

PA/VA

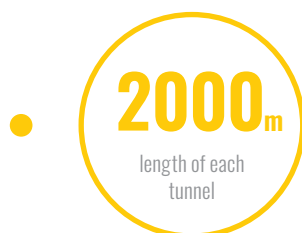
Zheleznitsa tunnel in Bulgaria

Introduction

„Zheleznitsa” on the Struma Motorway is the longest road tunnel ever built in Bulgaria and it is the first one equipped with a certified voice evacuation system.

The tunnel has separate bores for the vehicles to travel in each direction and they are approximately **two kilometers in length**.

The passageway have all the necessary systems for **energy efficient lighting, ventilation, video surveillance, fire alarm, intelligent traffic management system**.



Challenge

Key technical requirements of the project included:



to make **intelligible announcements** in the challenging acoustic environment, where there are high levels of traffic and ventilation noise, as well as long reverberation times;



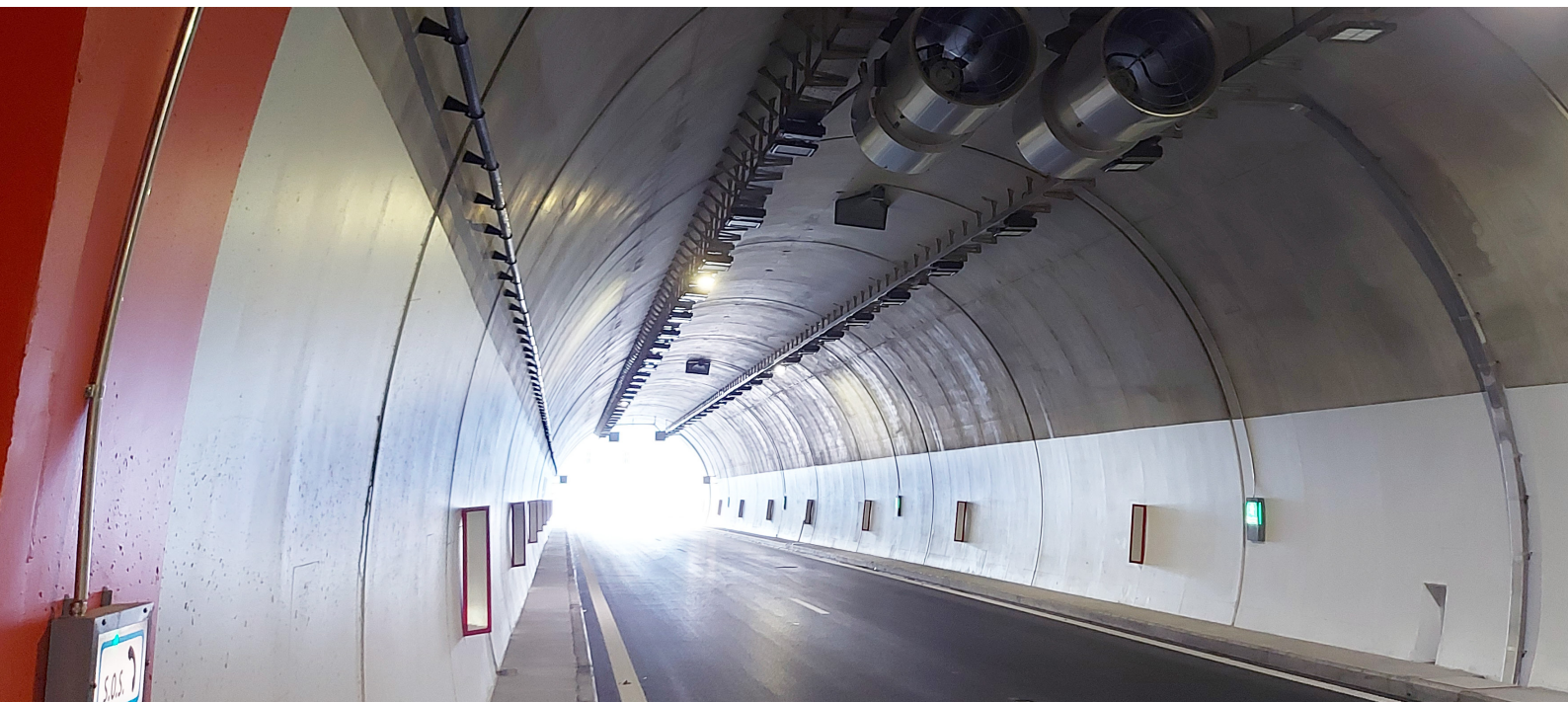
to install **specialised stainless steel tunnel horn loudspeakers**, certified to EN54-24;



to **provide system with individual loudspeaker delay**, compensating up to 2km distance delay;



Complete **SCADA integration**.



Solution

Tunnels offer a unique challenge when it comes to providing **intelligible voice messages**. In practice high levels of background noise and long reverberation time make it not possible to provide fair STI using typical horn speakers, as these are unable to provide a very high SPL level (up to 100 dB) consistently throughout the tunnel, without feeding reverberation.

The answer to this issue is to use specialized horn speakers with extremely precise directivity and high SPL output– such as the Ambient-System **ABT-TNL100 tunnel horn speaker**.

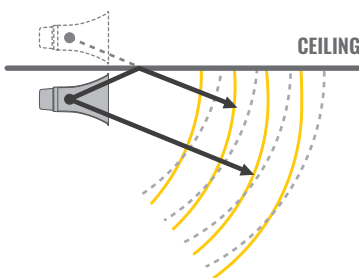
With a horizontal dispersion angle of **only 22 degrees**, the ABT-TNL100 minimises the sound energy that reaches the tunnel walls, resulting in a better direct to reverberant sound ratio and, in consequence, better speech intelligibility. At the same time the ABT-TNL100 loudspeaker's front-to-back ratio is approximately 35 dB **minimizing interference emitted from the rear of the device**.

These performance characteristics of the ABT-TNL100, combined with a time-aligned amplification system, with individual loudspeaker delay, **create a coherent wave front moving along the tunnel**, which increases the resulting intelligibility (STI) of the messages. .

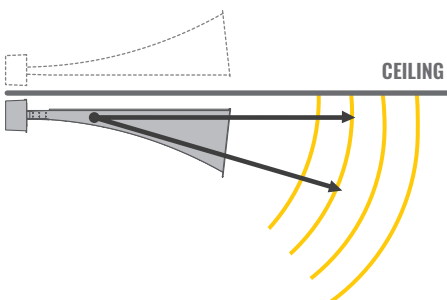
Key System Parameters:

- » Full digital audio transmission between system cabinets and remote microphones.
- » Remote control and monitoring using SNMPv2 protocol.
- » Up to 30 seconds delay available, individually set per loudspeaker.

Standard loudspeaker



ABT-TNL100 tunnel loudspeaker



Number of MultiVES PAVA racks located in 2 amplification rooms (at the northern and southern portal buildings).	4
Total number of ABT-TNL100 100W speakers installed inside the tunnels.	82
Total number of ABT-T2430 small format horn speakers to cover the escape routes.	24

