

• **GLOBAL COMPARISON CHART (CLEPA)**

• **LAMINATED WINDSCREENS**

<b>TEST</b>	<b>EUROPE ECE Regulation 43</b>	<b>JAPAN Safety Regulations for Road Vehicles, Article 29</b>	<b>USA FMVSS205/ANSI Z26.1-1977 ANSI Z26.1a-1980</b>	<b>DRAFT GLOBAL STANDARD</b>
Windscreen Optics	Test on windscreens <ul style="list-style-type: none"> <li>• using defined vision areas</li> <li>• at the installation angle</li> <li>• Test method ISO 3538</li> </ul>	Tests on windscreens <ul style="list-style-type: none"> <li>• using defined vision areas</li> <li>• at the installation angle</li> <li>• Test method ISO 3538</li> </ul>	Test of 12" squares which may be cut from the most curved part of the windscreen <ul style="list-style-type: none"> <li>• no defined vision area</li> <li>• not tested at the installation angle</li> <li>• not as ISO 3538</li> </ul>	As ECE R43
Light Transmission	TL $\geq$ 75% Test procedure ISO 3538	TL $\geq$ 70% Test procedure ISO 3538	TL $\geq$ 70% Test procedure ISO 3538	TL $\geq$ 70% i.e. as for USA, Japan and Directive 77/649/EEC Forward Field of Vision
Light Stability High Temperature Humidity	Test procedure and evaluation: ISO 3917	As ECE R43	Test procedure ISO 3917 Evaluation high temperature and humidity not as ISO 3917	As ECE R43
Fire resistance	250 mm/min	89 mm/min	88.8 mm/min	90 mm/min
Impact 227g Ball	Test procedure ISO 3537 Test at + 40° C and - 20° C Varying drop heights according to thickness	As ECE R43	Test procedure ISO 3537 Test at 25° C Standard drop height	As ECE R43 Temperatures the same, but two standard drop heights according to temperature

**LAMINATED WINDSCREENS** (continued)

<b>TEST</b>	<b>ECE Regulation 43</b>	<b>JAPAN Safety Regulations for Road Vehicles, Article 29</b>	<b>USA FMVSS205/ANSI Z26.1- 1977- ANSI Z26.1a-1980</b>	<b>DRAFT GLOBAL STANDARD</b>
Impact 198g Dart	No test	No test	Test at 25° C. No ISO test.	No test
Penetration Resistance 2.26 kg ball	Test procedure ISO 3537 Drop height 4.0 m	Test procedure ISO 3537 Drop height 4.0 m	Test procedure ISO 3537 Drop height 3.66 m	As ECE R43
Abrasion Resistance	Test procedure ISO 3537	As ECE R43	As ECE R43	As ECE R43
Headform	Test procedure ISO 3537 Evaluation <ul style="list-style-type: none"> <li>• Penetration resistance</li> <li>• Evaluation of breaking pattern</li> </ul>	Test procedure ISO 3537 Evaluation as ECE R43	No test	As ECE R43  Test on flat 1100x500 mm test pieces not included. All testing to be carried out on windscreen production parts.
Colour Identification	<ul style="list-style-type: none"> <li>• Test to verify that traffic light colours can be recognised</li> <li>• Not an ISO test</li> </ul>	As ECE R43	No test	No test

## TOUGHENED BODYGLASS

Test	ECE Regulation 43	JAPAN Safety Regulations for Road Vehicles, Article 29	USA FMVSS 205 / ANSI Z26.1-1977 Z26.1a-1980	DRAFT GLOBAL STANDARD
Impact Test 227g Ball	<ul style="list-style-type: none"> <li>• Test procedure ISO 3537</li> <li>• Drop heights: thickness <math>\leq</math> 3.5 mm – 2.0 m thickness <math>&gt;</math> 3.5 mm - 2.5 m</li> <li>• Flat 300 x 300 mm test pieces</li> </ul>	<ul style="list-style-type: none"> <li>• ISO 3537</li> <li>• Drop heights as ECE R43</li> <li>• Test pieces as ECE R43</li> </ul>	<ul style="list-style-type: none"> <li>• Test procedure ISO 3537</li> <li>• Drop height: 3.05m</li> <li>• Test pieces as ECE R43</li> </ul>	<p style="text-align: center;">As ECE R43</p> <p style="text-align: center;">Standard drop height: 2.0 m</p>
Impact Test 4.99kg shot bag	No test	No test	No ISO test. Drop height: 2.40 m <ul style="list-style-type: none"> <li>• Flat 305x305mm test pieces.</li> </ul>	No test
Abrasion Test	No test for the glass surface If plastic coated, then: test procedure ISO 3537	As ECE R43	<ul style="list-style-type: none"> <li>• Test procedure ISO 3537</li> <li>• Carried out on bodyglass requisite for driving visibility</li> </ul>	As ECE R43
Light Transmission	<ul style="list-style-type: none"> <li>• Test procedure ISO 3538</li> <li>• In areas requisite for driving visibility: <math>T_L &gt; 70\%</math></li> <li>• In areas not requisite for driving visibility: <math>T_L</math> no lower limit</li> </ul>	As ECE R43	<ul style="list-style-type: none"> <li>• Test procedure ISO 3538</li> <li>• For passenger cars the TL limit is <math>&gt; 70\%</math> , except for rooflights</li> <li>• For other vehicles the limits are as ECE R43 and Japan.</li> </ul>	As ECE R43
Optical Quality	No test	Sidelights requisite for driving visibility	No test	No test

**TOUGHENED BODYGLASS *continued***

Test	ECE Regulation 43	JAPAN Safety Regulations for Road Vehicles, Article 29	USA FMVSS 205 / ANSI Z26.1-1977 Z26.1a-1980	DRAFT GLOBAL STANDARD
Fragmentation	<p>Test procedure ISO 3537</p> <ul style="list-style-type: none"> <li>• Production parts are broken using a spring loaded centre punch or pointed hammer from 4 defined breaking points</li> <li>• The minimum particle count allowed is 40 (in any 5x5 cm sided square) with an upper limit of 450 for a thickness &lt; 3.50 mm. 400 for thickness &gt;3.5 mm</li> <li>• No elongated particles (splines) in excess of 7.5 cm are permitted</li> <li>• The maximum particle size allowed is 3 cm<sup>2</sup></li> <li>•</li> </ul> <p>NB: Some deviations on the above are permitted. Example: splines up to 10 cm</p>	<p>ISO 3537</p> <ul style="list-style-type: none"> <li>• Requirements are similar to those specified in ECE R43</li> <li>• Some small differences in the allowed deviations</li> </ul> <p>Deviation examples:</p> <ul style="list-style-type: none"> <li>• splines up to 15 cm</li> <li>• in case particle count &lt; 40, then: particle count <math>\geq 160</math> in any 10 x 10 cm square is acceptable</li> </ul>	<p>No fragmentation test as ISO 3537 Instead: there is a fracture test on the flat 305x305mm squares used for the 227g ball test. The drop height is increased until the glass breaks. The weight of the largest fragment must not exceed 4.25 g. No evaluation of the length of fragments.</p> <p><i>1996 revision of ANSI Z26 proposes a fragmentation test as ISO 3537, with only one defined break position (25mm inboard of the mid-point of the longest edge) The interpretation of results is based on the weight of the largest fragment, which must not exceed 4.25 g. This equates to the following maximum particle sizes: 3 mm thickness: 5.6 cm<sup>2</sup> 4 mm thickness: 4.2 cm<sup>2</sup> 5 mm thickness: 3.4 cm<sup>2</sup> No evaluation of the length of fragments.</i></p>	<p>As ECE R43, with some changes:</p> <ul style="list-style-type: none"> <li>• a single centre break position is specified.</li> <li>• the upper particle count limit is removed. Minimum limit remains at 40.</li> <li>• the elongated particle limit is raised from 7.5 to 10 cm</li> <li>• Determination of the largest particle weight rather than of the area, e.g. for glass up to 4.5 mm thickness the weight must not exceed 3.0 g. This equates to: 3.9 cm<sup>2</sup> for glass 3 mm 3.0 cm<sup>2</sup> for glass 4 mm</li> </ul> <p>Unlike ECE R43 and Japan, no deviations are permitted.</p>

# Justification Paper for CLEPA proposal 'Global Standard for Vehicle Safety Glazing'

## Foreword

In response to the Agreement of 25<sup>th</sup> June 1998 concerning the establishment of global technical regulations, CLEPA prepared a draft Global Standard for Vehicle Safety Glazing Materials, for discussion at GRSG and WP.29. A working group was set up with representation from:

Europe CLEPA/GEPVP (Groupement Européen des Producteurs de Verre Plat)  
Japan FGMAJ (Flat Glass Manufacturers Association of Japan)  
USA SAE Glazing Sub Committee

The Terms of Reference for this working group was to agree a standard covering the technical and performance requirements for safety glazing materials for motor vehicles and their trailers. The standard would specifically be written to exclude reference to any certification process (Type Approval/Self Certification), since these would be regulated in the legislation of Contracting Parties to the Global Agreement.

The working group adopted ECE R43 (Supplement 4) as its base document, but also took into account the US requirements (FMVSS 205/ANSI Z26.1) and the Japanese Safety Regulation for Motor Vehicles 29 (1994), together with ISO standards covering test methods for vehicle glazing. One should note that several tests have different requirements for different vehicle categories. In view of the fact that the categories are defined in a different way in Europe, Japan and the US, all references to vehicle categories have been made according to the European model and have been put in square brackets (issue that needs further discussion).

In general the Global Standard proposed by CLEPA follows the test and performance requirements of ECE R43 (Supplement 4) but inevitably, in the interest of achieving a consensus, some modifications have been introduced. The attached chart shows a comparison of the current regulations and the draft Global Standard for laminated windscreens and toughened bodyglass, which account for almost all currently used glazing in passenger cars.

The notes below highlight the major changes to ECE R43 that have been introduced.

### **Minimum light transmittance – 70% for windscreens**

Annex 3/9.1

Annex 4: Toughened glass windscreens

Annex 6: Ordinary laminated glass windscreens

Annex 8: Treated laminated glass windscreens

Annex 9: Safety-glass panes faced with plastics material (in ref. to annexes 4, 6 and 8)

Annex 10: Glass-plastics windscreens

The working group recommends that, in the interest of harmonisation, the European requirement for windscreen light transmittance should be reduced from 75 to 70% to align with the US and Japanese requirements.

The question of light transmittance is an emotive issue and has been the subject of considerable debate both in the United States and Europe. Laboratory based visual acuity tests show that under low contrast conditions there is a slight worsening of performance for a change from clear glass, which has a transmittance of 89%, down to tinted glass of 70-75%. The results from analysis of accident data, however, have not shown any obvious difference in accident rates for vehicles fitted with clear and tinted heat absorbing windscreens.

Work in Europe using driving simulators has given conflicting results, but in general has shown no significant change in performance down to 70% light transmittance. The indications from this work are that under low contrast conditions the test subject would reduce driving speed to compensate for any deterioration in visibility.

The prime reason for using tinted glass for windscreens is to reduce glare, heat and UV transmission to the inside of the vehicle, i.e. for laminated windscreens.

Light transmittance	Direct solar heat transmittance
%	%
90	81
75	49
70	44

Recent developments in Europe have focused on improved occupant comfort. Solar control glazing has a significant effect in terms of in-car comfort and, where air-conditioning is fitted, is environmentally beneficial, since it allows a reduction in the size of the cooling unit and its energy consumption.

#### **Deletion of the test of identification of colours**

Annex 3/9.4 of ECE R43

Annex 4: Toughened glass windscreens

Annex 6: Ordinary laminated glass windscreens

Annex 8: Treated laminated glass windscreens

Annex 9: Safety-glass panes faced with plastics material (in ref. to annexes 4, 6 and 8)

Annex 10: Glass-plastics windscreens

The current ECE R43 test is a mere visual check. Information collected from the test houses allows the conclusion that the minimum light transmission requirements for the glazings in the field of vision of the driver will guarantee correct colour identification. No impairing through intruding shade-bands or ceramic bands is allowed, as regulated by the provisions set in § 9 of Annex 3. Furthermore the optical and technical design of international signalling are such that the needs of colour-blind drivers are met, by adding further parameters such as shape in fixed signals and arrangement of sequence in traffic lights. To require another, sophisticated test such as used for colour definitions by designers, appears inappropriate in a safety standard. Consequently the identification of colours test has been deleted, to bring the series of tests of optical requirements in line with the US and Japanese regulations, which do not include it.

#### **Fire-resistance test: requirements set to a maximum of 90 mm/min for all glazings concerned**

Annex 3/10

Annex 9: Safety-glass panes faced with plastics material (in ref. to annexes 4 to 8)

Annex 10: Glass-plastics windscreens

Annex 11: Glass-plastics panes other than windscreens

Annex 13: Rigid plastic glazings other than windscreens

Annex 14: Flexible plastic glazings other than windscreens

Annex 15: Rigid plastic double-glazed units

The requirements were brought in line with the more stringent specifications of the US and Japanese standards. In current ECE R43 a maximum of 250 mm/min is allowed for glass-plastic glazings and 110 mm/min for plastic glazings.

#### **Fragmentation test**

Annex 5: Toughened glass panes other than windscreens

Many years of experience of working with ECE R43 and the JIS standard, which contain several breaking positions, have demonstrated that a centre break position is the most stringent. In practice glass manufacturers in Europe and Japan routinely break from the centre for CoP testing, because a satisfactory fracture indicates a good tempering process and predicts a good performance for other breaking positions. For this reason, only a single break position at the geometric centre of the glass pane is specified.

The assessment of fragmentation requirements has been rewritten to remove all references to deviations. This has been done to make the requirements less ambiguous since the previous wording caused some confusion, both for the manufacturers and the test houses. These changes do not represent a lowering of the standard.

### **Deletion of the 4 m headform test on flat specimens**

Annex 6: Ordinary laminated-glass windscreens

This test has not been included because it does not provide useful information with respect to product performance. Many years of experience have demonstrated that the mean break height values for a 2260 g ball test on 300 x 300 mm specimens (test 4.2) correlate well with the 10 kg headform test on 1100 x 500 mm test pieces. 1100 x 500-mm test pieces have to be especially manufactured and may not necessarily be fully representative of production parts. It is possible to cut 300 x 300 mm test pieces from the flattest portion of a windscreen that are fully representative of the end product. As a result it is standard procedure to carry out CoP tests on such test pieces.

### **Procedure for assessment (Pass Rate / Deviations)**

All tests in all annexes

The requirements contained in ECE R43 relating to re-test procedures (for Type Approval) have been eliminated: a pass rate has been introduced, in line with current US practice. This helps to avoid ambiguity and does not represent a relaxation of existing requirements.

The example shown in the comparison chart for the fragmentation test requirements on toughened glass, provides an illustration relating to deviations, i.e. both ECE R43 and the Japanese requirement allow deviations for elongated particles of up to 10cm and 15cm respectively. In the draft Global Standard the limit is specified as 10cm .