

Tunnels for High-Speed Railway Lines Based on the TMG Concept

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Summary

The paper presents the application of the TMG (“Tunnel Multi Gallery”) concept to the construction of tunnels for high-speed railway lines. The TBM technique for tunnel building and the common solutions for tunnels to high-speed railway lines are presented, as well as, the main safety requirements for railway tunnels, particularly for those intended for high-speed trains. The TMG concept is presented, as well as, a solution for tunnels to high-speed railway lines based on the referred concept, in which the functional and the safety requirements are satisfied with much lower costs than with the conventional solutions.

Keywords: Tunnels; TBM, Railways; TMG, High-Speed, Safety.

1. Introduction

The construction of tunnels is increasingly used on the implementation of transport infrastructure, particularly of high-speed railway networks. The TBM (“Tunnel Boring Machine”) technique is the most common, nowadays, because of both the economic reasons and the environmental issues.

With the TBM technique, the machine excavates the soil, while placing precast lining segments around the tunnel surface, which are clamped together and will form the exterior wall of the tunnel, which becomes circular shaped.

In the conventional TBM railway tunnel solution, after the execution of the exterior wall of the tunnel, a filling is laid at its bottom, creating a platform for the circulation of the trains, with the two tracks placed side by side. In long tunnels, for safety reasons, galleries to outside are also built, regularly arranged along the tunnel, for local access and the evacuation of people in the event of an accident or of fire inside the tunnel.

With high-speed trains (trains running at speeds of 250 km/h, or more) this conventional solution becomes problematic and, instead, two separated tunnels are usually built, each one for one direction of traffic, which are connected by cross-passages and provided with galleries to outside, for local access and the evacuation of people. However, in this solution the two tracks become without contact, not allowing for the trains to pass from one track to the other, in the case one of them becomes inoperable. Sometimes (for example, in underwater tunnels), instead of galleries to outside, is customary to build a third tunnel (service tunnel), between the other two, being also interconnected by cross-passages, regularly spaced, for local access and the evacuation of people. Both solutions are very complex to build and very expensive.

The TMG concept, recently developed, constitutes an innovative and very cost-effective solution for the construction of railway tunnels built with the TBM technique, allowing, with a single tunnel of common size interior diameter, the installation of two independent and isolated railway tracks (each one for a direction of traffic), as well as, a service gallery and appropriate arrangements to ensure the adequate safety conditions, being particularly adequate for high-speed railway lines.