

**Draft minutes of the 5th meeting of the informal group on
“Behaviour of M2 & M3 general construction in case of Fire
Event (BMFE)”**

(<https://wiki.unece.org/display/trans/GRSG-BMFE-05>)

Date: **November 27**
November 28
Venue: **University Institute of Automobile Research (INSIA)**

1. Welcome and Roll call

The Chair welcomed the participants to the meeting.

2. Adoption of the agenda (BMFE-05-01e)

The agenda was adopted with the addition of some new documents.

3. Validation of the minutes of the last meeting (BMFE-04-10)

The minutes were adopted with no change

4. General outcomes of the intermediate skype meeting and validation of the minutes (email dated 30 October 2018)

The minutes per the email of Plastic Europe (30 October 2018) with the corrections in green, were adopted.

5. Accidentology & statistics : inputs from experts

Documents:

- BMFE-05-03 (N)
- BMFE-05-04 (RISE)

N presented the document BMFE-05-03. N wonders the need for regulation on electric buses for addressing the charging time. Perhaps this will be needed in the future, in articulation with UN R100. UN R100 contains requirements for the charging phase, however only when the charging component is out of the vehicle (grid).

Conclusion on electric bus safety: electric buses safety is not part of the terms of reference. The chair may raise this subject at GRSG-116 (April 2019) in his report to GRSG.

Yet the concern about electric heaters (when vehicle is parked), while system is fitted post approval subsists as a source of danger. However only danger for material since there is no passenger in the vehicle when it is connected.

Conclusion on electric heaters: can be raised at GRSG-116 as well.

Rate of fire events: 1.0 – 1.4% is a high level, confirmed by the figures in other countries. Most fires start from the engine compartment. It seems that the fires in Norway are not particularly related to vehicles impact. Major part of these events are linked to some malfunction. The issue seems also arise in part of the cases when items are installed by third party or non-professional.

Conclusion on BMFE-05-03:

- High rate of fire events
- Events not linked to impacts
- Events mainly starting from engine compartment, often due to leakage but the fire did not spread beyond this compartment in all cases. When the fire is contained in the engine compartment, there was no total burnout of the vehicle.

S presented the document BMFE-05-04.

Most interesting are the researches about fire when the vehicle is in use, yet this is mainly addressing the cases when the fire brigade was involved. The expert stressed that the TRL report was used as a background for GSR-2 and also contains statistics.

Some vehicles in the statistics referenced in the document BMFE-05-04 are probably equipped with automatic fire suppression systems under Fire Insurance incentives for about 10 years (2008). The Swedish insurance requirements are similar but not identical to the UN R107 requirements. However, the new requirements on exhaust emissions made the exhaust temperature increase, having some unknown influence on the number of fire events. The fire suppression systems do not affect the number of fire events, but decrease their consequences because they limit the propagation of the fires.

In France, most manufacturers anticipated the UN R107 mandatory requirements and the manufacturers have very positive outcomes. Euro 4 provoked a step in the level of temperature in the engine compartment, together with an increase of fire events.

There is still some uncertainty since the driver probably does not always call the fire brigade in case of a fire event, especially because the fire suppression system can act fast.

Seems there is no direct link between active safety systems and the number of fire event.

Conclusion on Accidentology & statistics:

- No clear outcomes of the statistics
- Clear reduction of the consequences of the fire events, linked to the presence of fire suppression systems.
- Above results mainly linked to Insurance incentives.
- Euro 4 provoked a step in the level of temperature in the engine compartment, together with an increase of fire events

- Most fire events did not spread out of the engine compartment (when vehicle equipped with a fire suppression system)
- No direct link between active safety systems and the number of fire events.

6. Regulation No.118 (Day 1 am)

6.1. Toxicity: assessment of behaviour of current R118-approved materials with regard to smokes toxicity under currently applied protocols - TASK-FORCE 1 (CREPIM)

Documents:

- BMFE-05-15 (CREPIM)
- BMFE-05-06 – 08 (RISE)

Mr. Khelifi presented the document BMFE-05-05 (ITC: Conventional Index of Toxicity)

The chair found key for toxicity the final use of the material.

Opacity: while the results are interesting, the chair pointed out that the buses and coaches have lower evacuation times than rail and air transport modes.

The group then faced the following (key) question: “how to make the link between the result for one material, with the combination of all components in a vehicle?” Mr. Khelefi proposed to raise this question with the German presentation BMFE-05-12 (see item 6.4)

Toxicity: check with D presentation BMFE-05-12

Opacity: the experts wondered what could be the next steps? Probably the heat level (irradiation - KW/m²). Gerflor mentioned that the test protocol is dependant on the material final use, in terms of irradiation level, exposition time and criticality performance requirements. The experts agreed that the timing is a key parameter and concluded that time and “irradiation” are the parameters to focus on.

Conclusion:

- Opacity:
 - o Group to go further in details; analysis of the test protocol focusing on buses and coaches
 - o Keeping the test set-up, changing the parameter value: durations, irradiation
 - o Pilot: Crepim, with Gerflor
- Toxicity: see this item 6.4.

Activity: CREPIM/CLEPA (Gerflor) to conduct analysis and draft proposal on the most adapted protocol on smokes opacity for road application.

BMFE-05-06 – 08 (RISE)

The group acknowledged that these documents were at the basis of the last amendments to UN R107. The group decided to keep them as reference documents.

6.2. Analysis of other transport modes: justifications for pass/fail limits (evacuation time, toxicity, flammability, ...) - TASK-FORCE 2 (CLEPA / CREPIM)

Documents:

- BMFE-05-13 (Gerflor)
- BMFE-05-18 (Plastic Europe) IMO regulations GRSG-BMFE 20181126

The presentation BMFE-05-18 was given to the group.

The presentation showed the difference of philosophy in maritime transport modes compared to the road transport, since there is no question of escaping the ship; the requirements are not linked to evacuation time, rather to “safe compartments”. If the results on flammability are good enough, there is exemption on smoke and toxicity. The basic criterion is “no flame propagation”.

In aviation, there is not regulation about smoke toxicity. The 1st parameter is the flame propagation, and smoke comes as a secondary parameter. The group wondered whether the criterion could be a link between the flame propagation and the evacuation time.

OICA stressed that the switch from R118.01 to 02 increased the production costs by ca. 10-15%. The OICA expert informed that it seems that the suppliers are not all ready for complying with the 02 series. The R118.01 requirements would become 30% more expensive for aligning them onto the corresponding requirements in marine/rail application. Even the colours may have a different behaviour, hence the suppliers must perform a lot of tests before applying for approval. Yet the worst case could be identified, then become the sole sample to be tested.

The expert from Plastic Europe informed that testing price for toxicity in aircraft is ca 2000€

Conclusion:

- Possible solution for a philosophy in regulatory requirements: very low flame propagation speed (i.e. “non-burning” material) with low-severity opacity/toxicity values, or alternatively permitting relatively high burning rate with high-severity opacity values. Approach to be further investigated in the next steps.

Activity: CLEPA/OICA to propose a comparison matrix (cost for each application vs. the materials) based on the available data.

6.3. Influence of adhesive agent (IDIADA)

Documents:

- BMFE-05-16 (IDIADA) R118-Adhesive agent tests
- BMFE-05-05 (S) Adhesives

E presented the document BMFE-05-16

The group had a debate on:

- the relevancy of separately testing the materials, if they must be re-tested as new materials after they are combined.
- Whether the glued material is the “best case” (unglued would then be the “worst case”)
- Manufacturers bearing the responsibility on components that they cannot trace from the suppliers.

S presented the document BMFE-05-05

The Type Approval Authority cannot assume that the addition of glue does not negatively affect the behaviour of the material. However, should the components not be tested separately, then some kind of manufacturer’s self-statement about the behaviour of the glue should be added into the information document.

Conclusion:

- Based on the test performed, the requirements are well defined in the current text of the regulation, with no safety critical concern
- Approval process: need to request a list of “adhesive agents” that can be used without decreasing the performances.

Activity: Sweden to provide a draft proposal with addition of a new item 5 in Annex 2 (new paragraph 5): “in case of adhesive agent to bond two materials, a list of adhesive agents that can be used without deterioration of the burning behaviour capabilities”

6.4. Development of a simplified method for testing the toxicity and smoke development during fire of interior materials used in buses and coaches. (GER)

Document: BMFE-05-12 (D) Smoke Gas Toxicity

D presented the document BMFE-05-12. The D research regarding toxicity test methods adapted to road transport is about to start and will last 10 months. D was ready to collect the inputs from this group for influencing the work. The expert stressed the need to first collect the experience of the last amendments to the existing regulations before amending them.

Link with toxicity and fire propagation requirement. The presentation showed the need for further information on the balance between the 2 parameters.

Other inputs were given (child behaviour, etc.)

D will provide a progress report at the occasion of the next BMFE meeting (BMFE-06 – 27-28 February in Oslo).

The chair stressed that the study can feed one of the two options in case of the alternative approach. OICA pointed out that the D and the Puisseguin are of the same type of scenario: even with the best

materials, the consequence on the number of fatalities would not change.

This was acknowledged, yet the chair recalled that the focus of the BMFE group should remain the feasible improvement in UN R118 and R107.

Conclusion:

- Regular progress report expected from D to BMFE
- Real interest of BMFE regarding the D research

7. Regulation No.107

7.1. Simulation and experiment: literature review (Plastics Europe / Volvo)

Document:

- BMFE-05-17 (PlasticsEurope)

PlasticsEurope presented the document BMFE-05-17 about Simulation and experiment literature review.

Influence of fire extinguishing system: OICA committed to find out what requirements were mandated by the city of Berlin from 2010 on, to arrive to a total eradication of fire events after 2010.

Conclusion:

- No feedback on the last amendments of the regulations
- No statistics in the last 4-5 years
- Automatic opening of roof hatches can help, according to CFD (Computerized Fluid Dynamics)

Activity :

- OICA to provide overview on influence of fire extinguishers regarding fire events statistics.
- CLEPA/PlasticsEurope to provide details on simulation regarding automatic roof hatches opening and safe escape.

7.2. Full scale test:

Document: BMFE-05-19 (Aguila) Fire Test Matrix 20181024-d Aguila

Target is to gather data to setup a list of relevant parameters. Having a reference scenario will permit to refine the relevant parameters (fixing physical data) to address the performance requirements.

Presence of fire brigade can affect the results of the test. difficulty in finding vehicles: 2 vehicles were found: one 18-year old (6 k€), and one 2-year-old (100 k€).

Yet 2 big blocking points (see email of 30 October):

1. Finding the vehicles

Volvo informed they might have a very old (8-year old) i.e. some kind of worst case. RUS

suggested to re-use the vehicles serving for testing the “road barriers” since this test must anyway be performed with busses and coaches. RUS perform these tests, perhaps Italy as well. The chair committed to check this possibility in France. Volvo to liaise with Aguila. Aguila is under investigations with Evobus

2. Decide the measuring equipment to focus on the outcomes we want to address.

There was a debate on how to use the data collected in this exercise.

Some expert suggested to establish some “simulation tool” as it exists in UN R13 (Annex 21 – Appendix 2)

S proposed simulating a fire without burning anything, rather checking the propagation, opacity etc. with no destructive test.

The chair wondered the need to add a new requirement into UN R107 for validation of the vehicle behaviour in the case of fire event. OICA stressed that this would much affect the R107 approach, influencing also R118, and suggested to focus the current work of the informal group to the items that are currently in the agenda, like door opening, flammability, toxicity, etc. the chair proposed to make it optional to the manufacturer, as an alternative to the set of the current performance requirements.

Gerflor informed of similar studies performed by LNE, data could be shared to adapt the measurement equipment.

Aguila informed about possible data on simulation.

Activity:

- Volvo to investigate availability of vehicles and share it with Aguila
- Aguila to investigate opportunities with Evobus
- Chair to investigate vehicles from barrier testing
- Simulation tool:
 - o All to internally investigate the need for such approach,
 - o Aguila will investigate the opportunity of CAE evaluation for the full-scale test purpose with support of PlasticsEurope.
 - o Item remains in the agenda
 - o Each party to have a position on whether there is a need to develop a simulation tool on the behaviour of the vehicles in case of fire event in R107 and/or R118
- Gerflor to provide information at next meeting on similar studies performed by LNE that could be shared in order to adapt test instrumentation.

7.4. Evacuation time : outcome of researches

Document: BMFE-05-14 (S) Evacuation trials Buses and Coaches

Item postponed to the next meeting

7.5. Outcomes of research on the time needed to break windows (RISE)

Item postponed to the next meeting

7.6. Automated emergency exit

Document: BMFE-05-10 (OICA) Automated emergency exits

OICA presented the document

CLCCR raised that CLCCR has concern that in case of a collision, the vehicle may be positioned such that the doors are not situated on the proper side of the road. The wording would then make it necessary to detect the position of the vehicle. Risk analysis: collision, fire event, wrong positioning.

E proposed to link this to the emergency lighting and the hazard signals. Yet paragraphs 7.8.3.2. and 7.5.1.5. already address this.

The group agreed to add this requirement into the new proposed paragraph 7.5.1.6., to read: “*or driving at a speed less than or equal to 3 km/h and activate the emergency lighting system according to paragraph 7.8.3.*”

A debate took place on the reaction of the passengers in case of automatic activation of the emergency lighting system since this may be frightening.

Conclusion: new paragraph to read:

*“7.5.1.6. In the case of vehicles of Classes II, III and B, having the engine located to the rear of the driver’s compartment, and in the event of excess temperature in the engine compartment or in any compartment where a combustion heater is located **the emergency lighting system according to paragraph 7.8.3. shall automatically activate, and the power-operated service doors situated on the side of the vehicle that is nearer of the side of the road corresponding to the direction of traffic for which the vehicle is designed shall open automatically when the vehicle is stationary or driving at a speed less than or equal to 3 km/h.**”*

7.8. Combination of fire detection and fire suppression warnings

7.6.1 Combination of fire detection and fire suppression warnings to the driver.

Conclusion: Item kept in the agenda for the next session. A draft proposal shall be built by OICA.

7.6.2. Minimal performance level for fire detection systems

Conclusion: Item kept in the agenda for the next session. A draft proposal shall be built by OICA, in combination with the previous item.

7.9. ISO standard

Possibility to use the ISO standards (ISO 5659-2 and ISO 5659-2 + FTIR).

Conclusion: Request transmitted to GRSG and WP29, BMFE waiting for their position

7.10. Safety instructions

Document: BMFE-05-11 (Chair, F and Secretary) Safety information

The chair and the secretary presented the proposal.

CLCCR questioned the added value of such proposal and questioned whether it is still possible for the operator to order a vehicle with no safety information transmission means.

S and the chair clarified that the proposal is the maximum that can be delivered in an approval vehicle, the next steps must be performed at national level with the use regulations. The chair informed that, depending on the current national constrains, this regulated basis is the way to impose adapted solutions to operators following OEM recommendations.

CLCCR also questioned the situation when the owner decides to re-furbish the vehicle, and pass from safety cards in seat back pockets to screens in the ceiling. In that case he should make the vehicle re-approved according to the new paragraph.

The group improved the wording as in the revision 1 of the document

Conclusion:

- Each party to argue for or against the proposal at the next meeting
- Text kept as amended until next meeting.

7.11. Optimization of luminous trajectories and functionalities (flashing lights for ex.)

Item postponed to the next meeting

7.12. Smokes extraction systems (document base : BMFE-04-03)

Item postponed to the next meeting

8. Next steps

9. Next meetings

- 9.1. 6th meeting (TBD) Oslo, 27-28 February, starting at 9:00 am the 1st day, finishing at lunch the 2nd day
- 9.2. 7th meeting (TBD)

10. Synthesis of activities for the next session:

- § 6.1. CREPIM/CLEPA (Gerflor) : analysis and draft proposal on the most adapted protocol on smokes opacity for road application.
- § 6.2. CLEPA/OICA to propose a comparison matrix (cost for each application vs. the materials) based on the available data.
- § 6.3. Sweden to provide a draft proposal with addition of a new item 5 in annex 2 (new paragraph 5): “in case of adhesive agent to bond two materials, a list of adhesive agents that can be used without deterioration of the burning behaviour capabilities”
- § 7.1. OICA to provide overview on influence of fire extinguishers regarding fire events statistics.
- § 7.1. PlasticsEurope to provide details on simulation regarding automatic roof hatches opening and safe escape.
- § 7.2. Volvo to investigate availability of vehicles and share it with Aguila
- § 7.2. Aguila to investigate opportunities with Evobus
- § 7.2. Chair to investigate vehicles from barrier testing
- § 7.2. Simulation tool:
 - o All to internally investigate the need for such approach,
 - o Aguila will investigate the opportunity of CAE evaluation for the full-scale test purpose with support of PlasticsEurope.
 - o Each party to have a position on whether there is a need to develop a simulation tool on the behaviour of the vehicles in case of fire event in R107 and/or R118
- § 7.2. Gerflor to provide information at next meeting on similar studies performed by LNE that could be shared in order to adapt test instrumentation
- § 7.6. OICA to provide a draft proposal on combination of detection and fire suppression warning + minimum performance level for detection systems (with CLEPA support)
- § 7.7. Chair to keep liaison with WP29 to get ISO standards in case of no feedback