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Automatic fire suppression systems for engine compartments in coaches and buses: regulations and standards.

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Background

- Before 2004: Approximately six to seven complete burnouts of buses each year in Sweden due to fires that started in the engine compartment.
- 2004: Swedish insurance companies requested that all buses should be equipped with an approved fire suppression system in the engine compartment.
- After 2004: No complete burnouts of buses due to such fires (information as of 2010-03-03).



This represents an important potential reduction in loss of lives. It also considerably reduces cost.

This Swedish example shows exemplary results from relatively simple changes in standard practice and is something that authorities and the insurance branch as a whole should embrace. Further, in order to verify extinguishing systems in a comparable way, there is a pressing need for a common international standard.



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Purpose of this project

To develop an international test standard for automatic fire suppression systems for engine compartments in buses and coaches.

To suggest international requirements on such systems.



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State of the art

- AS 5062-2006
Australian Standard
Fire protection for mobile and transportable equipment”
- SBF 128:1
Swedish Fire Protection Association
“Guideline for fixed automatic fire suppression systems on buses and coaches”
- Bus Fire Safety, SP Report 2008:41
SP Technical Research Institute of Sweden
Chapter 6: “Test method concept for engine compartment fire extinguishment systems”



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State of the art

AS 5062-2006

Australian Standard

“Fire protection for mobile and transportable equipment”

- Comprehensive document on fire protection.
- Refers to several other established test standards.
- Well defined tests of components but no test on system level.



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State of the art

SBF 128:1

Swedish Fire Protection Association

“Guideline for fixed automatic fire suppression systems on buses and coaches”

- Engine prepared with saw dust, fuel spill, and cotton pulp.
- Engine shall be running for 20 minutes before igniting the cotton pulp.
- Tests on a bus approved by SBF.
- Requires participation of SBF-approved controllant.
- No spray fire in this test.



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State of the art

Bus Fire Safety, SP Report 2008:41

SP Technical Research Institute of Sweden

Chapter 6: “Test method concept for engine compartment fire extinguishment systems”

- Contains an engine mock-up prepared with fibrous (e.g. saw dust), liquid and gaseous fuels.
- Contains a spray fire.
- Downscaled test (1:3) for development purposes.



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Top view

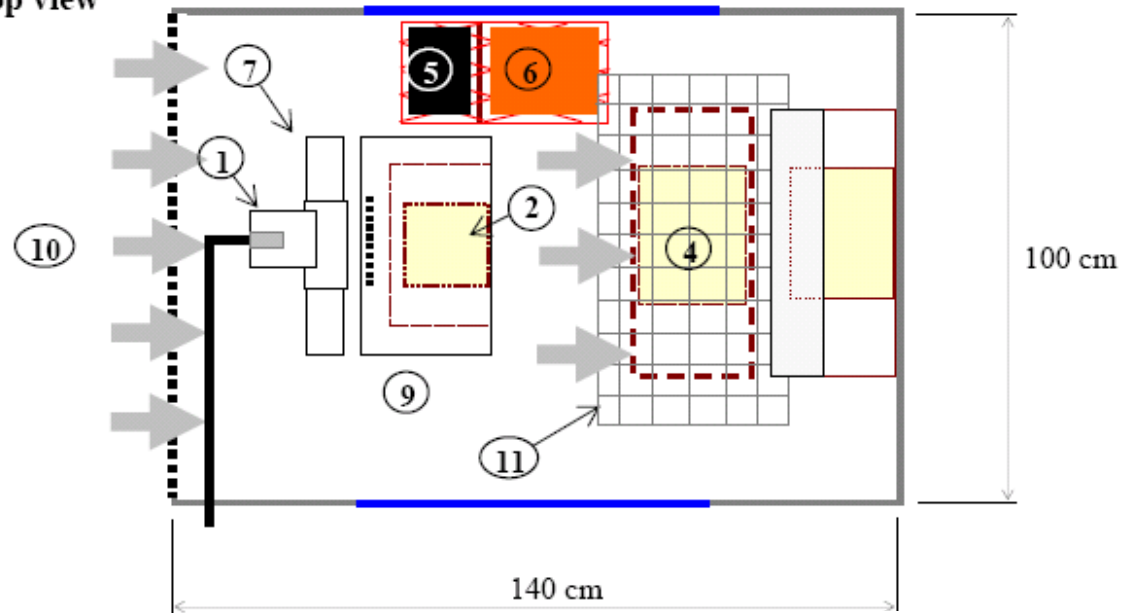


Figure Legend:

1. Spray fire (*diesel*)
2. Engine fire, location in a cavity in the engine mock-up (*diesel in mineral wool*)
3. Rear wall fire (*diesel in mineral wool*)
4. Pool fire (*diesel in mineral wool*)
5. Smouldering fire (*rubber*)
6. Smouldering fire (*cellulose*)
7. The exhaust pipe mock-up
8. The exhaust pipe heater (*5 propane burners*)
9. The engine mock-up, with a cavity for the engine fire.
10. Air inlet
11. Air outlet

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Side view

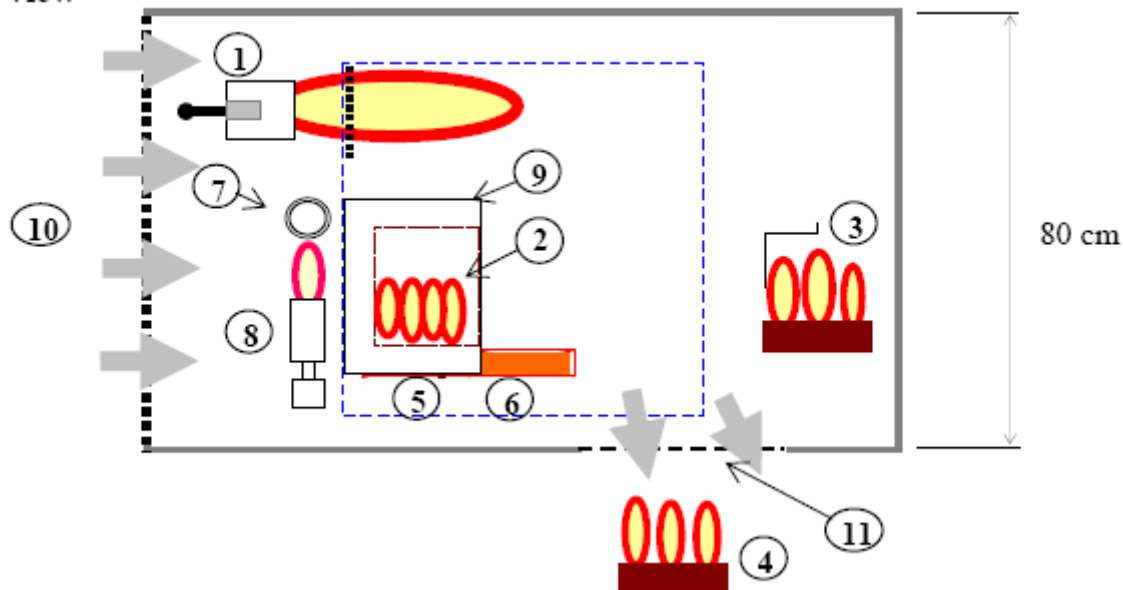


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Figure 8. The axial fan with guide rails in the space. Right picture with the flow resistance

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6.2.3.1 The spray fire system

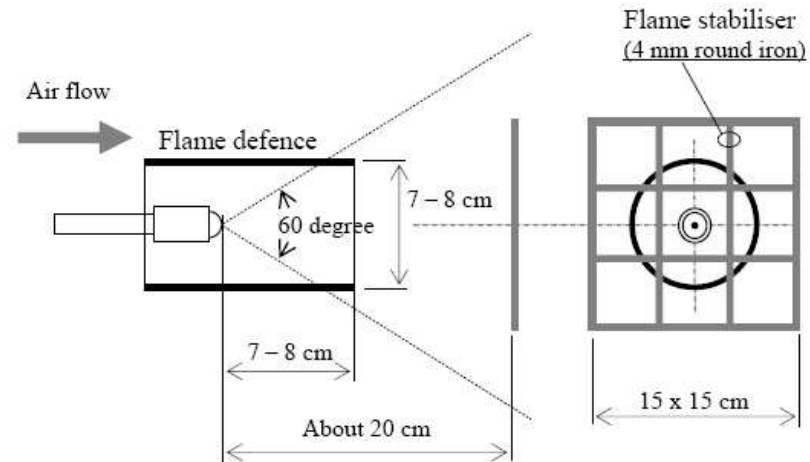


Figure 9. An explanatory sketch for the spray fire.

The spray fire system consists of three parts:

1. The nozzle (full cone, 60°, X gram/min/10 bar).
2. A flame defence (see Figure 9)
3. A flame stabiliser (a hot steel net to accelerate the evaporation)



Figure 10. The spray fire burner.

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The wood pellets in the net basket compartment No 2.



A rubber piece cut off from the profile.



Figure 13. The smouldering rubber fire load in the net basket compartment No 1.

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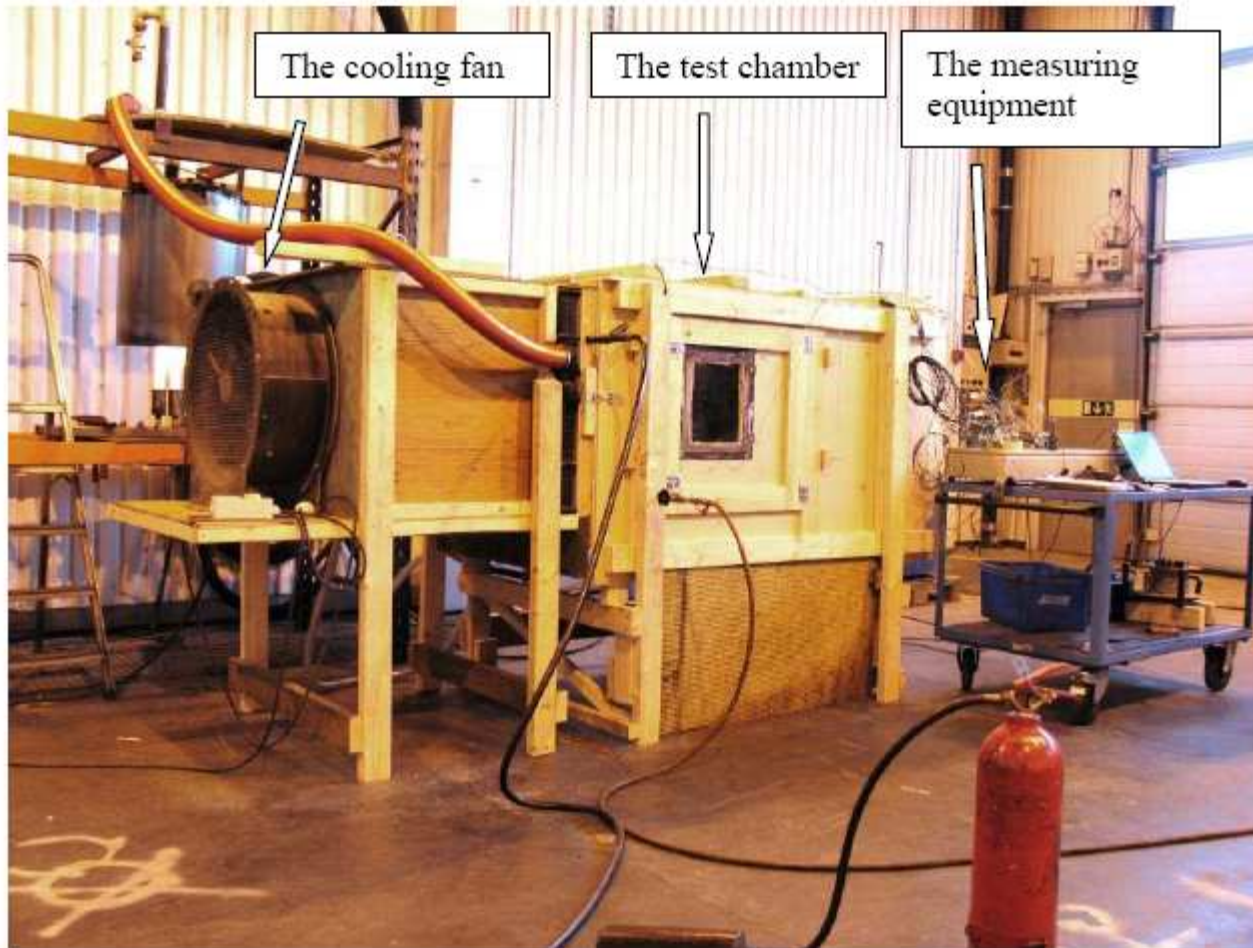


Figure 21. The test chamber including surrounding equipment.

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Figure 27. The extinguishing system is activated.

Work ahead

- Design and build a full scale mock-up
- Formulate test procedure
- Validate, that is, prove that results in the mockup correlates with results in real engine compartments.
- Formulate test standard and requirements.



Requirement specification for an international test standard

- Well defined test
- Vibrations
- Clogging of nozzles
- Maximum pipelengths
- Temperature span
- Aging
- Should be applicable for any fire suppression technology



Concluding remark

The test standard should combine the best parts of the existing methods, and also include new thinking as well as input from authorities and industry.



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