

# FOCUS

## A UITP POSITION PAPER

### ***Preventing and combating fires in metro systems***

*The metro system is a safe mass transit system, but unfortunately fire risks cannot always be avoided. Therefore, UITP has decided to launch a collective reflection on fire safety in metro systems.*

Twenty-five networks took part in this work, highlighting:

- The reality of this risk: although disasters are very rare, each passing year sees several fires that start within main networks,
- Its specific nature: underground public transport has its own distinctive characteristics that set it some considerable distance apart from other transport modes,
- The variety of strategies that can be implemented in order to lessen this risk.

These efforts resulted in UITP adopting a position by formulating recommendations aimed not just at the operators of metro networks, but also all outside actors concerned with safety policy in public transport and public places.

#### ***The need for an integrated approach***

Protection against fire has three major objectives: protection of people (passengers, staff and nearby residents), protection of assets, and protection of the environment. It groups together all the technical and organisational measures and every precaution taken in order to avoid putting people, equipment and installations at risk from fire. It involves all metro system installations, its rolling stock and its infrastructures (tunnels, stations and miscellaneous equipment), not to mention its procedures and its structure. Protection is preventive whenever it involves stopping fires from starting or spreading; it becomes defensive when it involves ferrying people to safety and fighting the fire and the smoke from it.

Fire safety has prompted the development of numerous standards nationally, internationally and within networks themselves, chiefly regarding materials and construction regulations. Nevertheless, these standards only provide a framework and are not sufficient without the existence of an integrated approach. Indeed, fire safety is a matter for everyone: the people in charge of the design of installations and the operation of networks, fire officers, metro users, and people who work for the various businesses active in underground spaces.



This is an official position of UITP, the International Association of Public Transport. UITP has over 2000 members in 80 countries throughout the world and represents the interests of key players in this sector. Its membership includes transport authorities, operators, both private and public, in all modes of collective passenger transport, and the industry. UITP addresses the economic, technical, organisation and management aspects of passenger transport, as well as, the development of policy for mobility and public transport world-wide.

## **UITP recommendations**

### **1) Owing to its specific characteristics, the metro poses particular risks and requires specific solutions**

The risks found within metro systems are specific. Essentially, they stem from the high level of traffic and passenger numbers, conditions relating specifically to transportation in tunnels, and the system's confinement within an enclosed space from which evacuation is difficult and whose emergency exit routes might become filled with toxic gases and thick smoke.

In addition, the oldest networks are faced with dangers related to the cohabitation of installations and equipment whose designs, ages and conditions vary.

These dangers differ from those encountered in other transport modes, particularly road and rail transport:

- Unlike road transport, metro systems do not carry the hazardous materials responsible for most disasters in recent years. Metro journeys are short and interspersed by stations that can be used to evacuate passengers and as access points for the emergency services.
- Unlike heavy rail, metro systems do not carry freight, and the crossing of tracks – the source of many accidents in rail networks – is very rare if not non-existent. Furthermore, the unified command structure found in metro networks facilitates the training of actors and the organisation of the emergency services.

For these reasons, it is not appropriate to apply to metro the same rules developed for other transport modes. Instead, specific rules must be developed for underground sections.

However, the specific characteristics of metro systems must not stop lessons being drawn from disasters that occur in these sectors, particularly as regards aspects involving dysfunctional emergency systems.

### **2) Fire safety objectives must be determined with the authorities and evaluated while taking account of the problem's different aspects**

Metro safety objectives cannot be defined only by the network managers, but should be drawn up and selected alongside the authorities who define objectives and priorities.

These objectives and priorities must be defined while taking account of the problem's various aspects: protection of people, assets and service quality, not to mention technical and economic constraints.

### **3) A global safety concept must be developed**

For a long time, all networks used standards as the basis for defining their policies on fire safety. Today, there are a lot of such standards. These are useful, but also have their limits and are certainly not satisfactory. Alongside them, a "safety concept" must be developed that, in the case of each network, determines:

- how to avoid fires and stop them from starting,
- how to detect them,
- how to contain them by sealing off and protecting vulnerable points,
- how to ensure passenger safety,
- finally, how to control fires.

This safety concept, whilst possibly using technical solutions that vary from one network to another depending on their technical characteristics, environment, constraints and material, is based on



Paris – RATP : Short circuit (1997)



Hamburg – HHA : Fire prevention means (1980)



common principles: it takes into account the components of the transport system (tunnel, track, cable, rolling stock, personnel, passengers, etc.) and is based on a delicate and detailed analysis of the risk and dangers.

**4) Analysis of the fire dangers and risks must be included from as early as the network design stage and continued through its maintenance and operation**

Analysis of fire dangers and risks provides the basis of fire prevention. This analysis must be made from as early as the equipment and system design stage in order to prevent fires from starting and controlling their spread (for example, by reducing the fire loads of materials used). However, it must also be present at the maintenance and operational stage. It calls for a re-assessment of functions neglected by standardisation, for example regular track and equipment cleaning.

These analyses must be based on recognised methods like Preliminary Danger Analysis (PDA) and Preliminary Risk Analysis (PRA). They may also be supplemented to good effect by full-scale trials. For this to happen, collaboration with manufacturers and infrastructure builders is essential.



Paris – RATP : Exercise with firemen (1999)

**5) Relations with external actors (fire, ambulance, etc.) must be prepared in meticulous detail**

In the event of fire, numerous actors from outside the network will be called upon to intervene in order to facilitate the evacuation of people and deal with the fire and its consequences: fire brigade, ambulance service, etc. Interventions by such services must be prepared and coordinated. Lines of command must be clearly defined. Staff called upon to intervene must be trained for this type of action. They must be familiar with the locations, possess a map of the installations, and have equipment at their disposal which is compatible with the equipment used by the network.

All this information must be compiled together within safety intervention plans that are adapted to the context and furnished to all actors likely to have to intervene in the event of a fire.

**6) Safety policy – a matter for staff as well as passengers**

Safety is the concern for everyone. Reactions from staff and passengers in the initial moments of a fire are crucial. Many disasters are made worse by poor decision-making, or by passengers being unfamiliar with the tunnel and then heading in the wrong direction, pushing one another and being trampled to death underfoot, to name but a few of the consequences. High-quality passenger information and signposting is vital.

An equally vital element is training for staff, who must be able to take the right decisions in the opening minutes of a fire and provide the correct guidance.

In order to optimise staff reactions, the procedures to apply will be defined, training courses organised and regular drills staged with the fire services.



**7) No smoking - enforced and complied with throughout the system**

Anything that might cause a fire to start underground must be eliminated. For this reason, smoking poses a serious danger and so the majority of networks have chosen to address this problem by banning smoking among staff and passengers. Measures must be taken to ensure proper compliance with this ban throughout the network.

### ***8) Systematic feedback from experiences must be organised***

Experience shows that there are generally precedents for the events causing disasters. Each fire must be the object of an in-depth analysis of causes and consequences that also proposes recommendations. When a risk is detected, the right action must be taken to ensure that it can never become the source of a fire. In this vein, fire safety must not be set in stone, but must be constantly adapted in line with the latest data.

Even though some metro systems have recorded deaths and material damage as a result of fires, these are nevertheless small in number (33 serious fires between 1970 and 2003, all networks combined). Metro is the safest mode of urban transport.



Berlin – BVG : « Deutsche Oper » station - Train after fire (2000)

This official position has been produced by the 'Electrical Installations and Safety Systems' Subcommittee of the Metro Division

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