

Developing Fire Safety Assessments

Future Considerations

Fire and Materials Working Group

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Fire Safety Assessment

Keys to full-scale to lab scale test correlation

- Establish equivalent fire scenarios
 - ❖ Well-ventilated versus Under-ventilated
 - ❖ Different heat fluxes
- Full scale configuration representative of actual compartment and it's combustion environment
 - ❖ Heat flux and fire temperatures
 - ❖ Airflow/ventilation
 - ❖ Volumetric/mass ratios
- Understand fundamental material properties and their response to dynamic fire conditions
 - ❖ Heat release/Smoke
 - ❖ Flame propagation/Ignition temperatures
 - ❖ Toxicity

Fire Safety Assessment

- Toxicity Testing of Insulation (DOT/FAA/AR-TN07/15):
 - A straightforward correlation has not resulted when comparing toxicity results from the “box” and full scale test configurations.
 - Steel “Box” test method is complex and difficult/costly to run.
- Future Proposal for Research:
 - Consider alternate lab-scale test methods to gain knowledge of material properties for composite and insulation systems
 - Investigate opportunities of using various material properties to control the full-scale fire dynamics that address the key safety aspect - FLASHOVER

Fire Safety Assessment

Technical Resources:

- “Hazards of Combustion Products” Conference in November 2008, London
<http://www.xzg98.dial.pipex.com/html/publications/toxtoc.htmAsdf>
- “Bench-scale Assessment of combustion toxicity – analysis of current protocols” T. Richard Hull, February 2007, Fire Science Journal 42 (2007) 340 – 365
 - http://www.sciencedirect.com/science?_ob=PublicationURL&_tockey=%23TOC%235723%232007%23999579994%23661055%23FLA%23&_cdi=5723&_pubType=J&_auth=y&_acct=C000032059&_version=1&_urlVersion=0&_userid=615015&md5=7f4c995a4a46f6125838186d164db014

Railway Smoke & Toxicity Test Method Overview

- EU has been working since the 1990's to standardize Railway fire requirements
- CEN 45545 “Fire Protection of Railway Vehicles”
7 parts

Part 1 General

Part 2 Requirements for fire behaviour of materials and components

Part 3 Fire resistance requirements for fire barriers

Part 4 Fire safety requirements for railway rolling stock design

Part 5 Fire safety requirements for electrical equipment

Part 6 Fire control and management systems

Part 7 Fire safety requirements for flammable liquid and flammable gas installation

- CEN 45545-Gas analysis in ISO 5659-2 smoke chamber using the FTIR technique to analyse gases at 4 mins and 8 mins during the test.

Railway Smoke & Toxicity Test Method Overview

Similar size to NBS chamber
Horizontal specimen orientation

STANDARD SETUP:

- 25 kW kW/m²

With pilot flame

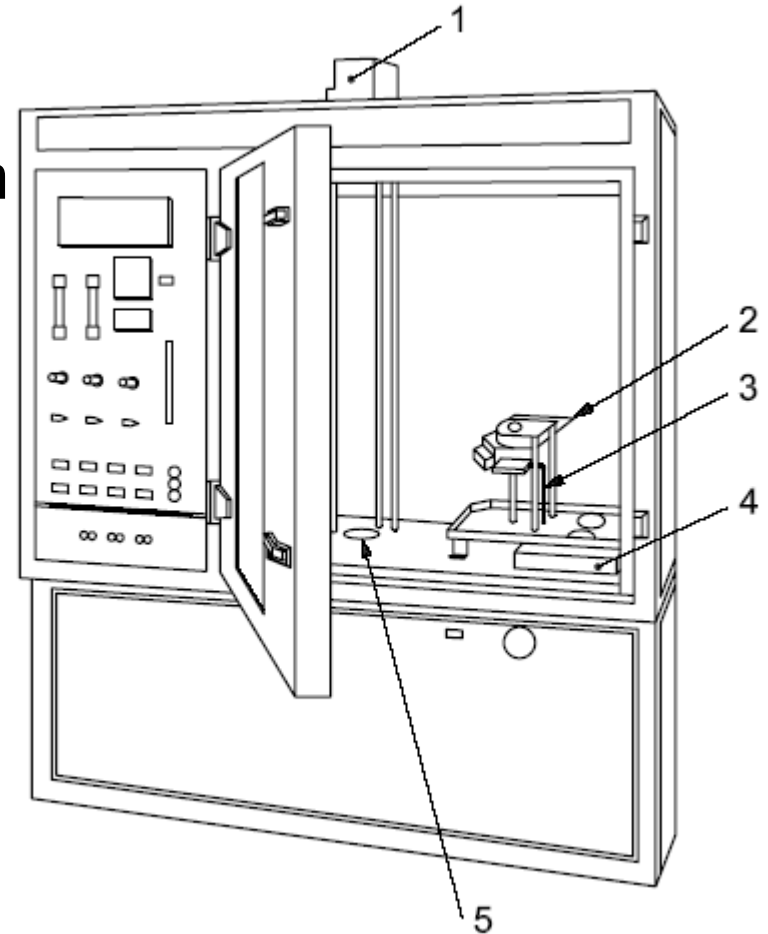
- 50 kW/m²

Without pilot flame

SPECIALIZED SETUPS:

- 90 kW/m²

With and without pilot flame



Fire Safety Assessment

Evaluate a variety of configurations at various fire conditions.

Predict material behavior as a function of heat flux and piloted ignition for a range of material properties.

Material Systems Tested in Lab-Scale Apparatus

