

SÉCURITÉ INCENDIE DANS LES TUNNELS DE TRANSPORT
FIRE SAFETY IN TRANSPORT TUNNELS

REMARQUES DE L'ATELIER "ROUTES"
REMARKS FROM THE "ROAD" WORKSHOP

Draft version 0.2

AITES/ITA SIA Seminar „Safety Fire“ in Tunnels Switzerland 23-24 March 2000

Workshop: The Road in Tunnel, its Management
The workshop was animated by M. MAREC, Past President of PIARC *CS*

**Comments on the Tunnel Task Force intermediate report by
the Swiss road authorities – Dated of 31 August 1999**

Attached : a list of participant

Introduction

The intermediate report released on the 31st of august 2000 by the Swiss road authorities (OFROU/ASTRA) was used as a basis for the discussions chaired by Mr. Michel Marec from the French Minister of Equipment, Transportation and Housing and the past-president of the Road-tunnel committee PIARC. The goal was to benefit from the assembly of independent specialist from various countries in order to

- comment on the report issued by OFROU/ASTRA and
- to assess the potential for creating new co-operations in order to conduct research and development projects.

The proposals and comments presented here are organised as in the report mentioned above.

Articles not mentioned hereunder get the full support of the participants.

1 Proposed measures for the road users (human behaviour)

Comments

- 1.01 People do generally not know when **escape routes** are present in a road tunnel. It appears desirable to inform people that when the "green" escape-route sign is shown, the escape route to the free will be present.
- 1.02 The **high-way code** should contain at least a minimum information concerning tunnels and users behaviour in case of incident (cf. 1.01)
- 1.03/04/06/07 For ADR **hazardous materials** vehicles, the group recommend to study the feasibility of locating a magnetic tag onto vehicles (or a GPS equipment). This would enable a determination of their position prior to reaching a forbidden zone and give the opportunity to sanction them.
- 1.08/09/10 In some tunnels, it might be possible and useful to enforce **rigorous speed limits** and possibly **minimum distances** between vehicles (while moving and when stopped). Efficient control of these distances is difficult. They will be tested in Mont-Blanc for pedagogical purposes as well.

- 1.09 The rejected proposition of demanding a certain **distance between vehicles** in a tunnel should be revisited to assess, if such a requirement for halted vehicles in case of fire would be of benefit and possible to implement. (For long tunnels, with little or limited traffic and with access control).

Additional recommendations arising at the workshop

- 1.11 The human behaviour could improve and become more law obedient by having an **automatic sanctioning system**. (This measure could also be placed in §3)
- 1.12 An **international uniformity** with respect to **signalling** and the desired human **behaviour** would be beneficial.

2. Proposed measures for the operation

Comments

- 2.02 Considering that 4 of the 14 serious accidents occurring since 1945 took place in tunnels shorter than 600 m, it should be reconsidered whether or not **shorter tunnels** might need a **safety officer** as well as the longer ones. This ambitious plan (irrespectively of the length of the tunnel) would probably be difficult to implement in some countries. However, in the Gotthard road tunnel, it is already in place.
- 2.04 Ideally exercises should be carried out in the object of concern. On the other hand, the possibility for the intervention personnel to practice is regarded as being very important. The **trial tunnel** has to be designed carefully. It might lead to an international co-operation. (2.04 relates somewhat to 2.06 too).

Additional recommendations arising at the workshop

- 2.07 It is recommended to establish a **safety-advisory board** involving all the relevant services e.g. fire fighters and police. This should be **involved** during the elaborating of the **basic design**.
- 2.08 **Training** of chief operators and their staff could be enhanced by holding
- regular **meetings** with all **operators** in order to exchange experience and
 - to establish a **staff training facility** with e.g. simulators.
- 2.09 Obviously regular maintenance checks should be carried out. For instance the following approach could be applied:
- **every 5 years**, a detailed analysis of the equipment should ensure that it is at the same level as when the tunnel was constructed
 - **every 15 years**, the installations etc. should be checked according to the prevailing standards valid at the moment of the check.
- 2.10 In order to prevent an unnecessary closing of a facility due to a partial failure of the equipment, an **adequate level of safety** should be established, although this is difficult to quantify.
- 2.11 An **adequate level of redundancy** should be established at the design state.

3. Proposed measures for infrastructure

Comments

- 3.01 A **guideline** for the assessment of the necessity of **upgrading/refurbishing** a tunnel and its equipment is called for. The group recommends to define precise rules concerning the eventuality to place **escape exits** in single-tube tunnels and at which distances to locate them according to a risk/benefit analysis. Systematically requiring too closely spaced exits is considered being a waste of public funds that could be spent better elsewhere.
- 3.02 There is no reason to systematically ban **single-tube** tunnels with **bi-directional traffic**.

- 3.03 A standard **design fire of 30 MW** was found adequate for the dimensioning of the ventilation system.
- 3.05 When revising the **guideline** on tunnel **equipment** following points should be considered:
- the disadvantage of having information panels written in many (e.g. four) languages, which according to Italian experience appears to be a non-optimal solution,
 - the possibility to reduce the density of equipment by installing **components with multiple functions**,
 - to prevent the establishment of temporary signals in tunnel e.g. due to road works. The **traffic holds at the portals only** and
 - the eventual use of **loudspeakers** depending on the noise level in the tunnel.

Additional recommendations arising at the workshop

- 3.11 If it is impossible to make **escape routes** going to the outside of the tunnel directly or by benefiting from a second tube, it should be examined to use the **air-ducts** eventually combined with shelters to enhance the chances of escaping a fire. Furthermore, it should be examined if additional excavated area arising from the construction method applied could be turned into an escape route, i.e. due to using a tunnel-boring machine, which could give rise to a **potentially unused space** underneath the road surface.
- 3.12 A **detection of overheated vehicles** that then are being prevented from entering the tunnel is currently being investigated on the Italian side of the Frejus tunnel using an infrared system. Although it so far appears difficult to establish a threshold value, this approach should be pursued in Switzerland as well.
- 3.13 An **automatic detection** of vehicles registered with **dangerous goods** could soon be realised. The not permitted ones should be prevented from entering the tunnel. The benefits of this approach should be examined. (see 1.03/04/06/07)
- 3.14 A strong tool for conducting a **comparative risk/safety analysis** between various transportation routes is currently being developed by OECD and PIARC under the supervision of a team of experts chaired by Mr. Didier Lacroix (CETU). Combined with the decision support module including e.g. political and financial aspects, it is recommended to try to implement this tool for current and new projects.
- 3.15 The optimisation of the **general tunnel layout** including ramps, gradients, cross passages and the cross sections should be carried out, as it also influences the safety versus risk equation. It is very important to ensure that the drivers are able to see any obstacle at an adequate stopping distance. Designing a tunnel for a low speed and operating it at a higher speed and vice versa could prove dangerous.

4 Proposed measures for vehicles

Additional recommendations arising at the workshop

- 4.02 **Regular inspections** of trucks should be demanded on a federal level to ensure that they are properly maintained and thereby minimising faults such as: leaking fuel systems, overheated or malfunctioning brakes and short-circuiting of the electrical system.
- 4.03 It should be investigated if a supervisory/alarm system installed in trucks could detect overheating and other potentially dangerous malfunctions at an early stage.
- 4.04 Co-operation with international bodies in charge of truck regulations and with car manufactures should **prevent** the use of **material** that causes contagious gasses in case of a fire. Furthermore, it should be analysed whether or not a **smaller tank capacity** of the present 900 l could be demanded. Also a possible directive on the material and construction of the fuel tank should be revisited as currently plastic and aluminium is being used.