

# Laboratory fire experiments with a 1/3 train carriage mockup

## Fire protection in transportation

*Laboratory tests in a 1/3 part of a subway compartment using combustible materials from a realistic subway car were carried out. The tests were used as a part of an investigation to explore the ignition scenarios needed in order to obtain a flashover situation in an X1 subway car from Stockholm. The tests were carried out in June 2011, prior to the full-scale tests with commuter trains carried out in a tunnel in Arvika in September 2011. The tests presented here were carried out as a part of the METRO project.*

A total of six fire tests were carried out under a large calorimeter in a laboratory environment. The ignition sources used were either wood cribs placed on a corner seat or one liter of petrol poured on the corner seat and the neighboring floor. The amount of fuel was continuously increased in order to find the limits for flashover in the test setup. The fuel consisted of wood crib piles and ordinary luggage carried by commuter travelers. The tests show the importance of the arrangement and amount of fuel. The tests also showed that the combustible boards on parts of the walls had a significant effect on the fire spread. In the cases where the initial fire did not exceed a range of 400 – 600 kW no flashover was observed. If the initial fire grew up to 700 – 900 kW, a flashover was observed. The maximum heat release rate during a short flashover period for this test set-up was about 3.5 MW. The time to reach flashover was highly dependent on the ignition type, i.e. two wood cribs with or without petrol.

In connection to the large scale tests and the laboratory tests performed, classification tests of the interior and furniture of the X1 trains were carried out in accordance to technical specification CEN/TS 45545-2:2009. In order to estimate the classification a number of materials from the trains were tested using small scale fire test methods; ISO 5658-2, ISO 5659-2, ISO 5660-1 and ISO 9239-1. Fire behaviour of passenger seats in full scale was evaluated according to CEN/TS 45545-2:2009, Annex B.

The project is described in SP Report 2012:06 Laboratory fire experiments with a 1/3 train carriage mockup and in SP Technical Test Report CEN/TS 45545-2:2009 Railway applications - Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components.



Figur 1: Bilden visar en övertänd 1/3-delsvagn i SP brandlaboratorium, foto SP.

### Report and contact

The report can be downloaded at [www.brandforsk.se](http://www.brandforsk.se)  
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## Rapport och kontakter:

Rapport kan laddas ned från [www.brandforsk.se](http://www.brandforsk.se). För mer information kontakta Projektledarens namn, Företag, förnamn.efternamn@sforetag.se