Photo: © AlpTransit Gotthard Ltd

CASE STUDY   MARKET: **RAILWAYS**   REGION: **EUROPE**   COMPANY: **ALPTRANSIT**

ALPTRANSIT GOTTHARD ON TRACK WITH WORLD'S LONGEST RAILWAY TUNNEL

Alcatel-Lucent has been contracted to supply telecommunications systems for the 57km Gotthard base tunnel through the Swiss Alps as part of a SFr 1.7 billion contract for installing railway infrastructure.

AlpTransit Gotthard Ltd, based in Lucerne, Switzerland, was founded as a subsidiary of Swiss Federal Railways Ltd (SBB) with the sole purpose of over-seeing the construction of the New Rail Link through the Alps between Zürich and Lugano. The project comprises the Gotthard base tunnel due to open in 2016 and the Ceneri base tunnel in 2019. The company employs a workforce of around 140, stationed in Lucerne, Altdorf, Sedrun, Faido and Bellinzona.

AlpTransit Gotthard San Gottardo

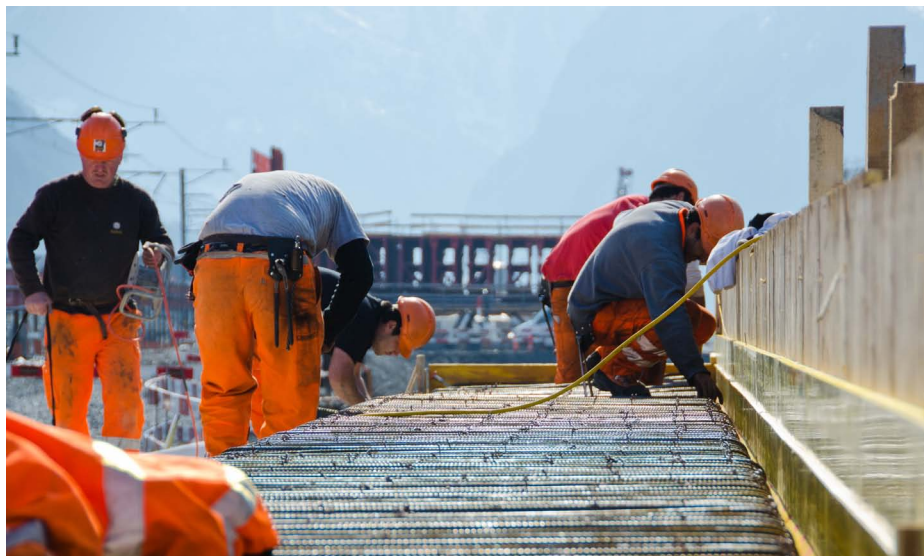**AT THE SPEED OF IDEAS**™

Alcatel·Lucent

Photo: © AlpTransit Gotthard Ltd

"We want a safe operation for both people and freight, so efficient communications are essential in such a complex system."

THE CHALLENGES

The twin-bore Gotthard base tunnel will be the longest railway tunnel in the world when commercial operations begin at the end of 2016. The length alone, at 57 km, provides its own problems, as the only access points for equipment and personnel in the preparation phase, and for evacuation in case of incident once it is in operation, are the portals at either end. Two emergency-stop stations are being incorporated, and there are two double crossover points to allow trains to change from one tunnel to the other. In addition, cross-tunnels have been built at 325m intervals between the twin tunnels, which are about 40m apart. All the equipment installed in the tunnel – power cables, communications systems, transformers and so on – is exposed to the high temperatures normally found at such extreme depths, and also dust and possibly moisture.

Like the twin tunnels, the railway infrastructure is now being installed in sections. The first section (Bodio-Faido West, 16 km) is now fully equipped with rail track, drainage, catenaries, signaling systems and telecommunications systems, and will be exhaustively tested in several stages. Telecommunications systems play a decisive role here, because it is vitally important for them to function optimally even under extreme conditions. Trains will

be controlled entirely by the standardized European Train Control System (ETCS) Level 2, with signals relayed direct to the driver's cab.

As most of the installations are difficult to access due to the distance from either portal, they must operate automatically so human intervention is reduced to a minimum. When the tunnel comes into commercial operation, trains will be passing through both tubes at high speeds and at frequent intervals, with planned four-hour maintenance windows at weekends.

WHY ALCATEL-LUCENT?

AlpTransit Gotthard's decision to award the contract for installing railway infrastructure was based on the economic and technical viability of the winning consortium, Transtec Gotthard, in which the Swiss operation of Alcatel-Lucent is a partner. Each partner in the consortium – which also includes Alpiq, Alpine Bau, Balfour Beatty and Thales – are among the leaders in their respective fields.

THE SOLUTION

Alcatel-Lucent is providing integrated delivery of the fixed network, the tunnel's radio system and a wavelength division multiplexing (WDM) network, initially using the Alcatel-Lucent 1696 Metrospan

Photo: © AlpTransit Gotthard Ltd

that connects to the IT solution. The fixed network includes a data network based on the Alcatel-Lucent Hardened OmniSwitch™ 6855, a communication installation for operations (voice services) and the tunnel's control system, which remotely monitors and controls the electro-mechanical installations in the Tunnel Control Center.

The tunnel's radio system transmits voice and data via GSM-R and Professional Mobile Radio (PMR) for concerns relating to railway technology, including operations, maintenance and intervention in case of an incident. It also acts as a platform for mobile telephone providers on the Gotthard line.

One of Alcatel-Lucent's first tasks was to install a temporary telecommunications system, which will be removed once the permanent system has been tested and approved. Installation involves a number of challenges which are being overcome be means of complex and detailed project management together with its Transtec Gotthard partners, which involves thousands of interfaces and sophisticated logistics techniques. Equipment is brought in in pre-assembled units and installed in the cross-tunnels. The ambient temperature in both the tunnel and cross-tunnels can go up to 45°C, so although a certain degree of cooling is provided by the air movement created by the passage of high-speed trains, Alcatel-Lucent's data network solution relies on equipment that needs no cooling. Any equipment that does require cooling is installed either outside the tunnel or in the air conditioned buildings at cross-over points.

THE BENEFITS

The Gotthard base tunnel venture is a ground-breaking project bringing considerable benefits not only for Switzerland and the high-speed passenger network but also the main trade route between northwestern Europe and North Italy. Without highly available, reliable telecommunications systems, the operation of a fast, frequent train service through a tunnel as long as this one would be inconceivable. The ETCS plays a key role here, with uninterrupted monitoring of

Photo: © AlpTransit Gotthard Ltd

"The biggest challenge is actually coordinating everything. There are thousands of interfaces and the logistics side is highly complex, but it can be managed with today's sophisticated techniques."

trains and messages transmitted direct to the driver's cab. Also important is that all aspects of operational management and railway processes are remotely monitored from the Tunnel Control Center.

The sheer complexity of the project demands a hierarchical structure, so contracting each stage of the work – in this case the railway technology – to a consortium is the most viable solution. The companies in Transtec Gotthard have a great deal of experience and

an excellent combined track record, including the rail technology contract for the Lötschberg base tunnel. Alcatel-Lucent already has valuable experience of the railway industry where a high level of availability is required; its Swiss-based global centre of competence for tunnels advises on projects all over the world.

For more information about Alcatel-Lucent 'Dynamic Communications for Rail', visit **www.alcatel-lucent.com/railways**

There is no doubt that the opening of the Gotthard base tunnel at the end of 2016 will be a tribute to the heroic efforts of all concerned and to their very high degree of cooperation on a pioneer project. As part of the Transtec Gotthard consortium, Alcatel-Lucent is delivering highly available, tried and tested telecommunications technology as its part in ensuring the safe, reliable operation of frequent high-speed trains through the world's longest railway tunnel.

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