



**Economic and Social
Council**

Distr.
GENERAL

TRANS/AC.7/6/Add.1
20 April 2001

Original: ENGLISH

ECONOMIC COMMISSION FOR EUROPE

INLAND TRANSPORT COMMITTEE

Ad hoc Multidisciplinary Group of Experts on Safety
in Tunnels

**REPORT OF THE AD HOC MULTIDISCIPLINARY GROUP OF EXPERTS
ON SAFETY IN TUNNELS ON ITS THIRD SESSION**

(20-21 March 2001)

Addendum 1

Annex

Consideration of draft recommendations of the
Ad hoc Multidisciplinary Group of Experts on Safety in Tunnels

The text below sets out the measures discussed by the Group of Experts at its third session held on 20 and 21 March 2001 in Geneva.

* * *

ANNEX TO DOCUMENT TRANS/AC.7/6

Measures discussed (modifications in bold)	Action taken at third session of AC.7 (10-11 March 2001)
MEASURES FOR ROAD USERS 1.01 Information campaigns regarding safety in tunnels should be regularly organised and implemented in collaboration with the principal partners. 1.02 Driving tests for all categories of vehicles should include specific questions concerning the behaviour of road users in the event of a vehicle breakdown, a traffic jam or a fire in a tunnel. 1.03 If a vehicle catches fire in a tunnel, it is strongly recommended that the driver drives his vehicle out of the tunnel whenever possible (self help principle). 1.04 Inspections of heavy goods vehicles and of vehicles carrying dangerous goods should be intensified. Inspections (or automatic checks) of heavy goods vehicles should be carried out at the entrance to long tunnels when the level of risk so justifies. The necessary funding should be made available to the authorities concerned. 1.06 Truck, coach and bus drivers should be tested periodically with respect to their knowledge of safety-relevant aspects of vehicles and equipment. 1.07 Regulations governing the transport of dangerous goods through tunnels should be rationalized at the international level, inter alia, through the five following measures: (a) Five dangerous goods cargo groups should be created which will be used to regulate the authorisation of the transport of dangerous goods in road tunnels (OECD/PIARC project). (b) Five new signs should be created to be placed at tunnel entrances prescribing the transport of prohibited or permitted dangerous goods with reference to the five dangerous goods cargo groups to be created. (c) A comparative risk analysis should be made, taking into account both the itinerary that includes the tunnel and any alternative itinerary or itineraries, before the decision is taken to authorise or not all or part of the transport of the dangerous goods. (d) A study should be made of the possible classification as dangerous goods of certain liquids or easily liquefied substances with calorific values comparable to that of hydrocarbons. (e) Recommendation of case-by-case consideration of the importance of operating measures for reducing the risk of the transport of dangerous goods in tunnels (declaration before entering, escort, etc.).	Adopted. Adopted. Adopted. Adopted, with addition of text from TRANS/AC.7/2000/7 to be moved to the chapter on operational measures Adopted. Text proposed by IRU not accepted. Adopted with addition of measures proposed in TRANS/AC.7/200/7 from PIARC/OECD study.

(f) A study should be conducted of the possibility of introducing automatic detection of the transport of dangerous goods (e.g. by electronic devices carried on vehicles). 1.08 On an exceptional case by case basis, regulations may require the formation of convoys and accompanying vehicles for the transport of certain types of particularly dangerous goods. 1.09 In certain cases, it should be possible to prohibit trucks from overtaking in tunnels with more than one lane in each direction. 1.10 For safety reasons, road users should maintain an adequate distance from the vehicle in front of them (in the event of a breakdown, congestion or fire in a tunnel). 1.11 <i>The speed of trucks in tunnels should be limited to a maximum of 60 km/h.</i> 1.12 <i>A compulsory distance of 100 metres between trucks in all tunnels has to be maintained.</i> 1.13 Provisions moved to Section 3 1.14 At the entrance to major tunnels, user information on the equipment available and proper conduct should be displayed. OPERATIONAL MEASURES 2.01 Countries should create a national body to supervise incidents in road tunnels and the activities of tunnel control bodies. This body should be entrusted with the following duties and powers: (a) Drawing up regulations governing the inspection of tunnels from the point of view of safety. (b) Supervision of organizational and operational schemes, training and equipment of emergency services in collaboration with safety officers. (c) Specification of duties of safety officers. (d) Implementation of necessary measures. (e) Authority to close tunnels for the purpose of training emergency teams and carrying out fire trials. 2.02 A safety officer should be appointed for all tunnels with a length of over 600 metres. The safety officer may be responsible for several tunnels in the same immediate area. The safety officer should be entrusted by the tunnel operator, police and fire fighters and have the necessary powers and authority to perform the following duties: (a) Plan the organization of emergency services and operational schemes. (b) Plan, implement and evaluate emergency operations. (c) Take part in the definition of safety schemes and the specification of infrastructure installations (new tunnels and modifications to existing ones).	Adopted, with addition. Adopted. Adopted with addition Rejected but maintained in recommendations to show it has been considered. Rejected but maintained in recommendations to show it has been considered. Adopted. Adopted. Adopted, with addition of detail from TRANS/AC.7/2000/6. Adopted, with addition of detail from TRANS/AC.7/2000/6.
---	---

(d) Train operational staff, traffic police and emergency services and organise drills at regular intervals. (e) Take part in the approval of tunnels (structure and installations) 2.03 Regulations should be drawn up governing periodical exercises for fire and rescue crews in tunnels in circumstances that are as realistic as possible. 2.04 A tunnel that is not part of the road network should be constructed for, or placed at the disposal of, emergency services for carrying out exercises and trials. 2.05 Details of all fires in tunnels should be recorded and evaluated by safety officers and the national supervisory body. 2.06 The suitability of using high-performance ventilators should be closely examined by tunnel firebrigades. 2.07 Tunnel fire-fighting crews should be equipped with a heat searching camera. 2.08 Complete or partial closure of lanes (if planned in advance) should always be made outside the tunnel. Variable message signs, traffic lights and mechanical barriers may be employed for this purpose. 2.09 Emergency response teams should be stationed at the two extremities of major two-way tunnels with heavy traffic. In the case of international tunnels, i.e. starting and finishing in a different country, one single control centre should be designated at an given time. Inspections should be conducted at several-year intervals of the state of installations and the quality of operations, and at longer intervals of the overall level of safety, by an expert or commission independent of the operator. 2.11 It is recommended that monitoring compliance with traffic regulations and the punishment of offences in long tunnels be increased, inter alia, through the use of automatic systems. In particular, distances between heavy goods vehicles and the speed of vehicles in tunnels should be better controlled, in order to reach a more unified traffic flow and consequently also more safety in tunnels. 2.12 It is recommended that tunnels with high traffic volumes be equipped with traffic management systems which can help to avoid traffic congestion in tunnels. The traffic should flow in such a way that after an incident unaffected vehicles can quickly leave the tunnel. 2.13 Alternative itineraries should be provided by authorities in the case of tunnel closure. 2.14 Guidelines are being finalised concerning the dimensioning and operation of ventilation systems in tunnels. They also need to address the improvement of automatic	Adopted. Adopted. Adopted. Adopted. Adopted. Adopted, with modification Adopted, with modification. Adopted. Should be integrated in 2.01 Previous 1.13.(§ 1) Previous 1.13.(§ 2b) IRU proposal. Adopted. Moved from 3.06.
--	--

fire detection and water supply for fire-fighting operations. 2.15 Guidelines for the preparation, implementation and evaluation of practical fire trials in tunnels are being coordinated at the international level. They should include the functioning of automatic fire detection. INFRASTRUCTURE MEASURES 3.01 Guidelines for single-tube bidirectional tunnels should be coordinated at the international level. They should specify the circumstances under which escape routes are necessary. The guidelines should propose a separate emergency gallery not dependent on the ventilation system in the case of tunnels with high risk potential, e.g. long bidirectional tunnels with high traffic density (traffic volume times tunnel tube length) and high longitudinal gradients. Exceptions may be made if it is economically not acceptable to build a separate parallel emergency gallery. In this case a quantitative risk analysis has to show that according to existing equipment, e.g. an improved ventilation system with optimised other tunnel techniques (e.g. improved fire detection, optimal rescue- and fire-brigade operation) a separate emergency gallery is not necessary. 3.02 In double-tube tunnels, in the event of an incident in one tube the other tube should be used as an escape route. 3.02 bis In the event of the prolonged closure of a tunnel, traffic and trade flows should be maintained by using the unaffected tube for two-way traffic in the case of double tube tunnels, or the provision of alternative itineraries in other cases. 3.03 The present-day use of traverses to provide access for emergency services has been examined and confirmed as suitable. 3.04 Wherever feasible, a crossing of the central reservation should be made possible in front of tunnel entrances. 3.05 The main criteria on which the decision to build a single or double-tube tunnel is based should be safety and projected traffic volume. To the extent possible, the same number of lanes should be maintained inside and outside the tunnel. 3.06 Moved to section 2 3.07 Moved to section 2 3.08 Guidelines and specifications for the installation of equipment in tunnels need to be adapted to the current status of technology. a) Harmonisation of the types of safety equipment available to users (extinguishers, telephones, radio communications).	Moved from 3.07. Will be completed by measures proposed by PIARC Adopted in principle. Needs more discussion. Adopted. <i>IRU proposal. See also 2.13</i> Adopted Adopted Adopted, with modifications. Principle adopted but needs more discussion. Integrate proposals of PIARC and German measures?
---	---

b) Installation of devices (signs and signals and others, if necessary), so that users can be stopped at the tunnel entrance and in long tunnels, at regular intervals inside the tunnel. c) Design of electrical, measurement and control circuits so that a local fault (due to a fire, for example) does not lead to the loss of the circuits not affected. d) Improvement of automatic fire detection. e) Improvement of CCTV-systems. f) Emergency cabins. g) Loudspeakers should be recommended only if they are useful, e.g. at traffic signals before tunnel portals or in cross connections during evacuation. In tunnel tubes they are often useless. h) The guidelines should account for announcements in different languages (e.g. the demand for immediate escape) via broadcasting or with internationally harmonised variable message signs. 3.09 Improvement and harmonisation of horizontal and vertical signing system (classical and dynamic) in tunnels and in their advance warning area. Compulsory use of optimum conspicuity high quality materials in signing. 3.09 bis Signalisation of escape routes should be harmonised at the international level. 3.10 The possibility of using fixed fire-fighting installations should be examined in certain cases. 3.11 Introduction into European and international standardization of an additional time-temperature curve, representative of a violent fire in a tunnel, so as to ensure adequate resistance to fire of structures which it is indispensable to maintain intact for safety purposes. 3.12 Operational centres. It should be considered whether it is necessary for certain tunnels (e.g. high traffic volumes, long tunnels) to have a control room. In case a number of tunnel control rooms are necessary within one region, it should be checked whether surveillance of these tunnels could be joined together by the transmission of video signals and operational data into a single operational centre. 3.13 Risk potential in tunnels. The guidelines should propose that the following points be taken into consideration when dealing with risk potential in tunnels: a) In the future, it should be considered to take traffic density (traffic volume per year times the tunnel tube length in km) as a parameter instead of length criteria, when designing for the equipment of tunnels. b) High longitudinal gradients can increase risk potential. Longitudinal gradients above 5% should therefore be avoided. c) When designing for a number of tunnel tubes (bi-directional or uni-directional tunnels) the proposed traffic volumes should first be taken into account as important	Not yet discussed. IRF proposals. Add signs in annex to final recommendations Adopted. Not yet discussed. Not yet discussed. Not yet discussed. (<i>perhaps already covered by 2.02?</i>) Needs more discussion. (<i>perhaps partly already covered by 3.01?</i>)
--	---

criteria. However, if there are important additional risks (e.g. under-water tunnel, high longitudinal gradients), these should also be considered in the design for the number of tubes with a qualitative risk analysis in conjunction with a cost-benefit expertise. d) In uni-directional tunnels with the possibility of daily congestion similar measures should be taken into account as in bi-directional tunnels. e) In underwater tunnels risk analysis studies should be performed, which could lead to partial or total restrictions on specific transports of dangerous goods through these tunnels. f) Tunnels with high risk potential call for shorter distances between lay-bys (at the moment around 700 m). MEASURES FOR VEHICLES 4.01 It should be made compulsory for all heavy goods vehicles and passenger vehicles to be equipped with a fire extinguisher. In addition, studies should be made of the possibility of equipping heavy goods vehicles and passenger vehicles with heat-detection equipment, or possibly automatic extinguishing equipment. 4.02 A study should be conducted of the possibility of reducing the maximum quantity of fuel carried by heavy goods vehicles and by passenger vehicles in tunnels. 4.03 A study should be conducted of the appropriateness and conditions for minimum fire resistance requirements for fuel tanks of heavy goods vehicles and passenger vehicles. 4.04 It is recommended that no further increases in the width, length and permissible maximum weight of heavy vehicles and road trains be approved. 4.05 A study should be conducted of measures to avoid the use in the construction of vehicles and especially refrigerated vehicles of highly inflammable materials which give off a toxic vapour or which could accelerate the spread of fire to other vehicles. 4.06 To submit all heavy goods vehicles and passenger vehicles to annual technical inspections, such as defined by the ECE/UN Agreement of 13 November 1997 or by the European 96/96/EC directive, particularly for the points contributing to the prevention of vehicle fires.	Adopted. Adopted, but doubts expressed. To be examined by WP.29 Adopted. Adopted. To be adapted because it is a delicate measure. Adopted. To be examined by WP. 29 Adopted in principle with modifications proposed by the French delegate. See also 1.04
---	--