DRAFT REPORT

3rd meeting of the GRSG informal group on

the introduction of plastic glazing for windscreens and laminated plastic panes other than windscreens in UN Regulation N°43

Venue: Bayer MaterialScience AG
Building B207
51368 Leverkusen
Germany

Chairman: Dr. Klaus Preuβer (D) (dr.klaus.preusser@t-online.de)
Secretariat: Mr. Olivier Fontaine (OICA) (ofontaine@oica.net)

Attendees:

ACKERMANN, Doris	OICA/GME
BERTHET, Florence	OICA/Renault
BIERENS, Mark	Delta Glass BV
BLASS, Rudolf	Evonik Industries AG
Dr. BUCKEL, Frank	Bayer Material Science
Dr. DÜMMLER, Matthias	OICA/Daimler
CLINTJENS, Paul	Saint-Gobain Sekurit
CRANS, Matthew	Altuglass International
DAMM, Richard	Germany, BMVBS
DELNEUFCOURT, Jean Paul	European Commission
DUMMLER, Matthias	MPA NRW
ESSER, Matthias	OICA/Daimler
FONTAINE, Olivier	OICA
GEHRING, Uwe	BGS
GUBALA, David	Taber Industries (By phone)
Hammer, Jan	Webasto
HARA, Junichi	JASIC Japan
HELMICH, Gerd	NSG Group
KANJI NANJI, Anis	PSA Peugeot-Citroën
KIESEWETTER, Bernd	Evonik Industries AG
KILLIAN Philipp	Evonik Industries AG
MOTTET, Leon-Philippe	ACG Glass Europe
NAWROTH, Manfred	Bayer Material Science
Dr. PREUSSER, Klaus	Germany
PROCHAZKA, Jan	TÜV SÜD Czech s.r.o.
RANSONE, Brigitte	Saint-Gobain
ROSENKRANZ, Mark	John Deere
SAWADA, Tomotaka	JASIC
Dr. SCHMITZ, Jürgen	KRD
SMITH, Laurie	Taber Industries (by phone)
STARKE, Carsten	OICA/FORD
TERRAGNI, Matteo	Sabic
WIESENBERGER, Frank	Momentive
YAMAKAWA, Takehisa	OICA/JAMA

ZAFARI, François Altuglas International
ZANDER, Oliver Germany/BASt

1. **Welcome and Introduction**

Dr. Nawroth welcomed the participants to the second meeting of the GRSG informal group on plastic glazing (GRSG-IGPG).

2. Approval of the agenda

Document: IGPG-03-01 (Chair)

The agenda was adopted unchanged. The following documents were added during the meeting:
IGPG-03-10: (Bayer) Car Wash Round Robin Test
IGPG-03-11: (Bayer) Taber Round Robin Test Analysis
IGPG-03-12: (Bayer) PC Cutting Trails done by German Fire and Rescue Service (initiated by VDA)
IGPG-03-13: (MPA NRW) Round Robin sand drop test: Results and analysis
IGPG-03-14: (BASt) Comparative Tests with Laminated Safety Glass Panes and Polycarbonate Panes at the Federal Highway Research Institute

3. Revision and approval of the draft minutes of the 2nd meeting

Document: IGPG-02-08 (Secretariat)

The minutes were revised and adopted with slight modifications. The Secretary was tasked to edit a revision of the minutes.

4. Oral report about outcomes of GRSG-101 (18-20 October 2011)

The Chair summarized the status of the work at the informal group level, and the outcome of the discussions held at the 101st session of GRSG. He pointed out that GRSG-101-08 provides a summary of the work performed to date by the informal group.

5. Revision of the Task-force conducting the round Robin test for the sand drop test

Document: IGPG-03-13 (MPA NRW)

5.1. Reproducibility of the test method

Dr. Dümmler presented the results of the research about reproducibility
- The laboratory has an influence of the results.
- The number of cycles with same sand has no significant influence on the results (< 10 cycles)
- The sand supplier has an influence on the results

The group held a Q&A exchange:
- Laboratories 2, 4, 6 are UN R22 accredited.
- Labs 6 and 7:
  - 6 is UN R22 lab, haze measured by MPA
  - 7 was organized by VDA: no reason to eliminate the lab.
- The experts acknowledged that the Taber round robin showed a reproducibility of 7 times higher (about 30)

- UN R22 requires immediate test after cleaning, while UN R43 requires 40 hours delay. No information was available on whether the labs did follow correctly the UN R22 procedure.
- It was pointed out that the absolute value of haze is not that important at this stage, rather the test method reproducibility.

Conclusion:

- Feedback from the relevant labs would be interesting for knowing the way they followed the procedure.
- Comparison with the other test methods would be interesting.

5.2. Clarification of the test method

See presentation

6. Revision of the Task-force conducting the round Robin test for the Amtec-Kistler test

Document: IGPG-03-10 (Bayer)

6.1. Reproducibility of the test method

Bayer presented the document IGPG-03-10 and made the following preliminary comments:

- Lab N° 5 had older brushes than the others (5 years).
- Seems the test is quite "softer" than the Taber test.
- In all cases, the order of haze value is such that it is the lowest for glass, middle for PC, and highest for PMMA

The group held a Q&A exchange:

- The tests actually assess the coating layer, while the coating is different on PC and PMMA. Yet is was clarified that the Bayer coating for PC can be used on PMMA (was already done before).
- In the case of double sided coated samples, the face not tested can be influenced by the tape; hence there may be a need to re-condition this side.
- The brushes can have a varying abrasion rate, related to time, even when not used.

6.2. Clarification of the test method

See presentation

7. Revision of the outcome of the Taber test calibration tour

Dr. Buckel explained he had had numerous contacts with Taber Industries, which clarified that the last Round Robin test for the Taber test was performed in 2004, while last wheel types were delivered in 2008.
Dr. Buckel was of the opinion that, according to the results of the round robin, the main influencing factors seem to be the nozzle gap and the wheel lot (tests performed with wheels coming from different wheel lots may provide different results).

The informal group held a telephone meeting with Taber Industries (TI):

The experts firstly discussed documents IGPG-03-06 (tracking card) and IGPG-03-05 (comments from TI about the round robin):

- As all equipments passed the test, it was proposed to pay attention primarily to the ones on the "border line".

- Lab 2: could be the flatness of the table, misalignment of the arm, age of the instrument (1989, bearing not replaced).
- Lab 3: 11 year old instrument, arm alignment. Arm re-alignement can be performed by Ericsson (EU) as having good relations with Taber.
- Lab 4, Lab 5: OK
- Lab 6: Test 1, 1-5 O'clock: OK, 6-9 o'clock quite deviated.
- Lab 7: TI definitely recommended improving the toe.
- About lab 9, there was no recommendation TI could provide.

Nozzle distance: document IGPG-03-09, the table of percentage light demonstrates the influence of the nozzle distance. TI made some tests showing a clear influence of the nozzle distance on the haze values recommended 0,8 mm as the correct value.

Lab 9 used wheels from 2 different lots. TI committed to investigate the difference between the lots DY22 and DW22.

Test data verification of MPA (IGPG-03-04):
Dr. Dümmler questioned how TI would avoid future problems like that described in document IGPG-03-04. TI said they contacted their supplier, identified the root cause of the issue, dealing with the raw material. TI added additional tests on the raw materials and indicated that they are produced overseas, yet the suppliers are in the USA, making the contacts relatively easy. Other wheels of that lot, manufactured 3 years ago, were also investigated, not showing any problem. Traceability of the raw material is well maintained by TI. TI had indeed no feedback about labs using the wheels for plastic glazing.

It was questioned whether TI provides recommendations for which material the Taber test is recommended (scope of the test) i.e. is there any restriction for certain materials.
TI clarified that CS10F is relevant for haze on coating material. But certainly not for e.g. acrylic or plastic, uncoated, with 1000 cycles. Not only is the material different (physics), but the preparation of the samples as well. TI also pointed out that different wheels can address different materials. TI did not expect the type of ranges the informal group encountered and hence committed to further investigate the issue.

It was questioned how can a lab verify the wheels before testing, instead of waiting for inappropriate results.
TI recommended to test the wheels with a material whose expected results are known (method used by TI). TI has a large bank of reference material. When questioned about an example of a reference material, TI suggested as a recommendation simply using a material with known results. The informal group however could not accept such recommendation as the order of results with the 3 different materials is not consistent (the results for the three materials have no correlation). TI committed to further investigate this point.

Document IGPG-03-07:
TI confirmed they use a brush to reface the wheels after testing. TI confirmed that this could generate static electricity and that distance, state and cleanness of the nozzle are of high importance. The Taber test is sensitive and all details must be well calibrated. TI recommended abrading right away after cleaning.

Conclusion:

- TI welcomed any comment by email.
- Most influencing parameters were investigated.

- TI did not provide any indication of what material could be used as a reference, seeing the discrepancies between PC and PMMA. Dr. Dümmler and Mr. Helmich recommended continuing investigating the Taber test, at least up to the time ISO finishes its work.

A debate took place about the work ISO is currently conducting. Dr. Dümmler recalled that ISO is looking to clarify the standard for permitting any wheel supplier (Taber, Daiwa), i.e. finding a relevant abrasion (wheel) technical specification. The difficulty is to assess the wheels w/o destructing them. Yet the experts agreed that adding a new wheel supplier could add a new parameter (Taber wheel, Daiwa wheel, equipment).

8. Decision about the relevant abrasion test(s)

The informal group attempted to establish a list of criteria which could be relevant for deciding about a test method appropriate for plastic glazing:

- 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 the level currently achieved by glass with the Taber test)

It was pointed out that the reproducibility is related to the number of cycles and to the aggressiveness of the test, hence to the final haze values. It was then suggested to adapt the performance requirements to the test method. The reproducibility should be related to the target which must be reached. The informal group considered 2% haze a reasonable value for safety on the road.
The European Commission proposed to investigate the "spray testing method set up in the UN R112, Annex 6, Appendix 3. The Chair recommended the interested experts to study the UN R112 and put forward at the next meeting the comments they feel relevant.

The Chair was reluctant to abandon the Taber test already at this preliminary stage and recalled that the annex related to the side plastic glazing (Annex 14) is now 10 years old. As long as the group cannot be sure that the Taber cannot be improved and the problem of the wheels solved, the Taber test cannot be dropped. The Chair pointed out that there is just few time to wait until ISO finalizes its standard revision.
However some experts within the informal group were of the opinion that sufficient evidence was gathered to prove that the Taber test is not appropriate for the plastic material windscreens. One expert pointed out that, should the Taber test be a new test to be proposed (rather than an existing one), the results gathered to date would prove it not appropriate.

Concerning the sand drop test, it was proposed to decrease the quantity of sand for decreasing the final haze performance requirement.

A debate took place about whether adapting the performance requirement when using the Amtec-Kislter or the sand drop test. It was suggested to achieve performances equivalent to those of glass, i.e. align the haze value on that obtained with glass. The group considered relevant to firstly assess whether the test well simulates the reality, then secondly to find out the performance requirement relevant under the safety point of view (%haze).

The group faced the following political alternative:

- Adapting the existing tests and keeping the performance requirement, or
- keeping the existing tests then adapting the performance requirement.

The European Commission recalled that the tests for glass are also defined in gtr6, hence the UN R43 is bound to an international Agreement for what concerns the glass.

The experts then made an attempt to set up a "table of equivalence" permitting to compare the different test methods, keeping as a reference the values obtained by the glass with the Taber test:

	Glass		**Wet coated PC**		**Wet coated PMMA**	
	Delta haze (%)	Max delta haze value for 95% confidence	Delta haze (%)	Max delta haze value for 95% confidence	Delta haze (%)	Max delta haze value for 95% confidence
Taber test**	1,17	**2,00***	10,52	37,58	15,57	37,08
Sand drop test	3,38	**4,78**	3,06	4,39	5,01	8,04
Amtec Kistler test	0,19	**0,63**	0,74	1,83	3,04	6,67

* 1,95 was the experimental value resulting from the round robin test performed in 2011 on behalf of the GRSG informal group.

** values about Taber test to be revised in accordance with the outcomes of the ISO work.

Notes:

- **Bold values** would be the references to be reached by the other materials. The group is well aware that some figures in this table (e.g. 0,63) are not reasonable for a reference value.
- Wet coated PC: AS4700 (2-layer)
- Wet coated PMMA: UV curable coating: Perma resist 608 (mono-layer)
- Coating thickness: the suppliers committed to provide data

Conclusion:

- 3 tests in competition (UN R112 test to be considered by the experts for next meeting)
  - Amtec-Kistler
  - Sand drop
  - Taber
- Informal group still needs to find out which is the most appropriate test for the plastic windscreens
- Taber test shows lacks in reproducibility
- Still need to learn about the outcomes of the ISO work on the Taber test
- Informal group will have to consider the 3 reports about the 3 tests, get information from ISO, then make a decision hopefully at the next meeting.

9. Revision of the results of the laboratories internal inquiry about the resistance to temperature change test

Documents: IGPG-03-08 and IGPG-03-09

The group was questioned whether including the combinations in the final text.

I. Resistance to Temperature changes followed by abrasion:
   a. Report says it is reasonable.
   b. Informal group experts' opinion: seems not necessary as no negative experience was ever reported. Should the group decide not to use the Taber test for abrasion, it would have to be excluded as well from the combination.
   c. Conclusion: combination seems not relevant.

II. Resistance to Temperature changes as a single test:
   a. Informal group experts' opinion: Some experts were of the opinion that the temperature resistance should be included, out of a combination. Side glass experience did not show any failure to this test: seems relevant not to include it. However the regulation addresses any kind of "plastics" hence safety could be ensured thanks to this test because some new materials could need such test
   b. Conclusion: kept for the moment, subject to revision at next meeting.

III. 227g Ball drop followed by humidity test
   a. Report Conclusion: no failure
   b. Informal group expert opinion: aim was to assess the resistance to humidity after an impact.
   c. Conclusion: combination seems not relevant

IV. 227g ball drop followed by "boil" test (high temperature)
   a. Report Conclusion: no failure
   b. Comments from the informal group: this test was not mentioned during the 2nd meeting. The number of samples and tests performed is not sufficient to draw a conclusion as providing insufficient data. Height of 8,5 m was debated. The experts acknowledged that this value is a copy/paste from the glass test.
   c. Conclusion: not enough samples, neither coating or plastics, etc: no conclusion to the combination can be drawn to date. Yet the proposed height of 8,5 can be kept for plastics.

V. 2,26 kg ball drop test.
   a. Report Conclusion: no failure detected
   b. Informal group experts' opinion: headform test with a 10 kg ball already exists, hence the experts did not find necessary an additional test with a 2,26 kg ball..
   c. Conclusion: test deleted for the moment, Daimler to communicate a solid position for the next meeting.

10. Lab tour at Bayer with demonstration of PC glazing production in pilot plants

The experts had the opportunity to visit experimental production facilities where some automobile components are moulded then coated.

11. Further discussions of the draft regulatory text

Document: ECE/TRANS/WP.29/GRSG/2009/8 (D)

This item was not discussed due to lack of time

12. Comparison test at BASt about protection of pedestrians for glass and PC glazing.

Document: IGPG-03-14 (BASt)

Mr. Zander (BASt) and Mr. Gehring (BGS) presented the results of the BASt study. This study aimed at answering the two following questions:

- Does the use of plastic windscreens in vehicles lead to a higher injury risk for vulnerable road users, especially for pedestrians?
- Can the current test procedure (Phantom head drop test) on the approval of glazing according to UN regulation Nr. 43 be used for plastic glazing? Which modifications or extensions might be necessary?

The group held a Q&A exchange:

- The operators used the same glue for the plastic windscreens as for glass windscreens. The fixations of the windscreens were performed by a firm which is expert in windscreen exchanges. The informal group however acknowledged that the type and quality of glue could have an influence on the state of the windscreen and its aging.
- Dilatation must also be taken into account to a range of about 10mm/100°c. When the samples were clamped, the dilatation was taken into account (clamping was done at the test temperature). Also, it was stressed that the test vehicle was designed for glass panes rather than for PC. While it could be considered reasonable that a vehicle manufacturer adapts the windscreen frame design to the nature of the windscreen, the operators considered logical not to introduce an additional influencing factor into the study.
- Also the 3rd dimension can take over one part of the dilatation and, in case of multi-pane glazing, one of the panes can take over the dilatation of the other.
- Concerning rescuing the occupants, the experts were informed that the rescue teams can use the same cutting tools used for steel panes.

The informal group was informed that it is expected that an additional, more complete report will be distributed around the end of 2011 / beginning of 2012.

13. List of action items for next IG meeting

- IGPG Experts attending the ISO WG to ask the ISO experts whether their results can be shared with this IGPG informal group (item 7)
- Each expert to investigate relevancy of the UN R112 spray test and to come with a position at next meeting (item 8)
- Dr. Buckel and Dr. Dümmler to improve the table under item 8 and propose constructive conclusions (item 8)
- Each expert to study in depth the round robin test reports (items 5, 6, 7)
- Thickness of the coating of the samples used in each round robin test to be provided before Christmas 2011 (items 5, 6, 7)
- Dr. Buckel to present the results of chemical resistance after stone chipping test.
- Daimler to present a proposal for a wiper test.
- Daimler to communicate a solid position about the 2,26 kg ball drop test for the next meeting (item 9.V)

14. Schedule for further IG meetings.

Document: GRSG-99-25 (D)

IGPG-04 : Bonn 6/7 March 2012
IGPG-05 : Paris 5/6 September 2012

15. Any other business

None.