

**Justifications to the proposed amendments to UN Regulation No. 43 proposed by IGPG
(ECE/TRANS/WP.29/GRSG/2014/23)**

Paragraph 2.6.3. and 2.6.4.:

Need for new definitions with regard to the new Annex 18 (Laminated rigid plastic panes) and Annex 19 (laminated rigid plastic windscreen). The proposed definitions are inspired from that of “laminated glass” (paragraph 2.2.).

Paragraphs 2.18, 2.19, 5.8., 10.2. :

Changes to the references to the annexes due to the insertion of new Annexes 17, 18 and 19.

Paragraph 5.2.:

Addition of a reference to Annex 18 due to the addition of a new definition of type for plastic panes.

Paragraph 5.5.5.:

Addition of a reference to Annex 18 due to addition of a new abrasion test for plastic panes.

Paragraphs 5.5.11. to 5.5.13.

Addition of new markings due to the creation of provisions for rigid plastic windscreens, laminated rigid plastic panes and laminated rigid plastic windscreens.

Paragraphs 7.13. to 7.15.:

Addition of particular requirements for the new types of components introduced per the new Annexes 17, 18 and 19.

Paragraph 8.2.1.2.:

Update of the table of tests to fit the addition of the new components and the consequential new tests. In particular, addition of a new footnote 3, providing to the applicant the choice to conduct tests following the set of three additional tests (sand drop, car wash and wiper) as an alternative to the existing Taber test, for plastic material.

The informal group investigated the adequacy of the current abrasion test (Taber test) for materials other than glass. On the one hand the Taber tests already gives satisfaction for the assessment of the resistance to abrasion for plastic panes for side windows, but on the other hand, the location and constraints faced by the windscreens are such that the Taber test could perhaps not adequately simulate the reality. For this reason, it was decided to create a set of three tests as an alternative to the Taber test based on the following criteria:

- Reproducibility of the test, i.e. test not too sensitive to the test equipment
- Well simulating the reality (practicability)
- COP should be possible mainly (but not only, depending on the shape) on real parts.
- Ensuring proper safety level (the test would permit to achieve a level of safety at least equivalent to that currently achieved by glass with the Taber test)

The applicant will then have the choice to apply for an approval pursuant the existing Taber test, or pursuant to the set of the three new tests. These three new tests are

- the sand drop test (Annex 3, paragraph 4.7.),
- the car wash test (Annex 3, paragraph 4.8.) and
- the wiper test (Annex 3, paragraph 4.9.).

These three tests are considered properly addressing the three main sources of abrasion faced by a windscreen as the sand drop test simulates the abrasion due to the action of dust and sand on the windscreen in normal dry conditions, the carwash test simulates the particular abrasion due to the action of wet carwash brushes on the pane surface, and the wiper test is deemed to simulate the action of the wiper on the windscreen.

Annex 1

Paragraph 2: Changes to the references to the appendices due to the addition of the new components.

Appendices 1, 2, 3 and 5: Changes to the reference to Appendix 10 due to the addition of new appendices

Appendices 10, 11 and 12:
Creation of new forms for addressing the new components.

Annex 2:

Creation of new approval marks due to the creation of provisions for rigid plastic windscreens, laminated rigid plastic panes and laminated rigid plastic windscreens.

Annex 3, paragraph 4.7.

Insertion of a new sand drop test.

The experts in the informal group acknowledged the merits of the Taber test for glass, but recognized as well that the abrasion applied on a plastic material surface by the Taber test may not well represent the reality of the abrasion in real use of the vehicle due to the molecular structure of the plastic material. The Taber test was indeed designed for assessing the resistance to abrasion of glass rather than plastic material, which reacts differently to the action of the abrading wheels. The sand drop test is deemed to properly simulate the abrasion due to the action of dust and sand on the windscreen in normal dry conditions. This test has also the advantage of being already described in Annex 10 of UN R22 (Protective helmets – text available at <http://www.unece.org/trans/main/wp29/wp29regs21-40.html>.)

Annex 3, paragraph 4.8.

Insertion of a new car wash test.

Test method per ISO 20566, as amended by the Task-force established by the informal group. The amendments focus on adapting the text to UN R43, i.e. references to existing paragraphs, deletion of private company names, etc. The carwash test is deemed to properly simulate the abrasion due to the action of wet carwash brushes on the pane surface.

Annex 3, paragraph 4.9.

Insertion of a wiper laboratory test

The wiper test is deemed to simulate the action of the wipers on the windscreen in both dry and wet conditions. It was developed by the task force established by the informal group, and the method is deemed to well correlate the reality in view of the experience gained to date. The proposed test method provides not only a homogeneous scratch distribution on the individual samples, but also a good repeatability and a good reproducibility. Furthermore the test procedure allows to distinguish (based on significant haze differences) between not recommendable and suitable coating systems.

Annex 3, Paragraph 4.9.2.

In order to keep the test method technology neutral, the choice of the wiper blade is let to the applicant subject to compliance with the test method specifications (sample size, blade material, etc.).

Annex 3, Paragraph 4.9.6.

Number of test cycles.

This item was subject of deep debates in the informal group. The number of wiper test cycles must indeed simultaneously be representative of the reality and ensure a level of safety at least equivalent to that achieved by the current Taber test, taking into account that the wiper test is only part of the set of three tests. The proposed value of [20,000] cycles is the result of research performed by the two subgroups established within the informal group. One subgroup was dedicated to real world testing (with vehicles fitted with plastic windscreen driven in real conditions) and the second subgroup was dedicated to the feasibility of the wiper test. It was then the task of the two subgroups to well correlate the results of each; both the number of cycles and the standard deviation in the measured delta haze were considered.

This criterion is a key to the success of the regulation because on the one hand it must permit the introduction of plastic windshields for approval in the regulation, and on the other hand it must guarantee a level of quality high enough to ensure road safety through the lifetime of the vehicle. As the group could not find any compromise on correct value (decision to further test in real conditions), the proposed figure of [20,000] cycles is subject to further change, after obtaining evidence that the figure correctly reflects reality.

Annex 3, paragraph 11.2.4.1.

Tested side

It is of obvious advantage that the side of the piece subject to test is the side that will be subject deterioration in reality

Annex 3, Appendix 1

Design Drawing of the Wiper Blade Holder

The wiper blade holder must be defined in details in order to ensure reproducibility of the test. The angle of the blade on the surface of the pane is critical to the wiping performance.

Annex 3, Appendix 2

Design Drawing from the Sample Box

The sample box must be defined in details in order to ensure reproducibility of the test.

Annex 17, paragraph 1.1.

Principal characteristics of the plastic windscreen

The list of characteristics is inspired from Annex 14 (rigid plastic panes) of the current text of the regulation.

However characteristics must be adapted to the case of windscreens fully made of plastic material. These parameters were taken from ISO 7823/1 (requirements for non-modified flat poly-methyl methacrylate –PMMA - cast sheets for general-purpose use).

Annex 17, paragraph 1.2.

Secondary characteristics

“Obscurations” are added to the secondary characteristics. This characteristic is still missing in the old “plastic panes” Annexes 14 and 16 and must later be added there, too, in order to keep consistency over the complete regulation. See also Annex 19.

The other characteristic are conventional secondary characteristics for plastic panes

Annex 17, paragraph 2.1

The tests shall be carried out either on a representative flat piece or on a finished part. This flexibility is necessary because not all tests can be correctly performed on real finished parts. As an example, the ball drop tests would give inconsistent results should they be performed on a curved final part.

Annex 17, paragraph 3

Flexibility test

Copy/pasted from rigid plastic panes flexibility test.

Annex 17, paragraph 4

Headform test on a complete windscreen

Performance requirements are taken from Annex 14 of current regulation, rigid plastic panes.

Annex 17, paragraph 5

Mechanical strength test – 227 g ball

Performance requirements are inspired (but not copy/pasted) from Annex 14 of current regulation, rigid plastic panes, with only one drop height. Unlike the provisions for rigid plastic panes, no further series of tests can be carried out if some tests have given unsatisfactory results. This test must be performed twice:

- at -18°C
- after humidity test, at ambient temperature (paragraph 6.4.).

Annex 17, paragraph 6

Test of resistance to the environment

As mentioned above, three new tests have been introduced addressing the resistance to abrasion, in addition to the conventional Taber test.

Annex 17, paragraph 6.1.1.

Taber test

Performance requirements are inspired from those of the outer face of Class L rigid plastic panes. No further series of tests can be carried out if some tests have given unsatisfactory results.

Annex 17, paragraph 6.1.2.

Sand drop test

As mentioned above (see justifications to paragraph 4.7. of Annex 3), the sand drop test is deemed to well represent the real conditions abrading action. The level of performance requirements is set at maximum 5% delta haze after 3 kg of dropped sand. This was considered representative of the reality after a campaign of

comparison tests which led to a “table of equivalence” between the then existing abrasion test (see document IGPG-03-15-Rev.1 and subsequent reports).

Annex 17, paragraph 6.1.3.

Car wash test

The informal group agreed that the value of 10 cycles is sufficient, and even quite demanding. The car wash test can indeed be very difficult to fulfil for some coatings, and on the other hand, it is possible to adjust the coating to the kind of abrasion test to be performed. The test method makes it necessary to test flat parts of the windscreen. The level of performance requirements is set at maximum 2% delta haze (see IGPG-03-15); all samples must fulfil the requirements.

Annex 17, paragraph 6.1.4.

Wiper test

A value of 20,000 cycles is temporarily proposed until the informal group achieves a compromise. The informal group had to construct a new test method, starting from an existing test equipment originally designed for testing wiper blades rather than glass/plastic panes. As a consequence, neither the test equipment nor the test methods are mature enough to ensure robust results and the informal group experts found necessary to double-check the test method and performance requirements before making a final proposal to GRSG. The test method makes it necessary to test absolutely flat samples. The experts agreed that a delta haze of 2% would be representative, taking the number of test cycles as the representative variable for adjusting the performance level.

Annex 17, paragraph 6.2.

Test of resistance to simulated weathering

The test method and performance requirements are inspired from Annex 14 (rigid plastic panes). All samples must succeed the test.

Annex 17, paragraph 6.3.

Cross-cut test

The test method and performance requirements are inspired from Annex 14 (rigid plastic panes). All samples must succeed the test.

Annex 17, paragraph 6.4.

Resistance to humidity test

The test method and performance requirements are inspired from Annex 14 (rigid plastic panes). All samples must succeed the test. The 227 ball drop test shall be performed on the same samples 48 hours after the humidity test. This was considered relevant for testing behaviour under tropical climate (see document IGPG-04-04).

Annex 17, paragraph 6.5.

Fire resistance test

The test method and performance requirements are inspired from Annex 14 (rigid plastic panes). All samples must succeed the test.

Annex 17, paragraph 6.6.

Resistance to chemicals

The test method and performance requirements are inspired from Annex 14 (rigid plastic panes). Three samples out of four must succeed the test. One of these samples must be subject to cross-cut test as well for testing the resistance to chemical when the coating is damaged.

Annex 17, paragraph 7

Optical qualities

The test method and performance requirements are inspired from Annex 6 (laminated-glass windscreens). All samples must succeed the test.

Annex 18

Laminated rigid plastic panes

The informal group received the task to introduce a new annex addressing the test methods and performance requirements for laminated rigid plastic panes. Most tests and performance requirements are directly inspired from those of Annex 14 (rigid plastic panes).

Annex 18, paragraph 4.2.

Dimensions of the samples with regard to the tests to be performed

The informal group found necessary to clarify which tests are relevant for which dimension of piece or sample. All test pieces must succeed the test.

Annex 18, paragraph 5

Mechanical strength test – 227 g ball

Performance requirements are inspired (but not copy/pasted) from Annex 14 of current regulation, rigid plastic panes, with only one drop height. Unlike the provisions for rigid plastic panes, no further series of tests can be carried out if some tests have given unsatisfactory results. This test must be performed twice:

- at -18°C
- after humidity test, at ambient temperature (paragraph 6.4.).

Annex 18, paragraph 6

Test of resistance to the environment

The tests are mostly taken from Annex 14 (rigid plastic panes). The informal group found relevant to mandate tests assessing resistance to high temperature and resistance to radiation, because laminated plastic panes are subject to the same constraints as the laminated glass panes.

Annex 18, paragraphs 7, 8 and 9

Optical qualities, fire resistance and resistance to chemicals

Tests and performance requirements are directly inspired from those of Annex 14 (rigid plastic panes).

Annex 19

The informal group received the task to introduce a new annex addressing the test methods and performance requirements for laminated rigid plastic windscreens. Most tests and performance requirements are directly inspired from those of Annex 14 (rigid plastic panes) and Annex 6 (laminated-glass windscreens).

Annex 19, paragraph 1.2.

“Obscurations” are added to the secondary characteristics. This characteristic is still missing in the old “plastic panes” Annexes 14 and 16 and must later be added there, too, in order to keep consistency over the complete regulation. See also Annex 17.

The other characteristic are conventional secondary characteristics for plastic panes.

Annex 19, paragraph 2.1.

The informal group found necessary to clarify that the test pieces are well representative of the parts that will be fitted on the vehicle. Yet some flexibility was considered relevant as windscreens are complex parts which may not be tested according to the existing test methods.

Annex 19, paragraph 5.1

Mechanical strength test – 2260g ball

The test is taken from annex 6 (ordinary laminated glass windscreens) in order to check the laminating process of the product.

Annex 19, paragraph 5.2

Mechanical strength test - 227g ball

The test is taken from annex 6 in order to check mechanical strength for different temperature of the samples

Annex 19, paragraph 6.1.

Test of resistance to abrasion

As for rigid plastic windscreens, three new tests have been introduced addressing the resistance to abrasion, in addition to the conventional Taber test.

The tests are aligned on those of the new Annex 17.

Annex 23 (former Annex 20)

Annex 19, paragraph 6.9

Test of resistance of temperature changes in order to withstand the effects of prolonged exposure to extremes of temperature without significant deterioration.

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Paragraphs 2.11. to 2.13. are added to cover the new products introduced into the regulation.

Annex 24 (former Annex 21)

Provisions regarding the installation of safety glazing on vehicles

Paragraphs 4.1.2. and 4.1.3. are amended such that the regulatory text remains consistent, even in the case of an innovative wiper technology such that mentioned in the 2nd indent to paragraph 4.9.2. of Annex 3.
