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INLAND TRANSPORT COMMITTEE

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Ad hoc Multidisciplinary Group of  
Experts on Safety in Tunnels

# RECOMMENDATIONS OF THE GROUP OF EXPERTS ON SAFETY IN ROAD TUNNELS

## FINAL REPORT

Version 1.5

# Extract from the **DRAFT**

Note by the Secretariat: Reproduced as received

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## **A.1 VEHICLES** **as factor N° 4 influencing safety in road tunnels**

### **A.1.1 Principles**

#### **Technological developments**

With respect to the safety of road vehicles, there have been rapid **technological developments** over the past 10 to 15 years, with the result that motor vehicles (cars and trucks) are now safer than ever before.

In the course of these developments it has also proved possible to further reduce the risk of fire resulting from an accident (e.g. through requirements in respect to the impact of a crash and the associated safe placement of fuel tanks). Fires due to mechanical or electrical defects now occur less frequently and the risk can be minimized by carrying out periodical checks on vehicles.

The drawback of these technological developments and the resulting greater reliability of vehicles is that many drivers now have a **false sense of increased safety** and fail to observe existing **physical laws** and limits (e.g. vehicle mass, centrifugal force, braking distances, etc.).

Although vehicles now have a high standard of safety, adequate attention needs to be paid to their **maintenance**, especially of **heavy goods vehicles**. A periodical service and inspection should be carried out to ensure that brakes, turbochargers, electrical systems, etc., function correctly. It is essential to make sure that there are no leaks in fuel and oil feeds that could result in a fire.

### **International agreements**

#### ***1968 Vienna Convention on Road Traffic***

In accordance with the international Convention on road traffic dated 8 November 1968, all contracting parties are required to admit to their territories all motor vehicles and trailers from other countries which meet the conditions laid down in the Convention.

This means that, as far as additional equipment for vehicles is concerned, it would be necessary to incorporate a corresponding regulation into this agreement. (?) What about the 1958 Agreement (?)

The Convention currently does not contain any provisions with respect to measures aimed at preventing and fighting fire. (?)

#### ***1997 Agreement on Periodical Technical Inspections***

The international agreement dated 13 November 1997 on the adoption of uniform conditions for periodical technical inspections of vehicles and their reciprocal recognition foresees that motor vehicles with a weight of more than 3.5 t and which are used for international passenger or goods transport, will be required to undergo an **annual** technical inspection.

### **Assessment of miscellaneous items**

#### ***Fire extinguishers / fire-fighting systems***

Reliable fire extinguishers and fire-fighting systems are widely available on the market today. While extinguishers are fairly inexpensive, the installation of automatic fire-fighting systems in vehicles is both complex and costly. The degree of efficiency depends on the type and location of the fire. In order to ensure that fire extinguishers and fire-fighting systems remain functional, they need to be periodically checked by qualified specialists.

#### ***Requirements regarding fuel tanks and their location in the vehicle***

In modern vehicles, fuel tanks are positioned so as to ensure the greatest possible degree of safety in the event of a collision. Fuel containers have to be installed so that they are protected against the impact of a collision at the front or rear of the vehicle.

The relevant requirements are based on Guideline 70/221/EEC (?) ECE Regulation (?)

#### ***Engine power***

The regulation (?) which (?) governing a minimum engine power of 5 kW (6.8 HP) per tonne of total vehicle weight instead of 7.35 kW (10 HP), which is in harmony with that of the EU, only has a very minor effect on the temperature of an engine and exhaust emissions when the vehicle is fully laden. If, for example, diesel fuel, gasoline or oil should escape from a leaky component in the engine and catches fire, it is of little consequence whether the exhaust in the vicinity of the engine

has a temperature of 550 or 900 degrees C, since the self-ignition temperature of diesel fuel and gasoline is approximately 220 degrees C. Any leaks should therefore be repaired as quickly as possible, otherwise escaping fuel or oil could ignite at any time, regardless of the condition of the vehicle or its engine power.

However, engine power is a risk factor when it comes to safety in tunnels, because vehicles without a strong enough engine are unable to maintain their speed on steep approach roads leading into tunnels in the mountains. This means that they represent an obstacle to other road users by adversely affecting traffic flow thus reducing the capacity of the road and/or leading to risky manoeuvres by other users.

### ***Turbochargers***

The allegation that hot turbochargers are often the cause of vehicle fires has not been confirmed in studies carried out to date. However, technical defects, especially components from which oil or fuel is able to leak out onto hot parts of the engine or exhaust pipe, increase the risk of a vehicle catching fire.

### ***Brakes***

According to surveys carried out by PIARC, hot brakes in heavy motor vehicles are frequently the cause of a fire. It is therefore essential that brakes be properly maintained and serviced by qualified specialists, for correctly adjusted brakes are much less likely to overheat.

### ***Video systems for monitoring freight; smoke detectors***

Video monitoring systems and smoke detectors are widely available on the market. The degree of efficiency of the latter depends on the type of fire concerned. Equipment is expensive and installation is often complex.

### ***Electrical systems***

In modern vehicles, all active electrical components are switched via safety and automatic fuses. If a short circuit should occur, the circuit concerned is automatically switched off.

Special requirements apply to vehicles that are used for the transport of dangerous goods.

The proposed compulsory annual vehicle inspections should ensure that any electrical defects are detected at an early stage.

### ***Noise reduction/encapsulation***

Modern vehicles have to meet increasingly stringent standards with respect to environmental protection and noise levels, and in addition to improvements in engine and drive design, these lead to the use of complex noise suppression methods such as engine encapsulation. The insulation material used for the latter purpose is fire-resistant, but under certain circumstances it can still catch fire if it remains in contact with hot engine parts or the exhaust system for an extended period of time.

## **A.1.2 Proposed measures for vehicles**

### **Measure D4.01**

**It should be made compulsory for all heavy goods vehicles, buses and coaches to be equipped with a fire extinguisher. In addition, studies should be carried out of the possibility of equipping heavy goods vehicles, buses and coaches with heat-detection equipment, or possibly automatic extinguishing equipment.**

### **Measure D4.02**

**The quantity of fuel carried by heavy goods vehicles, buses and coaches should be reduced in order to diminish the potential consequences in the event of a vehicle fire in a tunnel.**

Working Parties 15 and 29 of the Inland Transport Committee are invited to determine the maximum quantity of fuel which should be permitted on the basis of a risk reduction analysis in tunnels while also taking into account the need for an adequate driving range for commercial transport purposes.

### **Measure D4.03**

**A study should be conducted of the appropriateness and conditions for minimum fire resistance requirements for fuel tanks of heavy goods vehicles, buses and coaches.**

### **Measure D4.04**

**It is recommended that no further increases be permitted of the width of heavy goods vehicles or of the weight of their cargo, which would lead to an increased calorific value for heavy goods vehicles.**

The Group of Experts felt that the current tunnel infrastructure in Europe could not support any further increases in the width, length and permissible maximum weight of heavy goods vehicles.

### **Measure D4.05**

**A study should be initiated for measures prohibiting the use of highly inflammable materials in the construction of vehicles (including refrigerated vehicles).**

These highly inflammable materials can give off a toxic vapour or accelerate the spread of fire to other vehicles. The Group of Experts requested WP.29 to look into this matter.

### **Measure D4.06**

**All heavy goods vehicles, buses and coaches should be subject to annual technical inspections, such as defined by the UNECE Agreement of 13 November 1997 or by the European Union's 96/96/EC Directive, particularly for the points contributing to the prevention of vehicle fires.**