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INLAND TRANSPORT COMMITTEE

Working Party on Road Transport

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agenda item 5 (a) (iii))

Amendments regarding Annex II of the European Agreement on Main International Traffic Arteries (AGR)

Compilation of amendment proposals concerning safety of tunnels

Annex II to the AGR

Compilation of modifications relevant to tunnels

New modifications appear in "bold italics".

In order to have a complete picture of the proposals, for each measure proposed their equivalence or correspondence is indicated with Annex 1 of the EU "tunnel" directive CE/2004/54 of 29 April 2004 (bold italics) and with the reports of the UNECE group of tunnel experts TRANS/AC.7/9 and TRANS/AC.7/9/Add.1 (underlined)

"I. GENERAL

Add the following to the end of the second paragraph:

"The provisions of this annex concerning tunnels shall apply to tunnels with lengths of over 500 m (Article 1). Some of these provisions, however, concern long tunnels only."

…

III. GEOMETRIC CHARACTERISTICS

…

III.2 Horizontal alignment and cross-section

III.2.1 Basic parameters

Amend as follows the table on recommended minimum values for parameters of horizontal and vertical alignment:

Design speed		60	80	100	120	140
Minimum radii in plane (corresponding to maximum superelevation 7%)		120	240	**450**	650	1 000
Maximum gradient (percentage not to be exceeded)*		8	7	6	5	4
Maximum longitudinal gradient in ***new*** tunnels** ***(2.2.2)***		**5**	**5**	**5**	**5**	**5**
Minimum radii at the highest point of the vertical alignment (in m)	One-way	1 500	3 000	6 000	10 000	18 000
	Two-way	1 600	4 500	10 000	-	-
Minimum radii at the lowest point of the vertical alignment		1 500	2 000	3 000	4 200	6 000

* The maximum gradient should be decreased by 1% in the case of express roads and motorways. When the maximum gradient is applied, an additional lane for slow-moving vehicles should be envisaged.

** ***Unless no other solution is geographically possible. In tunnels with gradients higher than 3%, additional and/or reinforced measures should be taken to enhance safety on the basis of a risk analysis. (2.2.3)*** (part of measure 3.08).

…

III.3 Cross-section between junctions

After the existing text, add the following paragraphs:

"In this respect, tunnels and bridges, structures which are an integral part of the road system, should, to the extent possible, ***with the exception of the emergency lane,*** have the same number of traffic lanes as there are before and after these structures. ***Any change in the number of lanes shall occur at a sufficient distance from the entrance to these infrastructures. (2.1.3)*** (measure 3.01)

For tunnels, the principal criteria to be taken into account in deciding on the number of tubes to build (a single tube or two tubes) are traffic forecasts and safety ***(taking into account such aspects as the percentage of heavy goods vehicles, gradient and length). (2.1.1)*** (measure 3.01)

Emergency stopping places (lay-bys) should be provided at least every 1000 m in ***narrow*** bi-directional tunnels ***with heavy traffic. (2.5.1)*** (part of measure 3.05)

New tunnels without an emergency lane should as far as possible be provided with emergency walkways, elevated or not, for tunnel users in the event of an incident. (2.3.1) In existing tunnels where there is neither an emergency lane nor an emergency walkway, additional and/or reinforced measures shall be taken to ensure safety." (2.3.2)

…

Insert the following new section V (the existing sections V (Environment and landscaping) and VI (Maintenance) become sections VI and VII respectively):

"V. MANAGEMENT, SAFETY EQUIPMENT AND GENERAL ARRANGEMENTS FOR TUNNELS

V.1 Traffic management systems

Tunnels with high traffic volume should be equipped with traffic management systems in order to avoid traffic congestion, particularly in the case of an incident. ***(3.1)*** (measure 2.12).

In the case of long or short-term closure of tunnels, the best possible alternative itineraries should be planned and indicated to users at diversion locations situated in advance of the tunnel. ***(3.6)*** (measure 2.13).

In the event of a serious accident, all the affected tubes of the tunnel should immediately be closed to traffic. The traffic should be managed in such a way that unaffected vehicles can quickly leave the tunnel. ***(3.4)*** (part of measures 2.08 and 2.12).

V.2 Control centre

A control centre should be provided for long tunnels with a heavy volume of traffic. (2.13.1) (measure 3.11). ***Surveillance of several tunnels may be centralized at a single control centre. (2.13.2)*** (measure 3.11).

For tunnels starting and ending in different countries or falling under the control of different national regions, one single control centre should be designated as being in control at any given time. ***(3.5)*** (measure 2.10).

V.3 Emergency exits and access for emergency services

The need to provide emergency exits and the distance between them should be decided case by case on the basis of a risk analysis of the tunnel in question. (2.3.5) (§ c of measure 3.02).

In new tunnels, emergency exits should be provided where the traffic volume is higher than 2000 vehicles/day per lane. (2.3.6)

The maximum distance between two emergency exits should not exceed 500 m. (2.3.8).

Shelters without an exit leading to escape routes to the open air should be avoided in future tunnel construction. ***(2.3.4)*** (§c of measure 3.02).

In twin-tube tunnels, in the event of an incident in one tube, ***the other tube may be used*** as an escape and rescue route. To this effect, the tubes should be connected at regular intervals by cross-connections for pedestrians and by cross-connections allowing the passage of emergency service vehicles. ***In the absence of these, direct connections with the outside or with an emergency gallery should be provided in each tube. (2.3.3 and 2.4.1)*** (measure 3.03).

For twin-tube tunnels, ***wherever geographically possible***, crossing of the central reserve ***(median strip)*** should be made possible ***outside each portal to allow emergency services to gain immediate access to either tube. (2.4.2)*** (measure 3.04).

V.4 Tunnel equipment

All safety installations or facilities for tunnel users, in particular, emergency telephones, extinguishers, emergency exits, lay-bys or the indication of radio frequencies should be signaled by means of fully visible signs and panels. The signs and panels to be used are described in the Vienna Convention on Road Signs and Signals of 1968. (2.12) (part of measure 3.05 and measure 3.10).

The safety equipment required in tunnels should be defined on the basis of ***a risk analysis*** of the tunnel under consideration. ***(1.1.3 and 1.3.2)*** (measure 3.08). ***A list of such equipment is provided below***. Some of this equipment is intended mainly for long tunnels ***and/or tunnels with heavy traffic.***

V.4.1 Lighting devices, power supply and electrical circuits

- ***Normal lighting to ensure appropriate visibility day and night for drivers; (2.8.1)***
- ***Safety lighting to allow a minimum visibility in the event of a breakdown of the power supply (2.8.2)***
- ***Evacuation lighting, such as evacuation marker lights, at a height of no more than 1.5 m to guide tunnel users to evacuate the tunnel on foot, in the event of an emergency; (2.8.3)***
- ***Emergency power supply capable of ensuring the operation of safety equipment indispensable for the evacuation of users; (2.17.1)*** (part of measure 3.05)
- ***Design of electrical, measurement and control circuits such that a local failure (such as one due to a fire) does not affect unimpaired circuits. (2.17.2)*** (part of measure 3.05)

V.4.**2** ***Emergency provisions***

- ***Emergency stations, equipped with at least an emergency telephone and two extinguishers, should be installed at the entrance to tunnels and inside at regular intervals. These intervals should not exceed 150 m for new tunnels and 250 m for existing tunnels. (2.10.2 and 2.10.3)*** (part of measure 3.05)

- In addition, a water supply should be provided for the fire brigade ***near the tunnel portals and inside at intervals which should not exceed 250 m. (2.11)*** (part of measure 3.05)

V.4.3 Ventilation systems

Appropriate ventilation systems should be provided ***to ensure the control of pollutants emitted by road vehicles under normal conditions and in the event of an incident, and the control of the air and of smoke in the event of a fire. When mechanical ventilation is necessary, the following recommendations should be observed: (2.9.1)*** (part of measure 3.05)

- ***In tunnels with congested bi-directional or unidirectional traffic, longitudinal ventilation should be used only if a risk analysis of the tunnel in question shows it is acceptable and/or if appropriate measures are taken. . (2.9.3)*** (§ b of measure 3.02)

- ***Transverse or semi-transverse ventilation systems should be used in other cases. (2.9.4)***

- ***In bi-directional tunnels with transverse or semi-transverse ventilation, equipped with a control centre, when justified by the length and the traffic, air and smoke extraction dampers should be installed which can be operated separately or in groups. In addition, the longitudinal air and smoke velocity should be monitored constantly and the steering process of the ventilation system adjusted accordingly. . (2.9.5)*** (§ b of measure 3.02)

- In twin-tube tunnels, appropriate means should be implemented to stop the propagation of smoke and gases from one tube to the other in the case ***of fire. . (2.3.9)*** (part of measure 3.03)

V.4.***4*** Other ***safety improvement devices and systems***

[…]

- Radio ***broadcast*** installations that can be used by ***the emergency services; (2.16.1)*** (part of measure 3.05)

- Systems for video surveillance and automatic detection of incidents and/or fires; ***(2.14.1 and 2.14.2)*** (part of measure 3.05)

- User information systems (radio, loudspeakers, variable message signs); ***(2.15 and 2.16)*** (part of measure 3.05)

- Traffic lights, barriers ***and other equipment*** to stop vehicles when necessary ***before the tunnel entrances and, if required, within the tunnel***; ***. (2.15.1)*** (part of measure 3.05 and measure 1.12)

[…]

- Overheating control systems for heavy goods vehicles (to be installed outside tunnels); (measure 2.16)

- Road signs and/or markings in order to help drivers to maintain an adequate distance from the vehicle in front; (measure 1.09)

- ***Automatic*** systems for detecting violations of traffic regulations particularly regarding speed limits and distance between vehicles; (measure 2.11)

- ***Adequate resistance to fire of the main structure of tunnels where a local collapse may have catastrophic consequences (for example, an underwater tunnel or a tunnel liable to cause the collapse of large adjoining structures). . (2.7)*** (measure 3.07)

Amend the numbering and content of the existing section VI (MAINTENANCE), renumbered as section VII, as follows:

"VII. MAINTENANCE

VII.1 General considerations

Complete the second paragraph of subsection VII.1 as follows (It is advisable that … traffic flow):

"… and safety."

Insert, after the second paragraph after the second paragraph of subsection VII.1, a new paragraph to read:

"Complete or partial closure of lanes due to construction or maintenance works planned in advance should always begin outside tunnels." ***(3.3)*** (measure 2.08)

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