

## Integrated Rescue Galleries – an alternative Safety Concept for Road Tunnels

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## Summary

According to the safety requirements of the EC-Directive on "minimum safety requirements for tunnels in the Trans European Road Network" (2004/54/EC) [1], implemented into national law in Germany by the "Guideline for Equipment and Operation of Road Tunnels (RABT)" [2], additional safety measures become mandatory in case of two-way traffic tunnels. Frequently these additional measures demand parallel rescue tunnels, which have to be carried out in addition to the original traffic tunnel. Another possibility, which is currently neither suggested by German guidelines or regulations nor by other international recommendations, could be the excavation of bigger cross-sections with an additional and integrated rescue gallery inside the traffic tunnel.

Investigations of the Federal Highway Research Institute (BASt) have shown that integrated rescue galleries inside the traffic tunnel could be a cost-effective solution compared with the standard solution with a separate, parallel rescue tunnel. In additional investigations, constructional and operational details for a typical tunnel cross section with integrated rescue gallery were examined and evaluated. A cost comparison with the standard solution was carried out, too. These investigations were carried out by an expert group, consisting of a tunnelling consultant firm, a ventilation consultant and a university institute. The project was funded by the German Federal Ministry of Transport, Building and Urban Development (BMVBS) and managed by the BASt. The first practical application of the new solution with integrated rescue gallery at a German road tunnel is planned for 2011.

This paper shows the different concepts of possible solutions for integrated rescue galleries and focuses on constructional aspects and operational safety aspects of the new solution with integrated rescue galleries.

**Keywords:** Road tunnel, Tunnel safety, Rescue tunnel, Integrated rescue gallery.

## 1. Introduction

Due to modified safety requirements according to the EC-Directive on "minimum safety requirements for tunnels in the Trans European Road Network" (2004/54/EC) [1], implemented into national law in Germany by the 2006 issue of the German RABT ("Directive for the Equipment and for the Operation of Road Tunnels") [2], safety facilities in terms of additional escape and rescue galleries for tunnels operated with two-way traffic are being demanded. Beside the established design of a second rescue tunnel, which runs parallel to the alignment of the road tunnel and possesses considerably reduced dimensions, another approach considers the construction of one expanded tunnel cross section housing rescue galleries, in this context referred to as integrated rescue galleries. Economic feasibility studies by the Federal Highway Research Institute (BASt) showed that the implementation of integrated solutions might even be reasonably priced and are therefore competitive. In order to draw a generally accepted conclusion, the results of those studies