

## Fire Safety Standards for the railway industry

The most advanced fire safety standards for the railway industry are the French standards:

- **NF F 16-101** Matériel roulant ferroviaire – Comportement au feu – Choix des matériaux
- **NF F 16-102** Matériel roulant ferroviaire – Comportement au feu – Choix des équipements électriques

which, in turn, refer to the test methods described in the following standards:

- **NF X 70 100** Analyse de gaz de pyrolyse et de combustion
- **NF X 10 702** Détermination de l'opacité des fumées en atmosphère non renouvelée

the latter being very similar in methods to the following American standards:

- **ASTM E 662** Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
- **ASTM E 162** Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

Equally as popular is the use of Bombardier Transportation toxicity specifications:

- **SMP 800-C** Toxic Gas Generation.

In Italy, since 2006, for installation on board of rolling-stocks, certification of conformity to the new Italian railway standards (listed below) is required:

- **UNI CEI 11170-1:2005** Trains and trams – Fire safety guidelines for trains, trams and guide vehicles – General principles
- **UNI CEI 11170-2:2005** Trains and trams – Fire safety guidelines for trains, trams and guided vehicles – Design recommendations – Fire containment measures – Indication, monitoring and evacuation systems
- **UNI CEI 11170-3:2005** Trains and trams - Fire safety guidelines for trains, trams and guided vehicles – Assessment of effect of fire on materials – Acceptable limits published by UNI and CEI together on 30/11/2005, in the delayed completion of the European standard relating to the effect of fire on materials to be installed on board of rolling-stocks, standard **EN 45545**, divided in 8 sections, only some of which have recently been published, after 16 years in the making, whilst the most crucial sections are still unfinished due to disagreements between the member countries (because of strong national interests, protectionism of domestic industries) especially in France, Germany, United Kingdom and Italy.

To date, this planned standard, to be published as a simple TS (Technical Specification) and to be complied with on a voluntary basis, cannot yet be used and, as for the implementation of the Directives for the railway industry (interoperability of high-speed and conventional railways), the current national standards in force in the single EU member states are regarded as equivalent in terms of safety.

For Italy, the requirements for materials relating to electrical connectors are contained in the 2nd schedule "Acceptability criteria for electrical and electronic materials and components" at the application "All other applications including inflammable materials" (all applications other than electric cables). For these applications, four tests are required to be carried out on the materials:

- The materials being affected by a small flame according to EN ISO 11925-2 with, according to the risk levels, for LR1 and LR2, a resistance to fire of the material of 15s; for LR3 and LR4, a resistance of 30s.
- Smokiness in compliance with French standard NF F 16-101 with IF better or equal to F2 for all risk levels. The material we use is classified as F1 (better than F2) according to the tests we carried out.
- Fume optical density measurement, in compliance with French standard NF X 10-702 (from NF F 16-101) with values  $\leq 100$  for all risk levels LR1...4.
- Toxicity measurement, in compliance with Italian standard CEI 20-37/7, with  $T \leq 2$  for all risk levels LR1...4.

## Tests

In 2006, we carried out laboratory tests approved by the French Railways SNCF, according to the above mentioned French standards **NF F 16-101** and **NF F 16-102**, the material we use in our connectors, which has been found to belong to **class F1** (Index Fumée **I.F.**  $\leq 20$ ) as well as a toxicity index (Index Toxicité Fumée) **I.T.C.** = 20.

Both these values meet the requirements set out by the French standards and by the Italian standard UNI CEI 11170-3 schedule 2, which relates to electrical connectors. We have also commissioned a qualified North American laboratory to carry out tests compliant with American standards, which have confirmed compliance with the requirements set out by the US Federal Transit Administration "Recommended Fire Safety Practices for Rail Transit Material Selection" for methods ASTM E 662 (NFPA 258) (fume specific optical density), ASTM E 162 (ASTM D3635) (surface inflammability ► flame propagation index) and Bombardier Transportation SMP 800-C (fumes and gases toxicity).

Test reports are available on request (please contact our Sales Offices).

All requirements have been met.

The connectors are suitable for use with alternate or direct current and facilitate the manufacture of sectional electric parts in complex machinery and installation and maintenance, in conformity with the European standard EN 60204-1. The connectors are designed for heavy duty industrial applications.