



Quantitative Risk Analysis for Road Tunnels

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Summary

The field of safety in road tunnels has always been an important issue for operators, owners and the responsible authorities. After the tunnel fires in 1999 the subject gained however in importance. In order to fulfil the requirements of the Directive 2004/54/EC of the European Parliament and of the Council on minimum safety requirements for tunnels in the trans-European road network Member States are to develop a methodology for a risk assessment in addition to the existing standards. The methodology will allow calculating the risks for a specific tunnel in a unified way, considering the main influence parameters and the effect of additional or alternative safety measures by using a comparative approach. The development and implementation of risk based approaches according to the requirements of the Directive 2004/54/EC in the national guidelines is intended to be finalised until April 2009.

Keywords: tunnel; tunnel safety; road tunnels, safety, risk analysis; risk assessment, RABT

1. Introduction

The severe tunnel fires in 1999 in the road tunnels of Mont Blanc (F/I) and Tauern (A) pointed out, to which specific risks – mainly related to confinement – road tunnel users can be exposed in comparison to open roads. After the tunnel fires, guidelines and standards in the context of road tunnel safety equipment have been defined or upgraded in several European countries.

In Germany, in 2003 the revised guideline "Richtlinien über die Ausstattung und den Betrieb von Strassentunneln (RABT)" [1] was published, in which the actual safety requirements for German road tunnels are defined. In April 2004 the Directive 2004/54/EC of the European Parliament and of the Council has been issued [2]. The Directive aims at ensuring a minimum level of safety for road users in tunnels in the trans-European network by the prevention of critical events that may endanger human life, the environment and tunnel installations, as well as by the provision of protection in case of accidents. It shall apply to all tunnels in the trans-European road network with lengths of over 500 metres, whether they are in operation, under construction or at the design state. The demands for safety measures posed by the RABT 2003 are in most aspects higher than the minimum requirements contained in the new EC tunnel directive.

On the other side the EC tunnel directive implies certain requirements, for example requirements for the risk assessment for road tunnels, which are until now not implemented on national level. In Germany the implementation of the requirements of the EC tunnel directive has been done by updating the RABT to a new version, called RABT 2006 [1].

2. Management of Road Tunnel Safety in Germany

As a consequence of the incidents during the last years and because of the increasing number and length of road tunnels in Germany (figure 1), tunnel safety has become an important issue. On the owner and operator side this has led to enforcement of standards. On the other side efforts have been made to support the right behaviour of users in road tunnels.

In 2002, the Federal Ministry of Transport, Building and Urban Affairs initiated a comprehensive retrofitting programme for road tunnels in order to ensure that existing tunnels reach as soon as possible the same level of safety than new road tunnels. Altogether a total of about € 300 million