Introduction

Directive 2004/54 EC

– Recitals
– Articles
– Annexes (I, II, III)

Implementation

– Germany
– other Member States

Structure

<table>
<thead>
<tr>
<th>Jahr</th>
<th>Name</th>
<th>Land</th>
<th>Länge</th>
<th>Tote / Verletzte</th>
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<tbody>
<tr>
<td>1978</td>
<td>Velsen</td>
<td>Niederlande</td>
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<td>Caldecott</td>
<td>USA</td>
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<td>Italien</td>
<td>600 m</td>
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<td>Brenner</td>
<td>Österreich</td>
<td>412 m</td>
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<td>Pfänder</td>
<td>Österreich</td>
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<td>3 Tote</td>
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<td>Italien</td>
<td>148 m</td>
<td>5 Tote, 10 Verletzte</td>
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<td>1999</td>
<td>Mont-Blanc</td>
<td>Frankreich-Italien</td>
<td>11.600 m</td>
<td>38 Tote, 25 Verletzte</td>
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<td>Tauern</td>
<td>Österreich</td>
<td>6.000 m</td>
<td>12 Tote</td>
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<td>2001</td>
<td>Gleisalm</td>
<td>Österreich</td>
<td>8.800 m</td>
<td>5 Tote</td>
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<td>St. Gotthard</td>
<td>Schweiz</td>
<td>12.600 m</td>
<td>11 Tote</td>
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<tr>
<td>2005</td>
<td>Frejus</td>
<td>Frankreich-Italien</td>
<td>12.900 m</td>
<td>2 Tote, 6 Verletzte</td>
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</tbody>
</table>
Introduction

Viamala, September 2006, 9 fatalities

EU-Directive


- Recitals
- Annex I: Safety Measures
- Annex II: Approval of the design, safety documentation, commissioning of a tunnel, modifications and periodic exercises
- Annex III: Signing for Tunnels

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Structure

- Introduction
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Recitals

- The objective is the achievement of a uniform, constant and high level of protection for all European citizens in road tunnels.
- Safety measures should enable people involved in incidents to rescue themselves, allow road users to act immediately so as to prevent more serious consequences, ensure that emergency services can act effectively and protect the environment as well as limit material damage.
- Member States should be encouraged to implement comparable safety levels for road tunnels located in their territory that do not form part of the Trans-European Road Network and consequently do not fall within the scope of this Directive.
### EU-Directive

#### Article 1: Subject matter and scope

#### Article 2: Definitions

#### Article 3: Safety Measures

- **Article 4: Administrative Authority**
- **Article 5: Tunnel Manager**
- **Article 6: Safety Officer**
- **Article 7: Inspection Entity**

#### Article 10: Tunnels whose design has been approved but which are not yet open

#### Article 11: Tunnels already in operation

#### Article 12: Periodic inspections

- **Article 13: Risk Analysis**
- **Article 14: Derogation for innovative techniques**
- **Article 15: Reporting**
- **Article 16: Adaptation to technical progress**
- **Article 17: Committee procedure**
- **Article 18: Transposition**
- **Article 19: Entry into force**

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### Organisation

#### Article 5: Tunnel Manager*

- The Administrative Authority shall identify as Tunnel Manager the public or private body responsible for the management of the tunnel.
- Any significant incident or accident occurring in a tunnel shall be the subject of an incident report prepared by the Tunnel Manager.
- The Tunnel manager forwards reports to the Safety Officer, to the Administrative Authority and to the emergency services.

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### Organisation

#### Article 4: Administrative authority

- The Administrative Authority may be set up at national, regional or local level.
- Each tunnel in the Trans-European Road Network located on the territory of a single Member State shall fall under the responsibility of a single Administrative Authority.
- The Administrative Authority shall commission tunnels.
- The Administrative Authority shall have power to suspend or restrict the operation of a tunnel.
- The Administrative Authority shall ensure that tunnels are tested and inspected on a regular basis, organisational and operational schemes (including emergency response plans) for the training and equipping of emergency services are put in place, the procedures for immediate closure of a tunnel in an emergency are defined, the necessary risk reduction measures are implemented.

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#### Article 6: Safety Officer

- For each tunnel, the Tunnel Manager shall, with the prior approval of the Administrative Authority, nominate one Safety Officer.
- He shall co-ordinate all preventive and safeguards measures to ensure the safety of users and operational staff.
- The Safety Officer shall perform the following tasks/functions:
  - co-ordination with emergency services,
  - take part in the planning, implementation and evaluation of emergency operations,
  - take part in the definition of safety schemes and the specification of the structure,
  - verify that operational staff and emergency services are trained,
  - take part in the evaluation of any significant incident or accident.
**Article 7: Inspection Entity**

- Member States shall ensure that inspections, evaluations and tests are carried out by Inspection Entities.
- Any entity performing the inspections, evaluations and tests must have a high level of competence and high quality procedures.
- Must be functionally independent from the Tunnel Manager.

*) Administrative Authority may perceive this task

**Risk Analysis**

**Article 13: Risk Analysis:**

A risk analysis is an analysis of risks for a given tunnel, taking into account all design factors and traffic conditions that affect safety, notably traffic characteristics and type, tunnel length and tunnel geometry, as well as the forecast number of heavy goods vehicles per day.

**Risk Analysis according to the EC-Directive**

- Alternatives to structural measures (Article 3).
- Special characteristic of a tunnel.
- Longitudinal ventilation in tunnels longer than 1,000 m with bi-directional and/or congested unidirectional traffic.
- Definition of regulations and requirements regarding the transportation of dangerous goods through a tunnel.
Alternative to structural measures with disproportionate costs (Article 3)

Compensation

Structural requirements ↔ other measures
(evidence for equivalent or improved protection)

Risk Analysis and implementation in Austria
Presentation by Rudolf Hoerhan

<table>
<thead>
<tr>
<th>Feature</th>
<th>New</th>
<th>Existing</th>
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</thead>
<tbody>
<tr>
<td>Tunnel</td>
<td></td>
<td></td>
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<tr>
<td>Traffic</td>
<td>&gt; 2.000</td>
<td>&lt; 2.000</td>
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<tr>
<td>Length</td>
<td>500 - 1000 m</td>
<td>1.000 - 3.000 m</td>
</tr>
<tr>
<td>Traffic</td>
<td>&gt; 3.000 m</td>
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</table>

Criteria for equipment

- Traffic: > 2.000 Veh./day and lane
- Traffic: < 2.000 Veh./day and lane
- Length: 500 - 1000 m
- Length: 1.000 - 3.000 m
- Length: > 3.000 m
- Tunnel: new
- Tunnel: existing

Safety Measures

Number of tubes and longitudinal slope

- 2 tubes obligatory, if traffic volume according to a 15-year prognosis is higher than 10,000 Veh./24h
- Longitudinal slope in tunnels less than 5 %, if geographically possible.
Safety Measures

Devices for closing the tunnel

- Barriers in front of tunnels; obligatory for tunnels longer than 1,000 m.
- Traffic signals in tunnels; recommended every 1,000 m in tunnels longer than 3,000 m with a control centre.

Emergency stations

- Emergency stations consist of a box on the sidewall or preferably a recess in the sidewall.
- They shall be equipped with at least an emergency telephone and two fire extinguishers.
- Emergency stations shall be provided near the portals and inside at intervals which for new tunnels shall not exceed 150 m and which in existing tunnels shall not exceed 250 m.

Safety Measures

Lay-bys

- Obligatory every 1,000 m for new bi-directional tunnels longer than 1,500 m without emergency lanes.
- In existing bi-directional tunnels without emergency lanes the feasibility and effectiveness shall be evaluated.

Emergency exits

- In new tunnels, emergency exits shall be provided. The distance between two emergency exits shall not exceed 500 m.
- In existing tunnels longer than 1,000 m, the feasibility and effectiveness of the implementation of new emergency exits shall be evaluated.
- Doors shall be used to prevent smoke and heat from reaching the escape routes behind the emergency exit.
### Safety Measures

#### Emergency walkways
- Obligatory, if emergency lane is not available.
- In existing tunnels, without emergency lane and emergency walkways additional/reinforced measures are to be taken.

#### Cross passages for rescue services
- Obligatory in two-tube tunnels, where the two tubes are at the same level or nearly.

#### Lighting
- Normal lighting shall be provided.
- Safety lighting shall be provided.
- Evacuation lighting, such as evacuation marker lights, at a height of no more than 1.5 m, shall be provided.
- The two nearest emergency exits shall be signed on the sidewalls at distances of no more than 25 m.

#### Water supply
- Obligatory for tunnels longer than 500 m.
- Hydrants at the portals and every 250 m inside the tunnel.
Safety Measures

Drainage

- Obligatory, where the transport of dangerous goods is permitted.

- If in existing tunnels that requirement cannot be met or can be met only at disproportionate cost, this shall be taken into consideration when deciding whether to allow the transport of dangerous goods on the basis of an analysis of relevant risks.

Safety Measures

Ventilation (1)

- A mechanical ventilation system shall be installed in all tunnels longer than 1,000 m (traffic volume higher than 2,000 vehicles per lane).
- In tunnels with bi-directional and/or congested unidirectional traffic, longitudinal ventilation shall be allowed only if a risk analysis according to Article 13 shows it is acceptable.
- Transverse or semi-transverse ventilation systems shall be used in tunnels where a mechanical ventilation system is necessary and longitudinal ventilation is not allowed.

Safety Measures

Ventilation (2)

- For tunnels with bi-directional traffic, with a traffic volume higher than 2,000 vehicles per lane, longer than 3,000 m and with a control centre and transverse and/or semi-transverse ventilation, the following minimum measures shall be taken as regards ventilation:
  - Air and smoke extraction dampers shall be installed which can be operated separately or in groups
  - The longitudinal air velocity shall be monitored constantly and the steering process of the ventilation system (dampers, fans, etc.) adjusted accordingly.

Safety Measures

Monitoring Systems

- Video monitoring systems and a system able to automatically detect traffic incidents (such as stopping vehicles) and/or fires shall be installed in all tunnels with a control centre.
- Automatic fire detection systems shall be installed in all tunnels which do not have a control centre.
Communication systems

- Radio re-broadcasting equipment for emergency service use shall be installed in all tunnels longer than 1,000 m with a traffic volume higher than 2,000 vehicles per lane.
- Where there is a control centre, it must be possible to interrupt radio re-broadcasting of channels intended for tunnel users, if available, in order to give emergency messages.
- Shelters and other facilities where evacuating tunnel users must wait before they can reach the outside shall be equipped with loudspeakers for the provision of information to users.

Control Centre

- A control centre shall be provided for all tunnels longer than 3,000 m (2,000 Veh./lane).
- Surveillance of several tunnels may be centralised at a single control centre.
Safety Measures

- a description of the planned structure and access to it,
- a traffic forecast study specifying and justifying the conditions expected for the transport of dangerous goods, together with the risk analysis,
- a specific hazard investigation describing possible accidents which clearly affect safety of road users in tunnels,
- an opinion on safety from an expert or organisation specialising in this field.

Safety documentation

**Commissioning stage**

- Safety documentation for the design stage;
- a description of the organisation, human and material resources and instructions specified by the Tunnel Manager to ensure operation and maintenance of the tunnel,
- an emergency response plan drawn up jointly with the emergency services which also takes into account people with reduced mobility and disabled people,
- a description of the system of permanent feedback of experience through which significant incidents and accidents can be recorded and analysed.

**Design stage**

- Safety documentation design stage,
- Safety documentation commissioning stage,
- a report and analysis on significant incidents and accidents, which have taken place since the entry into force of this Directive,
- a list of the safety exercises carried out and an analysis of the lessons learned from them.

**Operation**

- Safety documentation design stage,
- Safety documentation commissioning stage,
- a report and analysis on significant incidents and accidents, which have taken place since the entry into force of this Directive,
- a list of the safety exercises carried out and an analysis of the lessons learned from them.
Exercises

Periodic exercises

- The Tunnel Manager and the emergency services shall, in co-operation with the Safety Officer, organise joint periodic exercises for tunnel staff and the emergency services.
- Full scale exercises under conditions that are as realistic as possible shall be conducted in each tunnel at least every four years.
- The Safety Officer and the emergency services shall evaluate jointly these exercises, draw up a report and make appropriate.

Signing for tunnels

Road signs shall be used to designate the following safety facilities in tunnels:

- Lay-bys
- Emergency exits
- Escape routes
- Emergency stations

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Implementation

Guideline for road tunnel equipment and operation (RABT 2003)

European directive; implementation until May 2006
EUROPEAN UNION

THE EUROPEAN PARLIAMENT AND THE COUNCIL

Brussels, April 29, 2004

(OR. en)

2002/0309 (COD)
LEX 579
PE-CONS 3669/04
TRANS 168
CODEC 584

DIRECTIVE 2004/54/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL
ON MINIMUM REQUIREMENTS FOR TUNNEL SAFETY IN THE TRANS-EUROPEAN ROAD NETWORK

Guideline for road tunnel equipment and operation (RABT 2006)

Implementation

- Organisation (Articles 4 to 7)
- Risk Analysis (Article 13; prescriptive vs. performance based)
- Level of equipment (Annex I) is higher than requirements of the Directive
- Signing

Implementation

- Guideline (RABT 2006) given to the 16 "Länder" (States) by the Federal Ministry of Transport, Building, and Urban Affairs.
- Introduction by each of the 16 "Länder".
- Instructions on signing have been implemented by new articles in the traffic regulations (law).

Implementation

- Plan for upgrading of existing tunnels
- Methodology for risk analysis (national research, C3.3-WG2)
- Reporting of incidents on Federal level
- …
Implementation

Austria: Law
Netherlands: Law
Check Republic: Law
Belgium: Law for TERN tunnels

The End

Thanks for your kind attention!