No C 13, 20. 1. 1992, p. 505; and OJ No C 67, 16. 3. 1992.

⁽³⁾ OJ No C 40, 17. 2. 1992, p. 54.

⁽⁴⁾ 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 (OJ No L 42, 23. 2. 1970, p. 1.), as last amended by Directive 87/403/EEC (OJ No L 220, 8. 8. 1987, p. 44).

Article 3

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

Article 4

Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive not later than 1 January 1993. They shall forthwith inform the Commission thereof.

When Member States adopt the provisions referred to in the preceding subparagraph, they shall contain a reference to this Directive or shall be accompanied by such reference at the time of their official publication. The methods of making such a reference shall be adopted by Member States.

Article 5

With effect from 1 January 1994, Member States:

- may no longer issue the document provided for in the third indent of Article 10(1) of Directive 70/156/EEC in

respect of a type of vehicle of which the speed limitation device does not meet the requirements of this Directive,

- may refuse to grant national type-approval in respect of a type of vehicle of which the speed limitation device does not comply with the provisions of this Directive.

With effect from 1 October 1994, Member States may prohibit the first entry into service of vehicles when such vehicles are not equipped with a speed limitation device complying with the provisions of this Directive.

Article 6

This Directive is addressed to the Member States.

Done at Brussels, 31 March 1992.

For the Council

The President

Vitor MARTINS

ANNEX 1

1. SCOPE

- 1.1. This Directive applies to speed limitation devices, EEC type-approved as separate technical units for motor vehicles, and the equipment of motor vehicles, as described in Article 1, with these approved devices or similar speed limitation systems meeting the requirements of the Annexes to this Directive.

Motor vehicles, whose maximum design speed is lower than the set speed as provided for in Council Directive 92/6/EEC of 10 February 1992 on the installations and use of speed limitation devices for certain categories of motor vehicles in the Community ⁽¹⁾ need not be fitted with speed limitation devices or systems.

The purpose of this Directive is to limit to a specified value the maximum road speed of heavy goods and passenger-carrying vehicles. This is achieved by a speed limitation device or an on-board speed limitation system whose primary function is to control the fuel feed to the engine.

2. DEFINITIONS

- 2.1. For the purpose of this Directive:
- 2.2. '*Limitation speed V*' means the maximum speed of the vehicle such that its design or equipment does not permit a response after a positive action on the accelerator control.
- 2.3. '*Set speed (V set)*' means the intended mean vehicle speed when operating in a stabilized condition.
- 2.4. '*Stabilized speed (V stab)*' means the vehicle speed when operating in the conditions as specified in point 1.1.4.2.3 of Annex III.
- 2.5. '*Speed limitation device*' means a device whose primary function is to control the fuel feed to the engine in order to limit the vehicle speed to the specified value.
- 2.6. '*Unladen mass*' means the mass of the vehicle in running order, including coolant, oils, fuel, tools and spare wheel on board, where applicable.
- 2.7. '*Vehicle type*' means vehicles which do not differ in such essential respects as:
- 2.7.1. — make and type of the speed limitation system or the speed limitation device, if any,
 - 2.7.2. — range of speeds at which the limitation may be set within the range established for the tested vehicle,
 - 2.7.3. — maximum engine power to unladen mass ratio less than or equal to that of the tested vehicle, and
 - 2.7.4. — highest ratio of engine speed to vehicle speed in top gear less than that of the tested vehicle.
- 2.8. '*Type speed limitation device*' means speed limitation devices which do not differ with respect to the essential characteristics such as:
- make and type of the device,
 - range of speed values at which the speed limitation device may be set,
 - method used to control the fuel feed of the engine.

3. APPLICATION FOR EEC VEHICLE TYPE-APPROVAL

- 3.1. The application for approval of a vehicle type with regard to speed limitation shall be submitted by the vehicle manufacturer or by his duly accredited representative.

⁽¹⁾ OJ No L 57, 2. 3. 1992, p. 27.

- 3.2. It shall be accompanied by the undermentioned documents in triplicate and by the following particulars:
 - 3.2.1. a detailed description of the vehicle type and of vehicle parts related to the speed limitation, comprising the particulars and documents referred to in Annex II, Appendix I.
 - 3.2.2. A vehicle representative of the type to be approved shall be submitted to the technical service responsible for conducting the approval tests.
 - 3.2.3. A vehicle not comprising all the components proper to the type may be accepted for tests provided that it can be shown by the applicant to the satisfaction of the competent authority that the absence of the components omitted has no effect on the results of the verifications, so far as the requirements of this Directive are concerned.
- 3.3. The competent authority shall verify the existence of satisfactory arrangements for ensuring effective checks on conformity of production before EEC type-approval is granted.

4. EEC TYPE-APPROVAL

- 4.1. If the vehicle submitted for approval pursuant to this Directive meets the requirements of point 7 below, approval of that vehicle type shall be granted.

Notice of approval or of extension or of refusal of approval of a vehicle type pursuant to this Directive shall be communicated to the Member States by means of a form conforming to the model in Annex II, Appendix 2 to this Directive.
- 4.2. An approval number shall be assigned to each type approved. The same Member State may not assign the same number to another vehicle type.

5. APPLICATION FOR TECHNICAL UNIT EEC TYPE-APPROVAL OF A SPEED LIMITATION DEVICE

- 5.1. The application for EEC type-approval of a speed limitation device as a technical unit must be submitted by the manufacturer of the speed limitation device or by his duly accredited representative.
- 5.2. For each type of speed limitation device the application must be accompanied by:
 - 5.2.1. documentation in triplicate giving a description of the technical characteristics of the speed limitation device and the method of its installations on one or more types of vehicle for which the speed limitations device is intended to be installed;
 - 5.2.2. five samples of the type of speed limitation device; the samples must be clearly and indelibly marked with the applicant's trade name or mark and the type designation;
 - 5.2.3. a vehicle or an engine (in the case of testing on an engine bench) fitted with the speed limitation device to be type approved, chosen by the applicant in agreement with the technical service responsible for conducting approval tests.
- 5.3. The competent authority shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production of the speed limitation device before type-approval is granted.

6. APPROVAL

- 6.1. If the speed limitation device submitted for approval pursuant to this Directive meets the requirements of item 7 below, approval of that type of speed limitation device shall be granted.
- 6.2. An approval number shall be assigned to each type of speed limitation device approved. Its first two digits (00 for the Directive in its original form) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Directive at the time of issue of the approval. The same Member State may not assign the same number to another type of speed limitation device.

- 6.3. Notice of approval, or of extension or of refusal of approval of a type of speed limitation device pursuant to this Directive shall be communicated to the Member States by means of a form conforming to the model in Annex II, Appendix 4 to this Directive.
- 6.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every speed limitation device conforming to a type of speed limitation device approved under this Directive an international approval mark consisting of:
 - 6.4.1. a rectangle surrounding the letter 'e' followed by the distinguishing number of the country which has granted approval; and
 - 6.4.2. the approval number, as given on the EEC type-approval certificate (see Annex II, Appendix 4), near to the rectangle of the approval mark.
- 6.5. The approval mark shall be clearly legible and indelible.
- 6.6. Annex II, Appendix 6 to this Directive gives an example of the arrangement of the approval mark.

7. REQUIREMENTS

7.1. General

- 7.1.1. The speed limitation must be such that the vehicle in normal use, despite the vibrations to which it may be subjected, complies with the provisions of this Directive. The speed limitation device shall be so designed, constructed and assembled as to enable the vehicle in normal use, fitted with the speed limitation device, to comply with the provisions of this Directive.
- 7.1.2. In particular, the speed limitation device of the vehicle must be so designed, constructed and assembled as to resist corrosion and ageing phenomena to which it may be exposed and to resist tampering.
 - 7.1.2.1. The limitation threshold must not, in any case, be capable of being increased or removed temporarily or permanently on vehicles in use. The inviolability shall be demonstrated to the technical service with documentation analysing the failure mode in which the system will be globally examined.

The analysis shall show, taking into account the different states taken by the system, the consequences of a modification of the input or output states on the functioning, the possibilities of obtaining these modifications by failures or by tampering and the possibility of their occurrence. The analysis level will be always to the first failure.
 - 7.1.2.2. The speed limitation function, the speed limitation device and the connections necessary for its operation, except those essential for the running of the vehicle, shall be capable of being protected from any unauthorized adjustments or the interruption of its energy supply by the attachment of sealing devices and/or the need to use special tools.
- 7.1.3. The speed limitation function and the speed limitation device shall not actuate the vehicle's service braking system. A permanent brake (e.g. retarder) may be incorporated only if it operates after the speed limitation device has restricted the fuel feed to the minimum fuel position.
- 7.1.4. The speed limitation function or the speed limitation device must be such that it does not affect the vehicle's road speed if a positive action on the accelerator is applied when the vehicle is running at its set speed.
- 7.1.5. The speed limitation function or the speed limitation device may allow normal accelerator control for the purposes of gear changing.
- 7.1.6. No malfunction or tampering shall result in an increase in engine power above that demanded by the position of the driver's accelerator.
- 7.1.7. The speed limitation function shall be obtained regardless of the accelerator control used if there is more than one such control which may be reached from the driver's seating position.
- 7.1.8. The speed limitation function or the speed limitation device shall operate satisfactorily in its electromagnetic environment without unacceptable electromagnetic disturbance for anything in this environment.
- 7.1.9. All components necessary for the full function of the speed limitation or the speed limitation device shall be energized whenever the vehicle is being driven.

7.2. Special requirements

- 7.2.1. For the different categories of motor vehicles the limitation speed V shall be set in accordance with Directive 92/6/EEC.
- 7.2.2. This speed limitation may be achieved either by the equipment of the motor vehicles with EEC type-approved speed limitation devices or similar systems on board of the vehicles fulfilling the same speed limitation function.
- 7.2.3. The set speed shall be indicated on a plate in a conspicuous position in the driver compartment of each vehicle.

8. TEST

The speed limitation tests to which the vehicle or the speed limitation device presented for EEC type-approval is submitted as well as the limitation performances required, are described in Annex III to this Directive.

At the request of the manufacturer and with the agreement of the type-approval authority, vehicles whose calculated unlimited maximum speed does not exceed the set speed defined for those vehicles may be exempted from the testing of Annex III provided the requirements of this Directive are met.

9. MODIFICATION OF THE TYPE OF THE VEHICLE OR THE SPEED LIMITATION DEVICE AND EXTENSION OF EEC TYPE-APPROVAL

- 9.1. Every modification of the vehicle type or the type of the speed limitation device shall be notified to the administrative department which approved the vehicle type. The department may then either:
 - 9.1.1. consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the vehicle or the speed limitation device still complies with the requirements; or
 - 9.1.2. require a further test report from the technical service responsible for conducting the tests.
- 9.2. Confirmation or refusal of approval, specifying the alteration, shall be communicated by the procedure specified in paragraph 4.1 above to the Member States.
- 9.3. The competent authority issuing an extension of approval shall assign a series number to each communication form drawn up for such an extension.

10. CONFORMITY OF PRODUCTION

- 10.1. Every vehicle or speed limitation device approved under this Directive shall be so manufactured as to conform to the type approved by meeting the requirements set out in point 7 above.
- 10.2. In order to verify that the requirements of item 10.1 are met, suitable checks of the production shall be carried out.
- 10.3. The holder of the approval shall, in particular:
 - 10.3.1. ensure the existence of procedures for effective quality control of the vehicle or the speed limitation device;
 - 10.3.2. have access to the testing equipment necessary for checking conformity to each approved type;
 - 10.3.3. ensure that test result data are recorded and that the annexed documents remain available for a period to be determined in agreement with the administrative department;
 - 10.3.4. analyse the results of each type of test, in order to verify and ensure the consistency of characteristics of the vehicle or the speed limitation device, making allowance for permissible variations in industrial production;
 - 10.3.5. ensure that for each type of vehicle or speed limitation device sufficient checks and tests are carried out in accordance with the procedures approved with the competent authority;

- 10.3.6. ensure that any set of samples or test pieces giving evidence of non-conformity in the type of test in question shall give rise to a further sampling and test. All necessary steps shall be taken to restore conformity of the corresponding production.
- 10.4. The competent authority which has granted type-approval may at any time verify the conformity control methods applied in each production unit.
 - 10.4.1. At every inspection, the test records and production records shall be presented to the visiting inspector.
 - 10.4.2. The inspector may select samples at random to be tested in the manufacturer's laboratory. The minimum number of samples may be determined according to the results of the manufacturer's own checks.
 - 10.4.3. Where the quality level appears unsatisfactory or it seems necessary to verify the validity of the tests carried out in application of item 10.4.2, the inspector shall select samples to be sent to the technical service which conducted the type-approval tests.
 - 10.4.4. The competent authority may carry out any test prescribed in this Directive. The normal frequency of inspections authorized by the competent authority shall be one every two years. In cases where unsatisfactory results are found during one of these inspections, the competent authority shall ensure that all necessary steps are taken to restore conformity of production as rapidly as possible.

11. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

- 11.1. The approval granted in respect of a vehicle type or type of a speed limitation device pursuant to this Directive may be withdrawn if the requirements laid down in item 7 above are not complied with.
- 11.2. If a Member State withdraws an EEC type-approval it has previously granted, it shall forthwith so notify the other Member States, by means of a copy of the EEC type-approval certificate according to the model set out in Annex II, Appendix 2 or 4.

ANNEX II

Appendix 1

INFORMATION DOCUMENT No . . .

in accordance with Annex 1 of Council Directive 70/156/EEC relating to EEC type-approval of the motor vehicle type with regard to speed limitation or to equipment of speed limiting devices

(Directive 92/24/EEC)

The following information, if applicable, shall be supplied in triplicate and shall include a list of contents. Drawings, if any, shall be supplied in appropriate scale and in sufficient detail on size A4 or folded to that size. In the case of micro-processor controlled functions, supply relevant performance-related information.

- 0. GENERAL
- 0.1. Make (trade name of manufacturer):
- 0.2. Type and commercial description:
.....
- 0.3. Means of identification of type, if marked on the vehicle (b) ⁽¹⁾:
.....
- 0.3.1. Location of that marking:
- 0.4. Category of vehicle (c):
- 0.5. Name and address of manufacturer:
.....
- 0.6. Location of statutory plates and inscriptions and method of affixing:
 - 0.6.1. on the chassis:
 - 0.6.2. on the bodywork:
- 0.7. In the case of components and separate technical units, location and method of affixing of the EEC approval mark:
.....
- 0.8. Address(es) of assembly plant(s):
.....
.....

⁽¹⁾ The item numbers and footnotes used in this information document correspond to those set out in Annex I to Directive 70/156/EEC, as last amended by Directive 87/403/EEC.
Items not relevant for the purpose of this Directive are omitted.

1. GENERAL CONSTRUCTION CHARACTERISTICS OF THE VEHICLE
- 1.1. Photographs and/or drawings of a representative vehicle:
2. MASSES AND DIMENSIONS (e) (in kg and mm) (refer to drawing where applicable):
- 2.6. Mass of the vehicle with bodywork in running order, or mass of the chassis with cab if the manufacturer does not fit the bodywork (including coolant, oils, fuel, tools, spare wheel and driver) (o) (max. and min. for each version):
- 2.8. Technically permissible maximum laden mass stated by the manufacturer (y) (max. and min. for each version):
3. POWER PLANT (q)
- 3.1. Manufacturer:
- 3.1.1. Manufacturer's engine code (as marked on the engine, or some other means of identification):
- 3.2. Internal combustion engine:
- 3.2.1. Specific engine information:
- 3.2.1.1. Working principle: positive ignition/compression ignition, four stroke/two stroke ⁽¹⁾
- 3.2.1.3. Engine capacity (S): cm³
- 3.2.1.4. Volumetric compression ratio:
- 3.2.1.8. Maximum net power (+): kW at min⁻¹
- 3.2.1.9. Maximum permitted engine speed as prescribed by the manufacturer: min⁻¹
- 3.2.1.10. Maximum net torque (+): Nm at min⁻¹
4. TRANSMISSION (v)
- 4.2. Type (mechanical, hydraulic, electric, etc.):
- 4.5. Gearbox:
- 4.5.1. Type (manual/automatic/CVT (*) ⁽¹⁾):
- 4.6. Gear ratios:

Gear	Internal gearbox ratios (ratios of engine to gearbox output shaft revolutions)	Final drive ratio(s) (ratio of gearbox output shaft to driven wheel revolutions)	Total gear ratios
Max. for CVT			
1			
2			
3			
...			
Min. for CVT			
Reverse			

- 4.7. Maximum vehicle speed and gear in which this is achieved (in km/h) (w):
- ⁽¹⁾ Delete where inapplicable.
- ^(*) Continuously Variable Transmission.

6. SUSPENSION

6.6. Tyres and wheels:

6.6.1. Tyre/wheel combination(s):
.....

(For tyres indicate size designation, minimum load-capacity index, minimum speed category symbol;
for wheels indicate rim size(s) and off-set(s)).

6.6.1.1. Axle 1:

6.6.1.2. Axle 2:
etc.

6.6.2. Upper and lower limit of rolling radii:

6.6.2.1. Axle 1:

6.6.2.2. Axle 2:
etc.

6.6.3. Tyre pressure(s) as recommended by the vehicle manufacturer: kPa.

Appendix 2

MODEL

(maximum format: A4 [210 × 297 mm])

EEC TYPE-APPROVAL CERTIFICATE

(vehicle)

Stamp of Administration

Communication concerning the

- type approval ⁽¹⁾,
- extension of type approval ⁽¹⁾,
- refusal of type approval ⁽¹⁾,

of a type of a vehicle with regard to Directive 92/24/EEC relating to speed limitation devices or similar speed limitation on-board systems of certain categories of motor vehicles.

EEC type-approval No: Extension No:

SECTION I

0. General

- 0.1. Make (trade name of manufacturer):
- 0.2. Type and commercial description (mention any variants):
- 0.3. Means of identification of type, if marked on the vehicle (b) (*):
- 0.3.1. Location of that marking:
- 0.4. Category of vehicle (c):
- 0.5. Name and address of manufacturer:
- 0.8. Address(es) of assembly plant(s):

⁽¹⁾ Delete where inapplicable.

(*) The item numbers and footnotes used in this information document correspond to those set out in Annex I to Directive 70/156/EEC, as last amended by Directive 87/403/EEC.
Items not relevant for the purpose of this Directive are omitted.

SECTION II

1. Additional information

1.1. Make and type of EEC type-approved speed limitation device(s), if any; approval numbers:

1.2. Make and type of onboard speed limitation system:
.....

1.3. Speed or range of speeds at which the speed limitation may be set: km/h

1.4. Maximum engine power to unladen mass ratio of the vehicle type:

1.5. Highest ratio of engine speed to vehicle speed in top gear of the vehicle type:

2. Technical department responsible for carrying out the tests:

3. Date of test report:

4. Number of test report:

5. Ground(s) for extending type-approval (where appropriate):

6. Comments (if any):
.....
.....

7. Place:

8. Date:

9. Signature:

10. A list of documents making up the type-approval file lodged with the administrative department that has granted type-approval, which may be obtained on request, is attached.

Appendix 3

INFORMATION DOCUMENT NO . . . (a) (*)

in accordance with Annex I of Council Directive 70/156/EEC relating to EEC type-approval as a separate technical unit for the speed limitation device for motor vehicles

(Directive 92/24/EEC)

The following information, if applicable, shall be supplied in triplicate and shall include a list of contents. Drawings, if any, shall be supplied in appropriate scale and in sufficient detail on size A4 or folded to that size. In the case of micro-processor controlled functions supply relevant performance-related information.

- 0. General
- 0.1. Make (trade name of manufacturer):
- 0.2. Type and commercial description:
- 0.3. Means of identification of type, as marked on the technical unit (b):
- 0.3.1. Location of that marking:
- 0.5. Name and address of manufacturer:
- 0.7. In the case of components and separate technical units, location and method of affixing of the EEC approval mark:
- 12.8. Speed limitation device:
 - 12.8.1. Type of the speed limitation device: mechanical/electrical/electronic ⁽¹⁾
 - 12.8.2. Measures against tampering of the speed limitation device:
 - 12.8.3. Type of vehicle or engine on which the device has been tested:
 - 12.8.4. Speed or range of speeds at which the device may be set within the range established for the test vehicle:
 - 12.8.5. Engine power to unladen mass of ratio of the test vehicle:
 - 12.8.7. Type(s) of vehicle(s) on which the device may be installed:
 - 12.8.8. Speed or range of speeds at which the limiter may be set within the range established for vehicle(s) on which the device may be installed:
 - 12.8.9. Engine power to unladen mass ratio for the vehicle(s) on which the device may be installed:
 - 12.8.10. Highest ratio of engine speed to vehicle speed in top gear of vehicle(s) on which the device may be installed:
 - 12.8.11. Method used to control the fuel feed of the engine:

(*) The item numbers and footnotes used in this information document correspond to those set out in Annex I to Directive 70/156/EEC, as last amended by Directive 87/403/EEC. Items not relevant for the purpose of this Directive are omitted.

⁽¹⁾ Delete where inapplicable.

Appendix 4

MODEL (a) (*)
[maximum format A4 (210 × 297 mm)]

EEC TYPE-APPROVAL CERTIFICATE
(separate technical unit)

Stamp of
Administration

Communication concerning the:

- type approval ⁽¹⁾,
- extension of type approval ⁽¹⁾,
- refusal of type approval ⁽¹⁾,

of a type of a separate technical unit with regard to Directive 92/24/EEC relating to speed limitation devices or similar speed limitation on-board systems of certain categories of motor vehicles.

EEC type-approval No: Extension No:

SECTION I

- 0. General
- 0.1. Make (trade name of manufacturer):
.....
- 0.2. Type and commercial description:
.....
- 0.3. Means of identification of type, if marked on the technical unit (b):
.....
- 0.3.1. Location of that marking:
- 0.5. Name and address of manufacturer:
.....
- 0.7. In the case of components and separate technical units, location and method of affixing of the EEC approval mark:
.....

(*) The item numbers and footnotes used in this information document correspond to those set out in Annex I to Directive 70/156/EEC, as last amended by Directive 87/403/EEC. Items not relevant for the purpose of this Directive are omitted.

⁽¹⁾ Delete where inapplicable.

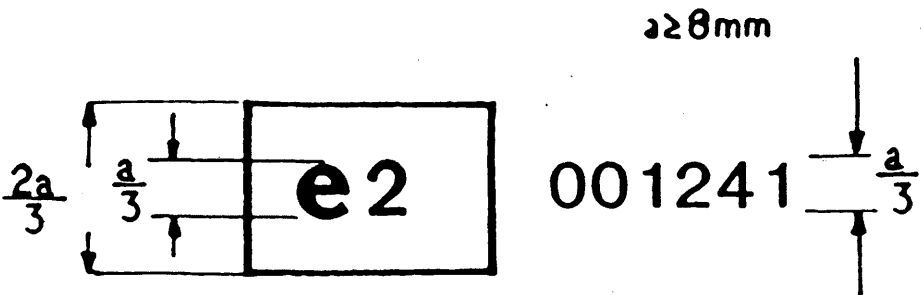
SECTION II

1. Additional information:
 - 1.1. Speed limitation device: mechanical/electrical/electronic ⁽¹⁾
 - 1.2. Vehicle type(s) on which the device may be installed:
 - 1.3. Speed or range of speeds at which the limiter may be set within the range established for vehicle(s) on which the device may be installed:
 - 1.4. Engine power to unladen mass ratio of the vehicle(s) on which the device may be installed:
 - 1.5. Highest ratio of engine speed to vehicle speed in top gear of vehicle(s) on which the device may be installed:
 - 1.6. Instructions for the installation of the device for each type of vehicle:
2. Technical department responsible for carrying out the tests:
3. Date of test report:
4. Number of test report:
5. Ground(s) for extending type-approval (where appropriate):
6. Comments (if any):
7. Place:
8. Date:
9. Signature:
10. A list of documents making up the type-approval file lodged with the administrative department that has granted type-approval, which may be obtained on request, is attached.

⁽¹⁾ Delete where inapplicable.

Appendix 5

Example of an EEC unit type-approval mark



The above technical unit type-approval mark, affixed to a speed limitation device, shows that the technical unit concerned was approved in France (e2) pursuant to this Directive under the type-approval number 001241. The first two digits indicate that the speed limitation device was approved according to the original form of this Directive.

ANNEX III

TESTS AND PERFORMANCES

1. TESTS OF SPEED LIMITATION DEVICE

At the request of the applicant for approval tests shall be made in accordance with either points 1.1, 1.2 or 1.3 below.

1.1. Measurement on test track

1.1.1. *Preparation of the vehicle*

1.1.1.1. A vehicle representative of the vehicle type to be approved or a device representative of the speed limitation device type as appropriate shall be submitted to the technical service.

1.1.1.2. The settings of the engine of the test vehicle, particularly the fuel feed (carburettor or injection system) shall conform to the specifications of the vehicle manufacturer.

1.1.1.3. The tyres shall be bedded and the pressure shall be as specified by the manufacturer of the vehicle.

1.1.1.4. The vehicle mass shall be the unladen mass as declared by the manufacturer.

1.1.2. *Characteristics of the test track*

1.1.2.1. The test surface shall be suitable to enable stabilized speed to be maintained and shall be free from uneven patches. Gradients shall not exceed 2 % and shall not vary by more than 1 % excluding camber effects.

1.1.2.2. The test surface shall be free from standing water, snow or ice.

1.1.3. *Ambient weather conditions*

1.1.3.1. The mean wind speed measured at a height at least 1 m above the ground shall be less than 6 m/s with gusts not exceeding 10 m/s.

1.1.4. *Acceleration test method*

1.1.4.1. The vehicle running at a speed which is 10 km/h below the set speed shall be accelerated as much as possible using a fully positive action on the accelerator control.

This action shall be maintained at least 30 seconds after the vehicle speed has been stabilized. The instantaneous vehicle speed shall be recorded during the test in order to establish the curve of the speed versus the time and during the operation of the speed limitation function or of the speed limitation device as appropriate. The accuracy of the speed measurement shall be $\pm 1\%$. The accuracy of the time measurement shall be within 0,1 s.

1.1.4.2. Acceptance criteria for the acceleration test

The test shall be satisfactory if the following conditions are met:

1.1.4.2.1. The stabilized speed V_{stab} reached by the vehicle shall be equal or less than the set speed V_{set} . However a tolerance of 5 % of the V_{set} value or 5 km/h whichever is the greater is acceptable.

1.1.4.2.2. Transient response (see figure 2 of appendix)

After the stabilized speed is reached for the first time:

- (a) the maximum speed shall not exceed the stabilized speed V_{stab} by more than 5 %;
- (b) the rate of change of speed shall not exceed $0,5 \text{ m/s}^2$ when measured on a period greater than 0,1 s; and
- (c) the stabilized speed conditions specified in 1.1.4.2.3. shall be attained within 10 s of first reaching of the stabilized speed V_{stab} .

1.1.4.2.3. Stabilized speed (see figure 2 of appendix)

When stable speed control has been achieved:

- (a) speed shall not vary by more than 4 % of the stabilized speed V_{stab} or 2 km/h whichever is the greater;
- (b) the rate of change of speed shall not exceed $0,2 \text{ m/s}^2$ when measured on a period greater than 0,1 s.

- (c) the stabilized speed (V_{stab}) is the average speed calculated during a minimum period of 20 seconds beginning 10 seconds after the stabilized speed is achieved.

1.1.4.2.4. Tests in acceleration shall be carried out and the acceptance criteria verified for each reduction ratio of gear allowing the speed limit to be exceeded.

1.1.5. *Test method at steady speed*

1.1.5.1. The vehicle shall be driven at full acceleration up to the steady speed, then shall be maintained at this speed without any modification on the test basis of at least 400 metres. The vehicle's average speed measurement shall then be repeated on the same test basis, but run in the opposite direction, and under the same procedures.

The stabilization speed for the whole test previously considered is the mean of the two average speeds measured on going trips and on coming back trips of the test basis. The whole test including the calculation of the stabilization speed shall be carried out five times. The speed of measurement shall be carried out with an accuracy of $\pm 1\%$, the time measurements with an accuracy of 0,1 s.

1.1.5.2. *Acceptance criteria for steady speed test*

Tests are judged satisfactory if the following conditions are fulfilled:

1.1.5.2.1. None of the stabilization speeds V_{stab} obtained shall exceed set speed V_{set} . However, a tolerance of 5 % of the V_{set} value or 5 km/h whichever is the greater is acceptable.

1.1.5.2.2. The gap between the extreme stabilization speeds obtained during the tests shall not exceed 3 km/h.

1.1.5.2.3. Tests in steady speed shall be carried out and the acceptance criteria verified for each reduction gear ratio allowing in theory the speed limit to be exceeded.

1.2. *Tests on chassis dynamometer*

1.2.1. *Characteristics of the chassis dynamometer*

The equivalent inertia of the vehicle mass shall be reproduced on the chassis dynamometer with an accuracy of $\pm 10\%$. The speed of the vehicle shall be measured with an accuracy of $\pm 1\%$. The time shall be measured with an accuracy of 0,1 s.

1.2.2. *Acceleration test method*

1.2.2.1. The power absorbed by the brake of the chassis dynamometer during the test shall be set to correspond with the vehicle's resistance to progressive movement at the tested speed(s). This power may be established by calculation and shall be set to an accuracy of $\pm 10\%$. At the request of the applicant, and with the agreement of the competent authority the power absorbed may alternatively be set at 0,4 P_{max} (P_{max} is the maximum power of the engine). The vehicle running at a speed which is 10 km/h below its set speed shall be accelerated at the maximum possibilities of the engine by using a fully positive action on the acceleration control. This action shall be maintained at least 20 seconds after the vehicle speed has been stabilized. The instantaneous vehicle speed shall be recorded during the test in order to establish the curve of the speed versus the time and during the operation of the speed limitation device.

1.2.2.2. *Acceptance criteria for the acceleration test*

The test shall be satisfactory if the following conditions are met:

1.2.2.2.1. The stabilized speed V_{stab} reached by the vehicle shall be equal or less than the set speed V_{set} . However a tolerance of 5 % of the V_{set} value or 5 km/h whichever is the greater is acceptable.

1.2.2.2.2. *Transient response (see figure 2 of appendix)*

After the stabilized speed is first achieved:

- (a) the maximum speed shall not exceed the stabilized speed V_{stab} by more than 5 %;
- (b) the rate of change of speed shall not exceed 0,5 m/s² when measured on a period greater than 0,1 s; and
- (c) the stabilized speed conditions specified in point 1.2.2.2.3 shall be attained within 10 s of first reaching of the stabilized speed V_{stab} .

1.2.2.2.3. Stabilized speed (see figure 2 of appendix)

When stable speed control has been achieved:

- (a) speed shall not vary by more than 4 % of the stabilized speed V_{stab} or 2 km/h whichever is the greater;
- (b) the rate of change of speed shall not exceed $0,2 \text{ m/s}^2$ when measured on a period greater than 0,1 s.

1.2.2.2.4. Tests in acceleration shall be carried out and the acceptance criteria verified for each reduction ratio of gear acceleration allowing in theory the speed limit to be exceeded.

1.2.3. Test method for steady speed test

1.2.3.1. The vehicle shall be installed on the chassis dynamometer. The following acceptance criteria should be met for power absorbed by the chassis dynamometer varying progressively from the maximum power P_{max} to a value equal to $0,2 P_{max}$. The speed of the vehicle shall be recorded in the full range of power defined above. The maximum speed of the vehicle shall be determined on this range. Test and record defined above shall be made five times.

1.2.3.2. Acceptance criteria for steady speed test

Tests are judged satisfactory if the following conditions are fulfilled:

1.2.3.2.1. Non of the stabilization speeds V_{stab} obtained shall exceed the set speed V_{set} . However, a tolerance of 5 % of the V_{set} value or 5 km/h, whichever is the greater, is acceptable.

1.2.3.2.2. The gap between the extreme stabilization speed obtained during the test shall not exceed 3 km/h.

1.2.3.2.3. Tests in steady speeds shall be carried out and the acceptance criteria verified for each reduction gear ratio allowing in theory the speed limit to be exceeded.

1.3. Test on engine test bench

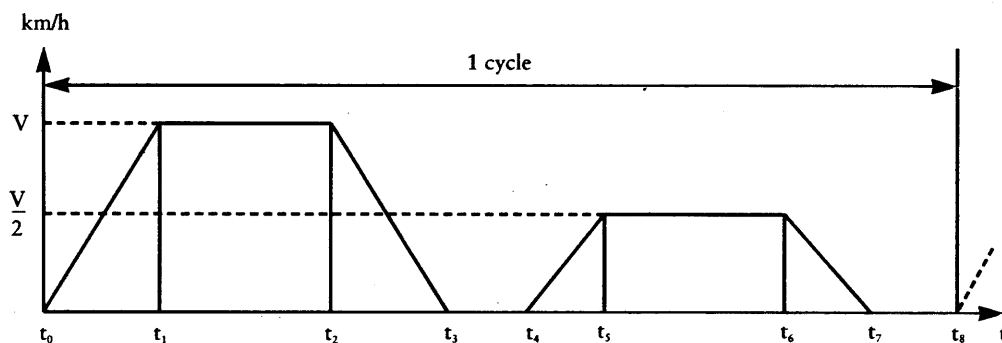
This test procedure can only be used when the applicant can demonstrate to the satisfaction of the technical services that this method is equivalent to the measurement on a test track.

2. ENDURANCE TEST

The speed limitation device shall be submitted to a durability test following the procedure prescribed below. However, this may be omitted if the applicant demonstrates the resistance to aging effects.

2.1. The device is cycled on a bench simulating the attitude and the movement which the speed limitation device would experience on the vehicle.

2.2. A functioning cycle is maintained by means of a control system supplied by the manufacturer. The diagram of the cycle is given below:



$t_0 - t_1 - t_2 - t_3 - t_4 - t_5 - t_6 - t_7$: the time taken to do this operation

$t_1 - t_2 = 2 \text{ seconds}$

$t_3 - t_4 = 1 \text{ second}$

$t_5 - t_6 = 2 \text{ seconds}$

$t_7 - t_8 = 1 \text{ second}$

Five conditionings are defined hereafter. The speed limitation device (SLD) samples of the type presented for approval shall be submitted to the conditionings according to the table below:

	1st SLD	2nd SLD	3rd SLD	4th SLD
Conditioning 1	x			
Conditioning 2		x		
Conditioning 3		x		
Conditioning 4			x	
Conditioning 5				x

- 2.2.1. Conditioning 1: tests at ambient temperature ($293\text{ K} \pm 2\text{ K}$); number of cycles: 50 000.
- 2.2.2. Conditioning 2: tests at high temperatures.

2.2.2.1. Electronic components

The components shall be cycled in a climatic chamber. A temperature of $338\text{ K} \pm 5\text{ K}$ is maintained during the whole functioning. Number of cycles: 12 500.

2.2.2.2. Mechanical components

The components shall be cycled in a climatic chamber. A temperature of $373\text{ K} \pm 5\text{ K}$ is maintained during the whole functioning. Number of cycles: 12 500.
- 2.2.3. Conditioning 3: tests at low temperature.

In the climatic chamber used for conditioning 2, a temperature of $253\text{ K} \pm 5\text{ K}$ is maintained during the whole functioning. Number of cycles: 12 500.
- 2.2.4. Conditioning 4: test in a salted atmosphere. Only for components exposed to the ambient road environment.

The device shall be cycled in a salted atmosphere chamber. The concentration of sodium chloride is of 5 % and internal temperature of the climatic chamber is $308\text{ K} \pm 2\text{ K}$. Number of cycles: 12 500.
- 2.2.5. Conditioning 5: vibration test

2.2.5.1. The speed limitation device is mounted in a similar way to its mounting on the vehicle.

2.2.5.2. Sinusoidal vibrations shall be applied in all three planes; logarithmic sweep shall be 1 octave per minute.

2.2.5.2.1. First test: frequency range 10-24 Hz, amplitude $\pm 2\text{ mm}$.

2.2.5.2.2. Second test: frequency range 24-1 000 Hz for chassis and cab mounted technical units, input 2,5 g. For engine mounted technical units, input 5 g.
- 2.3. Acceptance criteria of the endurance tests

2.3.1. At the end of the endurance tests, no modification of the device's performances shall be observed regarding the set speed.

2.3.2. However, if any breaking down of the device occurs during one of the endurance tests, a second device can be submitted to the endurance tests under consideration at the manufacturer's request.

Appendix

1. ASYMPTOTIC CURVE

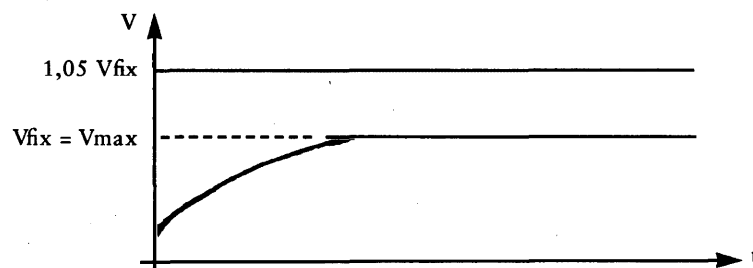


Figure 1

In this case, $V_{set} = V_{max}$; only the condition on maximum speed is to be satisfied.

2. OSCILLATING CURVE

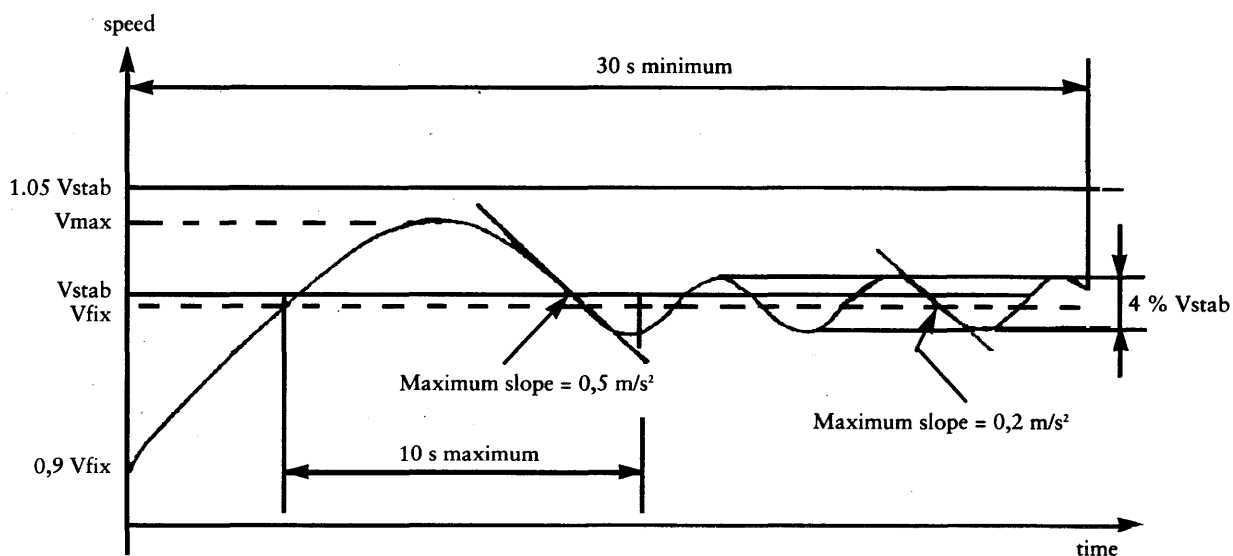


Figure 2

V_{max} is the maximum speed reached by the vehicle on the first half-period of the response curve.

V_{stab} is the stabilized vehicle speed. It is the average speed calculated during a minimum period of 20 seconds beginning 10 seconds after the stabilizing speed is achieved.