



Created in 1999 to offer the services and expertise of the laboratories of the two historical railway operators (RATP & SNCF), Eurailtest is an independent organisation that provides consulting, engineering and testing services worldwide.

Eurailtest coordinates a dozen laboratories, each of which has extensive experience in railway and urban testing in its own speciality.

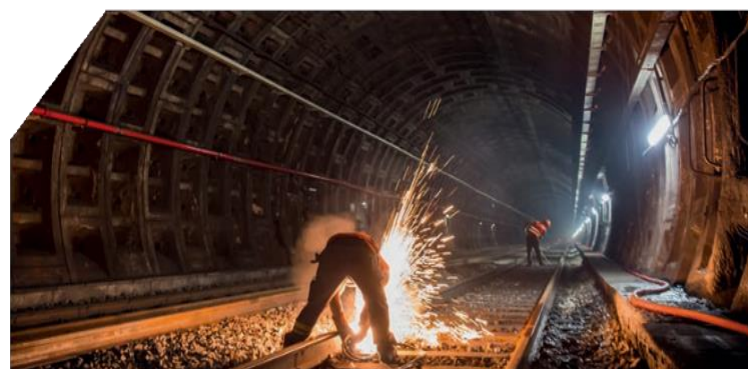
The RATP's Laboratory of Tests and Measurements (LEM) is recognised for its expertise in fire reaction measurements and tests on all urban transport components (rolling stock, infrastructure, equipment, stations and maintenance sites, etc.).

The Laboratory of Tests and Measurements is ISO 9001-2008 certified and COFRAC ISO 17025 accredited. The scope is available on www.cofrac.fr under accreditation reference n°1-1523.



A player on the French, European and international levels, the Fire Test Centre is a fire resistance laboratory approved by the Ministry of the Interior and assists projects in controlling fire risks. The Centre provides various services in the field of fire safety:

- Fire tests: these tests are accredited** and carried out on materials, products, structural elements or structures and therefore cover different scales depending on the objectives.
- Special & in-situ tests: this activity covers all smoke extraction tests carried out in-situ, as well as special tests for research programmes.
- Fire safety engineering: strong expertise combining digital and experimental approaches.
- R&D: the CEF has a team of doctors and PhD students dedicated to research and development projects for support all those involved in the construction process.



A ONE-STOP SHOP

The strength of a partnership between EURAILTEST, CERIB and LEM. EURAILTEST is enhancing its offer of services in the field of fire tests with the alliance of the competences of the RATP's Laboratory of Tests and Measurements (LEM) and those of the CERIB's Fire Test Centre for the validation of the performance of your products in the railway and non-railway fields.

Fire safety in railway vehicles is defined in the EN 45545 series of standards, with the aim of protecting passengers and staff in the event of a fire on board the vehicle.

The protection of passengers and crew is essentially based on measures to:

- Prevent fires due to technical defects the design of the equipment or the design of the vehicle (Part 1, Part 4, Part 5 and Part 7 *).
- Minimise the possibility of ignition of materials installed in rail vehicles due to accidents acts of vandalism (part 1, part 2).
- Detect a fire if it occurs (Part 6).
- Limit the spread of fire by specifying materials according to their operational categories (part 2) and measures to contain it (part 3).
- Minimise the effects of fire in terms of heat, smoke and toxic gases on passengers and on-board staff by specifying the materials installed in railway vehicles (part 2).
- Control and manage a fire, e.g. by means of fire detection, suppression and/or emergency power cut-off (part 6).

* Part(s) of the EN 45545 series concerned

** Scope of accreditation available at www.cofrac.fr



REACTION TO FIRE IN THE RAILWAY SECTOR

ON CABLES

Flame propagation test C2
(according to NF EN 60332-1)

- Determination of the cable height degraded by the application of a 1 kW flame
- Sample dimensions: 600 ± 25 mm in length

Smoke opacity measurement test in a 27 m3 chamber (according to NF EN 61034)

- Measurement of the optical density of smoke from a cable subjected to a prescribed source
- Sample dimensions: 1000 ± 5 mm cable or cable sections

Fire propagation test C1
(according to NF C32-070)

- Determination of the degraded height on a sample consisting of cable sections
- Cable strand subjected to an electric oven
- Sample dimensions: 1,600 mm in length

Toxicity and corrosivity testing of gases
(according to NF X70-100 and NF EN 50267)

- Determination of the Conventional Index of Toxicity (CIT)
- Determine the corrosiveness of combustion gases

Fire behaviour test on ribbon cable
(according to NF EN 60332-3)

- Determination of the cable height degraded by the application of a 20.5 kW flame
- Sample dimensions: 2,500 mm in length

Oxygen consumption calorimetry
(according to NF EN 50399)

- Measurement of heat release
- Measurement of the degraded cable height
- Measurement of heat energy release
- Sample dimensions: 2,500 mm in length
- Applications: all cables used in buildings and railway installations (Construction Products Regulation - CPR - CE marking)

ON MATERIALS

Vertical radiant panel
(according to NF ISO 5658-2)

- Flame propagation on materials used in a vertical position
- Measurement of the critical extinction flux (CFE - kW/m²)
- Sample dimensions: 800 mm x 155 mm (max thickness: 70 mm)

Cone calorimeter
(according to NF ISO 5660-1)

- Reaction to fire test - Heat release rate
- Measurement of the MAHRE parameter (Maximum Average Heat Rate Emission, kW/m²)
- Sample dimensions: 100 mm x 100 mm (max thickness: 50 mm)

Oxygen Limit Index - LOI
(according to NF EN ISO 4589-2)

- Determination of the fire behaviour via the oxygen index test
- Measurement of the minimum oxygen concentration in the chimney to maintain combustion of the material

Gas toxicity test
(according to NF X70-100)

- Determination of the Conventional Index of Toxicity (CIT)
- Tubular oven

Smoke opacity
(according to NF EN ISO 5659-2)

Smoke toxicity by infrared
(according to NF EN 45545-2)

- Determination of optical densities: D_s (max), VOF₄ and D_{s4}
- Furnace at 25 kW/m² with pilot flame or 50 kW m² without pilot flame
- Sample dimensions: 75 mm x 75 mm
- Determination of the Conventional Index of Toxicity (CIT)



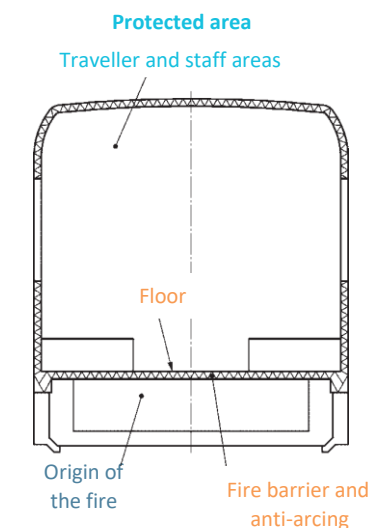
FIRE RESISTANCE IN THE RAILWAY SECTOR

OBJECTIVE

To assess the fire resistance performance of fire barriers:

- E: fire resistance
- I: thermal insulation
- W: radiation

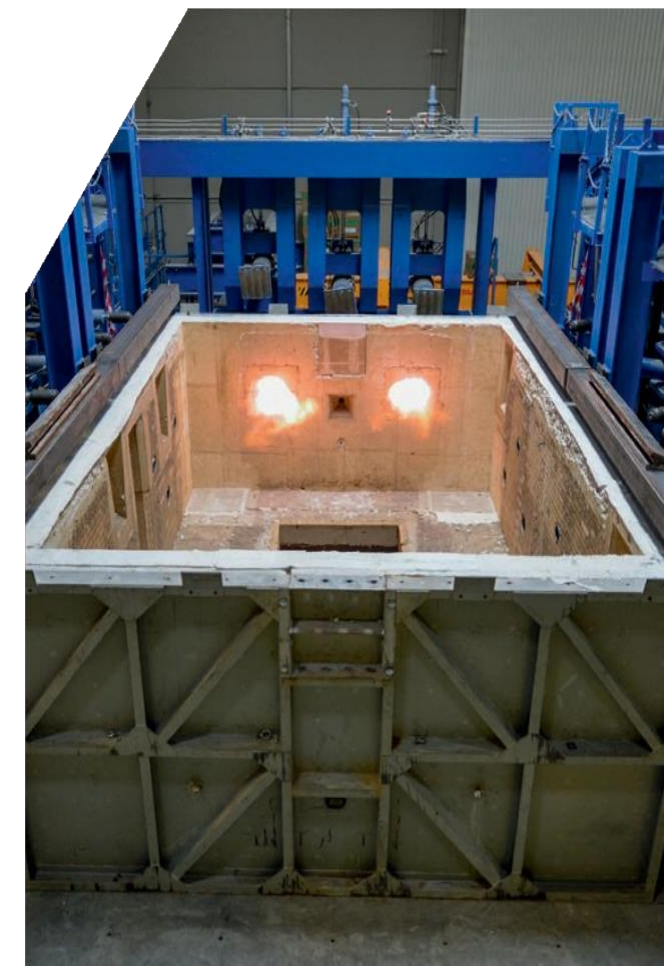
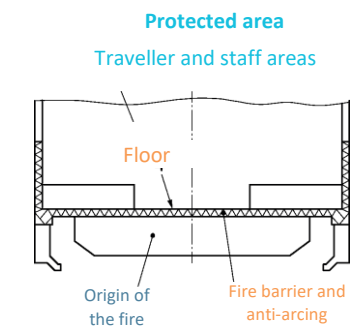
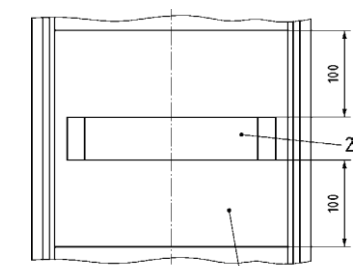
In some cases, it is a question of verifying the fire stability (example of an intermediate floor in a train).

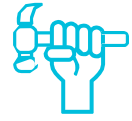


TESTING STANDARDS

Fire resistance tests are carried out in accordance with part 3 of the EN 45545 series of standards, which is based on general standards (NF EN 45545-14 and NF EN 1363-15) and specific test standards:

- Fire resistance testing of partition walls (NF EN 1364-1_a)
- Fire resistance testing of ceilings (NF EN 1364-2₇)
- Fire resistance testing of floors (NF EN 1365-2_a)
- Fire resistance testing of doors (NF EN 1634-1_a)





OVERVIEW OF THE FIRE RESISTANCE TESTS

The levels of fire resistance requirements depend on the category of operation, the category of design and their location in the vehicle and are governed by the EU Regulation.

PARTITION SEPARATING A DRIVER'S CABIN AND A PASSENGER AREA

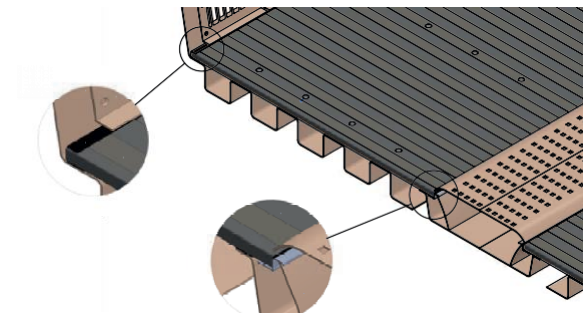
According to the standards NF EN 45541-1, NF EN 45545-3, NF EN 13663-1 and NF EN 1364-1:



The side of a partition separating a driver's cab from a passenger compartment that is not exposed to fire before being tested for fire resistance.

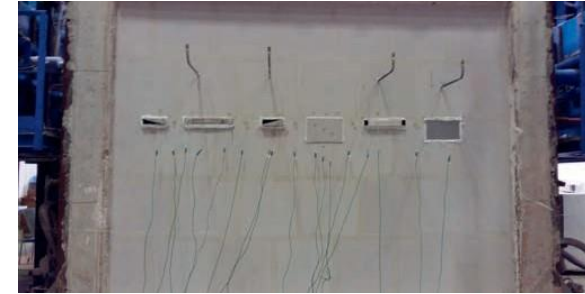
INTERMEDIATE FLOOR

According to the standards NF EN 45541-1, NF EN 45545-3, NF EN 13663-1 and NF EN 1364-1:



ELECTRONIC ENCLOSURES FOR RAILWAY USE

According to the standards NF EN 45541-1, NF EN 45545-3, NF EN 13663-1 and NF EN 1364-1:



Non-fire exposed side of electronic enclosures for railway use before fire resistance test.



Fire exposed face of electronic enclosures for railway use before fire resistance test.

- ² Commission Regulation (EU) No 1302/2014 of 18 November 2014 concerning a technical specification for interoperability (STI) relating to the rolling stock subsystem "locomotives and passenger rolling stock" of the rail system in the European Union.
- ³NF EN 45545-3: Railway applications - Fire protection in railway vehicles - Part 3: Fire resistance requirements for fire barriers.
- ⁴NF EN 45545-1: Railway applications - Fire protection in railway vehicles - Part 1: General. ⁵NF EN 13663-1: Fire resistance tests - Part 1: General requirements.
- ⁶NF EN 1364-1: Fire resistance testing of non-load-bearing elements - Part 1: walls.
- ⁷NF EN 1364-2: Fire resistance testing of non-load-bearing elements - part 2: ceilings.
- ⁸NF EN 1365-2: Fire resistance testing of load-bearing elements - Part 2: Floors and roofs.
- ⁹NF EN 1634-1: Fire resistance and smoke tightness testing of doors, closures, windows and hardware - part 1: fire resistance testing of doors, closures and windows.

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FIRE SECURITY



One-stop shop



Reaction and resistance to fire



Global expertise in the railway sector

