

Draft report of the 4th meeting of the informal group on “Behaviour of M2 & M3 general construction in case of Fire Event (BMFE)”

Dates: 10-11 September 2018

Venue: OICA Headquarters, Paris - France

1. Welcome and Roll call

The chair welcomed the delegates and organized an introduction tour de table

2. Adoption of the agenda (BMFE-04-01e)

The chair stressed the necessity that the different stakeholders communicate their respective inputs prior the meetings, such that real progress can be made on the different topics at the meetings.

3. Validation of the minutes of the last meeting (BMFE-03-04e)

The minutes were adopted with no change.

4. Accidentology & statistics : inputs from experts

The experts had no input to share on accident statistics. The chair urged the parties to bring data on accidents in their respective territories, such that the group can construct a scheme of the major trends about the origin of the fires.

Volvo informed having some figures addressing mainly Europe on fire suppression systems; the expert committed to share this information for the next meeting. S also committed to share data about fire events.

The group was informed that RISE possesses some data about fire events in Sweden. RUS informed having unfortunately no official statistics with regard to fire events on coaches. N committed to provide some input.

Conclusion:

- All to provide relevant data
- Volvo / Sweden / RISE to provide their respective studies.

5. Evacuation time : outcome of researches [RISE]

S informed having researches (dating the 2000's) providing results quite similar to those of Spain. The expert committed to share information.

Conclusion: S to provide input for the next meeting

6. Regulation No.118 : experts inputs, position, data sharing

6.1. Toxicity & opacity : synthesis of test protocols, timings in application for naval, rails, air and road transports

Documents: BMFE-04-06 (Gerflor – CLEPA)
BMFE-04-07 (Volvo – OICA)

Gerflor presented the document BMFE-04-06 comparing the testing methods for the different transport modes. The experts stressed that there is currently no unique material capable of passing all the tests of all transport modes, yet this can be due to the different specifications and applications among the transport modes, e.g. aircraft Industry requests thin components vs. the other transport modes.

RUS was interested in getting the ISO standards for the sake of their knowledge and progress in the field of fire detection and suppression. The chair committed to investigate the possibility of sharing the standards.

Burning rate vs. toxicity: Gerflor informed that there exist a few materials having good performances in both criteria, however in most of the cases, increasing one characteristic implies decreasing the other.

It was explained that some additives with chlorine or brome may affect the resistance to toxicity tests, i.e. the nature of flame retardant affects the toxicity results. However, there is not reliable relationship between toxicity and flame propagation speed. Some good material can be produced of PVC, but the case of textile may be different. OICA informed that the vehicle manufacturers put as a main specification the respect of the UN R118 requirements in their specifications to their suppliers. Yet Volvo committed to provide further information in this regard (some suppliers have products coming directly from the rail Industry). However the situation among the manufacturer may vary in this respect.

A discussion started on the way to make progress in the evaluation current materials. The chair proposed testing 1-2 textiles, 1-2 PVC, already approved under UN R118, without any installation characteristics, with the idea of having a performance status of the approved materials. The question of installation into the vehicles would be addressed as a second step. CREPIM committed to test some samples of materials currently used by the vehicle manufacturers, under toxicity and flame propagation criteria. The group was informed that there indeed exists a correlation between the concentration of some materials in the air and the resistance of the human body to those

materials.

The chair proposed 2 different activities:

- Evaluating the current approved materials (installation is assumed already captured by UN R118 – vertical vs. horizontal positioning)
- Scrutinizing the justifications for the limit values required in the different transport modes in order to capture the best criteria for the road transport.

IVECO suggested approaching their suppliers to get the details of the textile nature (weft of textile fabrics, material) such to have an image of the textile. Restricting to textile is relevant since the plastics (usually ABS) are usually specific to the transport mode application.

Subsequently to the meeting, Volvo kindly shared some data per document BMFE-04-07

Conclusion and action points:

- Setting up of a 1st task-force:
 - o Aim: evaluating the current approved materials (installation is assumed already captured by UN R118 – vertical vs. horizontal) for smokes and toxicity
 - o Pilot: CREPIM
 - o Manufacturers and testing houses to liaise in this regard
- Setting up of a 2nd task-force:
 - o Aim: scrutinizing the justifications for the limit values required in the different transport modes in order to capture the best criteria for the road transport (evacuation time, toxicity, flame propagation, etc.).
 - o Pilot: CLEPA (Gerflor)
 - o CREPIM to actively participate
- Chair to investigate the possibility of having the texts of ISO 5659-2 and ISO 5659-2 + FTIR (see EN45545 – Part II - 2013)

6.2. Adhesives consideration: how to evaluate § 5.2.4. requirements

Document: BMFE-04-04 (UK) TAAM Adhesives

The chair explained the background of the item: TAAM (Type Approval Authorities Meetings, trying to achieve common interpretations of particular topics coming from the application of the regulations): TAAM finds the current text of paragraph 5.2.4. in UN R107 as quite generic, and this hence leads to different interpretations of the provisions.

Question 1: *What level of documentation is acceptable to confirm compliance of an adhesive agent with paragraph 5.2.4?*

The chair questioned how the text is applied nowadays.

Iveco informed that the component is currently tested as a whole (sandwich). The glue is never tested separately. The chair confirmed this approach for the case of UTAC. S found that the Technical Services experts are usually sensitive persons who can take the most appropriate approach.

The chair was of the opinion that some guidance could be given by the BMFE informal group to TAAM, as to which approach, from combination and glue as a separate component, would be the relevant. Volvo informed that the question had been already addressed by the different Type Approval Authorities. E believed that, when the materials are glued such that they become a different component, this new component should be re-approved.

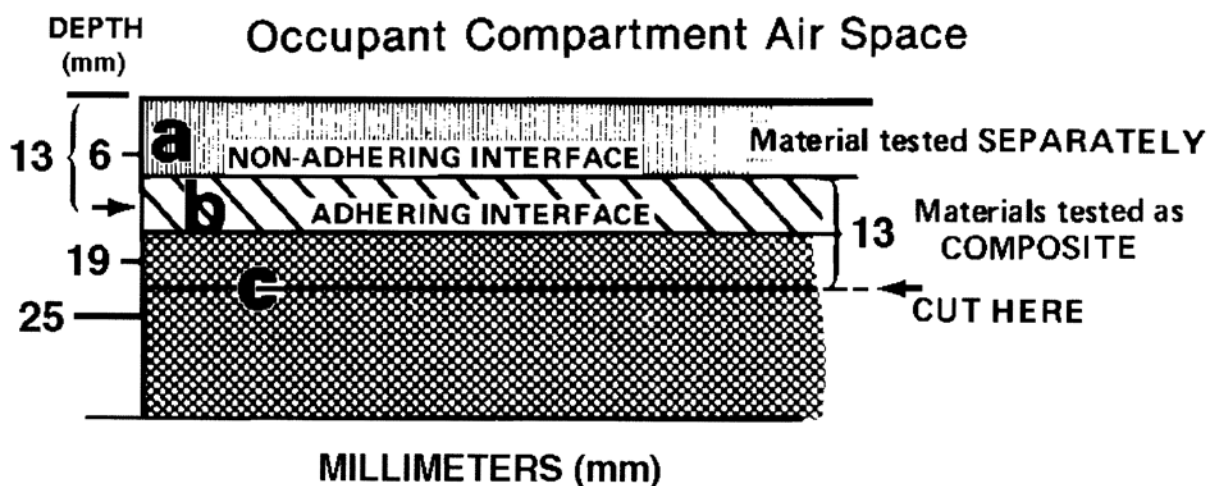
The group reviewed the paragraph 6.1.1. of UN R118

E informed of the scheme in the former directive, coming from FMVSS (see below). In E, the e.g. carpet, when glued on a wooden floor surface, must be re-approved as a new component. However, should the carpet be glued to the metallic floor (part of the structure of the vehicle), then there is no need to further test the carpet; this is relevant as metal is a thermal conductor. The group tried to capture the proper parameters: The glue burns because of its exposure to the air. However:

- The glue is never open to the air in the real world
- Practicability of testing the e.g. carpet glued on the metallic structure.

The chair summarized that the glued component must not be re-approved if it is bond to a material exempted from UN R118.

The experts had consensus that the glue is not a layer in the definition of composite material. Extract of FMVSS 302 (Flammability of materials used in the occupant compartments of motor vehicles) :



**Occupant Compartment Air Space
All Dimensions in Millimeters (mm)**

Volvo stressed that the concern usually does not come from horizontal components like carpets, rather from vertical components as they usually have an insulation layer.

Tentative provisional approach:

- Material glued on vehicle structure support:
 - o Glued on a support out of the regulation scope: testing the material as a separate component
 - o Glued on a support within the scope of the regulation: testing the combination of the material glued on the support
- Material glued on any other support: testing the combination of the material glued on the support

However, it was acknowledged that the glue could have an influence on the material and its support, as mentioned in § 6.1.1.5. of the UN R118.

Conclusion:

- The group cannot make a conclusion today, but item remains in the agenda for the next meeting
- E committed to provide results of further testing (impact of the glue on the material in a vertical test on different supports like wood, metal, no support, ABS, PVC, etc.)
- Aim is to have one reference support within the scope, and one reference support out of the scope of the regulation).
- In the case of 2 (already approved) materials glued together, they are assumed to make a new type of material (composite material), hence must be approved.

Question 2: *In all cases should the R118 installation approval holder list as part of their information document the adhesive agents that they are permitted to use within the vehicle for Annex 6 & 8 approved components and Annex 7 approved components?*

The chair stressed that, should the response to Q1 accept the glue as part of a new type of material, then the adhesive agents must not be part of any specific declaration.

S informed that they need the declaration, at least for COP.

Provisional conclusion:

- When the material is glued on any support not part of the vehicle structure, then the information on the adhesive agent are part of the component approval.
- When the material is glued to a support part of the vehicle structure, then the information are only part of COP.

The group subsequently reviewed the conclusions. S suggested proposing an amendment to the text of the regulation, along the lines of the above conclusions, i.e. testing the material including the glue if the thickness is within the 13 mm.

Conclusion:

- performing further tests according to the above
- S to provide a tentative wording prior the 5th meeting
- Item remains in the agenda, aim is to table a proposal for an amendment at GRSG-116 in April 2019

7. Regulation No.107 : experts inputs, position, data sharing

7.1. Outcomes of research on the time needed to break windows

The chair suggested postponing this item to next meeting.

Conclusion: item kept in the agenda.

7.2. Automatic exit opening : list of possible scenario and the way to address each scenario

Document: BMFE-04-08 (OICA – Iveco)

Mr. Genest presented the document BMFE-04-08. In bus and coach applications, the doors open completely, they are hence a good candidate for automation. However, this automatic opening necessitates energy.

Concerning the roof hatches, the automation is feasible: in the case of ejection, there is a need for energy

to release the locking springs. In the case of electric hatch, the automation is questionable.

Concerning the windows: the opening of a glued glazing pane is quite difficult. However, in the case of a panel included in an opening frame, as in FMVSS 217 provisions, the automated opening is easily feasible, but necessitates a huge mechanical and energy source. It also necessitates two actions: the locking system release and the opening itself. The manufacturers pointed out that it is already difficult to make the motorized opening of the doors reliable for the lifetime of the vehicle. It would be even more difficult to make reliable an automatic system for the same time. Aguila stressed that most of the fire event occurs without any vehicle impact, or with a light impact. The question finally was how automation could bring added value for one or both two actions (release + opening).

S pointed out the aim of the group is to focus on fire events and wondered at which speeds should the automatic opening occur. The chair supported that some pre-conditions must be respected for the automatic opening. During the following discussion, there was a tendency to link the automatic opening to the fire detection and the speed. There was also the question as to whether this needs additional power. HMI: same as current door opening indication, as the fire event is also indicated to the driver. In addition, such automatic opening linked to the speed would permit saving precious evacuation time.

The group also raised the problem of the “false positives” and Spain raised the question of the location of the fire: if the fire occurs in the passage of a door, this door could become dangerous as an emergency exit. Spain also recalled the philosophy of UN R107 (paragraph 7.8.3.) that the illuminance must be uniform and above a certain level.

The group agreed that these provisions should apply only to vehicles of Classes II, III and B, since the in-use conditions of the other classes are usually not subject to critical fire events. Vehicles with most seated positions are more difficult to egress. F however was keen that the regulatory door remains open to all classes of vehicles as a voluntary application.

Conclusion:

- No technical blocking points to automation of the opening of emergency door in case of fire event. Use of current sensors and opening system is possible. Early detection implies that the power source is still active.
- Speed related: use the same speed threshold (3 km/h) and sensor as in paragraph 7.6.5.1. of Annex 3
- Emergency lighting system associated (paragraph 7.8.3.)
- Focus on Vehicles of Classes II, III and B

7.3. Smokes extraction systems : evaluation of which existing system could be adapted to M2/M3

Document: BMFE-04-03e (F) Smokes extraction principle

There was no discussion on this item during the meeting, the chair informed that he is still awaiting input from D on this item. The presentation BMFE-04-03 is available in the dedicated website.

Conclusion: The item remains in the agenda for the next meeting.

7.4. Definition of minimum performance level for fire detection system : overview of current state of play with regard to the sensor technology according to vehicle implementation

The chair suggested linking this item to the proposal from S on fire detection systems (item 7.5.).

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

Document: BMFE-04-02 (S) R107 Fire detection systems

The expert presented the proposal. He pointed out that it indeed makes sense to inform the driver when the fire suppression system is activated even if the alarm system is not engaged. Volvo informed of systems de-activating the fan for avoiding oxygen input to the fire. OICA committed to review the problem internally before providing a position on this matter. The added value of the proposed wording is that it may occur that the fire suppression system activates, hence lowers the temperature before the temperature achieves excessive levels, such that the warning system would not activate.

The group held discussions on a possible ideal temperature threshold. The provisions should define a maximum temperature below which the detection must operate. There was a debate on the proper wording, e.g. as from which temperature should the system detect.

The experts were aware that a precise value could not address all the cases since the normal temperature of an engine depends on its technology and other parameters particular to each type of vehicle. In this regard, the group agreed that a measurable pass/fail criterion has still to be defined.

Conclusion:

- Need for a measurable pass/fail criterion
- Temperature or temperature variation seem to be relevant parameters
- Need to permit technologies detecting temperatures below that regulated (vs. above) – re-wording for permitting more performant or alternative solutions
- Pilot: OICA

- Wording to be produced on the basis of the current production (perhaps also anticipating the progress of technology)

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

The chair suggested postponing this item to next meeting.

Conclusion: item kept in the agenda.

7.7. Safety instructions : overview of the instructions already proposed for other applications

Document: BMFE-04-09 (OICA) Example of a Safety card in current production

RUS presented the existing safety instructions as in UN R44 and suggested that they are probably the only requirements in respect with safety instructions about the way of installation of the child resistance systems in a vehicle. The expert informed that in RUS there are currently no requirements (provisions) concerning safety instructions among the road transport homologation requirements.

RUS proposed the following provision:

“Direction to the nearest emergency exit should be provided and visible from each passenger seat”

Volvo shared an example of the safety card per document BMFE-04-09 that the manufacturer provides to their customers. Such cards are initiatives from the manufacturers themselves. The experts had an exchange on the final responsibility of providing such safety cards. F pointed out that at the time of Type Approval, only the free space dedicated to the safety card can be verified, while the card itself, as it is removeable, cannot be checked. Spain raised as well that the national legislations are not harmonized in this regard. F suggested mandating a dedicated place for the safety card, together with some minimum dimensions. Some traffic requirements could then be added at national level. S found as well that some instructions must be given, visible from each passenger seat (i.e. either one little per seat or one big visible from each place). The chair was keen that the regulation only provides general instructions for the presence of a dedicate place, with no detailed requirements such as dimensions, colours etc., as an incentive for the operators to provide instructions.

There was a debate on the relevancy of such incentive. The final element of the chain remains in any way the operator. Should the dedicated space be mandatory in the regulation, then the operator would not have any choice but taking the option of the dedicated space.

The group was informed that currently most manufacturers provide the space as an option, up to the operator to choose this option. Some experts were in the opinion that the safety card does not help informing the occupant, rather the instructions given by the driver or the crew. S supported by all the experts were in favour of technology neutral solutions.

The group elaborated about the wording proposed by RUS:

“Direction to the nearest emergency exit should be provided and visible from each passenger seat”

OICA wondered how to make the occupant aware of the nearest emergency exit. The expert raised the concern that people tend to egress through the door they used for entering the vehicle, hence this makes traffic jams on the way.

It was acknowledged that the occupants do not read any safety instructions at the time of the emergency, rather prior the travel. F was in favour of any tool that would help the occupants egressing the vehicle in case of emergency.

Scope: seems OK for Classes II and III, questionable for Class I.

In addition, the information must also be adapted to the occupant (child, handicapped person, elderly, etc.), hence this is more a problem for operators. There is currently no precise information on the quantity of lives that could be saved by this provision.

Draft compilation table

If the regulation provides requirements on:	The manufacturer shall provide:	The operator shall:	Comments
The safety card	dedicated space for the cards	provide the card adapted to the use of the vehicle	Design restrictive as it mandates a card. Difficulty to adapt the language to the territory where the vehicle will be operated
The safety instructions in general	general instructions like the location of the emergency exits	adapt the instructions to the occupants and the type of travels.	Technology neutral solution, permitting safety cards, video instructions, signalization, crew instructions, etc. However, difficulty in defining the pass/fail criteria.
The details related to the construction of the vehicle, like the location of the emergency exits or fire extinguishers	The relevant location for each emergency exit or fire extinguisher	adapt the instructions to the interior fitments they order to the manufacturers	Technology neutral. However, difficulty in defining the pass/fail criteria.

Tentative draft wording by the secretary:

“Means to transmit safety information to each passenger seat shall be provided. The safety instructions shall contain at least:

- *The location of the emergency exits*
- *The location of the fire extinguishers*
- *...”*

Conclusion:

- Chair and secretary to summarize the arguments exchanged in the debates, to be laid down in the report
- Provisions must be:
 - o Technology neutral
 - o Related to the construction of the vehicle
 - o Pass/fail criteria
- No big effort to the manufacturers, at least for some vehicle classes
- F and secretary to elaborate one or more proposals for the next meeting.
- 5th meeting to decide based on the proposals

8. (TBC) Full scale test : setup and matrix

Document: BMFE-04-05 (AGUILA) assumptions of the propagation of

Aguila presented their PPT presentation just after the discussion about the automation of door opening (item 7.2.). Aguila was 1st presented as a high technology company. The Aguila expert informed that, when the video was tabled at BMFE-03, there was a question about the possibility that opening the windows might activate the fire due to oxygen supply, and that opening the window may hence make the situation worse when the smokes come from the exterior. Therefore Aguila is currently initiating a 2nd campaign and makes a call to the stakeholders for supplying vehicles.

There was an exchange of view on the best way to support the work of Aguila. The experts believed that RISE may have protocols in place that can be of some help to Aguila.

The chair was keen to identify which criteria to focus on, and how to measure them. Even if the tests are not performed with the latest types of vehicles, having a test with one vehicle permits establishing a reference for relative evaluations.

In addition, the existing literature was proposed as a reference. The experts committed to investigate this as well.

Criteria:

- Smoke propagation
- Temperature at different heights
- Etc.

Campaign is expected to start end of 2018 / beginning of 2019.

Seems there is existing test protocols or simulation in the train industry. However, this mode of transport does not use the same materials, not the same fire propagation model, etc. Volvo committed to share their possible data on studies available for coaches. The chair called up the attendees to undertake a study on the feasibility of initiating a testing campaign. Gerflor mentioned that some CAE (Computer Aided Engineering) evaluations had to be carried out by the BAM (Bundesanstalt für Materialforschung und -prüfung - scientific and technical federal institute for material research and testing -

<https://www.bam.de/Navigation/EN/Home/home.html>) in Germany and will contact BAM to get further detailed data.

OICA committed to hold internal enquiry to investigate the most suitable data to share to the group. Volvo pointed out the origins of the fire events may evolve in the future with the implementation of the last amendments: probably the proportion of fires with electrical origin will increase.

F stressed that the group should focus on the assumption that the fires start mainly in the engine compartment, with the drawback that this compartment is far away from the driver's position, hence he may face delay before being alerted of the fire.

Conclusion:

- Defining on which vehicle to perform the tests. Call to the manufacturers as to whether they can provide "spare coaches" for conducting the tests. OICA committed to investigate the possibility of providing vehicles, yet this is subject to their value and availability. Seems that some vehicles of high mileage can be found on a secondary market. Aim is to get answers by the next session
- 3 Steps:
 1. Simulation, literature for evaluating what are the best options for the 2nd step
 2. Physical tests
 3. According to the outcomes of the two 1st steps, elaborating a matrix of data and criteria for constructing a test method to be added in the regulation
- 1st step: Pilot: Volvo (M. Jansson) and CLEPA. Spain committed to check literature at a technical university. CLEPA (Gerflor) committed to contact BAM institute to consult available CAE evaluation results.
- 2nd step: OICA and Aguila to investigate options to get vehicles to be tested.
- 3rd step: all stakeholders to liaise for constructing the set of data and measurements.
- Timeline:

- Chair to organize a Skype meeting prior 5th meeting for evaluating the state of play with regard to the the 3 above steps.
- Tentative date: 2nd half of October. Proposal will be distributed soon.
- Final completion for BMFE-05 (27-28 November 2018)
- BMFE-05 to finalize the matrix of tests for permitting the start of the tests.

9. Summary of the action points

Who	What	Deadline
All (especially Volvo / S / RISE)	provide relevant data on accidents in their respective territories, such that the group can construct a scheme of the major trends about the origin of the fires	5 th meeting
S	Data on evacuation time	5 th meeting
CREPIM	Initiate task-force 1 on evaluation of the current approved materials with regard to smokes and toxicity	Initiate by Mid October 2018. Preliminary results for 16 November 2018
CLEPA (Gerflor)	Initiate task-force 2 on the verification of the justifications for the limit values required in the different transport modes in order to capture the best criteria for the road transport (evacuation time, toxicity, flame propagation, etc.)	Initiate by Mid October 2018 Preliminary results for 16 November 2018
Chair	Investigate the possibly of having the texts of ISO 5659-2 and ISO 5659-2 + FTIR	5 th meeting
E	provide results of testing on the impact of the glue on the material in a vertical test on different supports like wood, metal, no support, ABS, PVC, etc.	16 November 2018
S	Propose a draft wording stipulating that: <ul style="list-style-type: none"> - When the material is glued on any support not part of the vehicle structure, then the information on the adhesive agent are part of the component approval. - When the material is glued to a support part of the vehicle structure, then the information are only part of COP. 	16 November 2018

Who	What	Deadline
OICA	Elaborate draft text on automation of emergency exits.	16 November 2018
OICA	Elaborate draft text on combination of the fire detection and fire suppression warnings to the driver	16 November 2018
Chair, F and Secretary	<ul style="list-style-type: none"> – summarize the arguments exchanged on safety instructions – elaborate one or more proposals 	16 November 2018
Volvo (M. Jansson) and CLEPA	Initiate 1 st step on full scale tests (Simulation, literature for evaluating what are the best options for the 2 nd step)	Initiate by Mid October 2018
OICA and Aguila	investigate options to get vehicles to be tested (2 nd step)	As from 1 st outcomes of the 1 st step
All	liaise for constructing the set of data and measurements	As from outcomes of 1 st and 2 nd steps
Chair and Secretary	Organize a Skype meeting prior 5th meeting	<ul style="list-style-type: none"> - 19/10 am - 29/10 pm - 30-31/10 am or pm TBC
INSIA	provide relevant access information for 5th meeting.	-

10. Next meetings

5th meeting to be held on 27-28 November in Madrid, starting at 9:00 am the 1st day and finishing around lunch the 2nd day, kindly invited by INSIA.

Mr. Alcala Fazon to provide relevant access information to the Secretary in due time.