

## Fire safety in buses

Note: The text reproduced below was prepared by the experts from Norway and Sweden in order to inform about the progress of the project "Fire Safety in Buses".

# Fire safety in buses

## Aim

The aim of the project is to get a knowledge basis about fire safety in buses and fire properties of material used in modern buses and coaches.

## Completed tasks

- Statistical survey of bus fires in Norway and Sweden
- **Survey and fire tests of interior materials in buses**



## Bus fires statistical review

- 1.0 - 1.5 % of buses in Norway and Sweden are involved in a fire incident every year
- Highest risk of severe fire starting in engine compartment



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## Material fire tests

- A number of modern bus interior materials have been tested in state-of-the-art small-scale fire tests
- Evaluation of:
  - Horizontal flame spread
  - Ignition and heat release
  - Flame spread behaviour
  - Smoke production
  - Toxic/irritant gas generation



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## Products tested

- Wall panels (Y1-2)
- Plastic panels (Y3-4)
- Insulation (Y5-6)
- Curtains (Y7-8)
- Wall surface (Y9-11)
- Floors (G1-2)



Products taken from M3 vehicles of Classes I, II and III.



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## Horizontal flame spread

- Test of horizontal flame spread (ISO 3795)
- Burning rate of 100 mm/minute is the main fire safety requirement for vehicle interior materials



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## Results ISO 3795 flame spread test



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## Flame spread

- Horizontal flame spread test for surface linings (ISO 5658, International Maritime Organisation, IMO)
- European harmonised flooring test



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## Results horizontal flame spread test (IMO)



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## Smoke and toxic gas production

Smoke chamber ISO 5659-2 / IMO

Simultaneous gas analysis by FTIR (IMO)



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## Result smoke production (IMO)



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## Conclusions

- The flame spread test (ISO 3795) is not enough to represent common types of bus fire.
- The present fire safety requirements imply a low level of fire safety for bus passengers.
- Materials approved for vehicles are not necessarily allowed in other applications.

The fire safety level can be improved with materials that:

- resist fire for a longer period of time,
- produce less smoke.

It will result in more time for evacuation, easier evacuation and more time to extinguish the fire.



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## Proposal for change of ECE-regulation 118

- Use similar fire safety approach as for passenger trains and ships.
- Establish requirements on:
  - Flame spread from a strong initial fire.
  - Smoke production.

ISO 5658-2



ISO 5659-2



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