The Rail Link through the Alps is accomplished

Travel safely and quickly through the Alps thanks to innovative train control systems from Thales
Project of the century

With the commissioning of the Ceneri Base Tunnel, the NRLA project of the century is completed
It all began between 2003 and 2007 with the first major base tunnel project: Thales equipped the 34.6-km Lötschberg Base Tunnel with innovative rail signalling solutions, including the ETCS Level 2 European Train Control System.

As a partner of the Transtec Gotthard consortium, Thales was subsequently responsible for the entire signalling infrastructure of the longest train tunnel in the world: the 57-km Gotthard Base Tunnel, which celebrated its opening in 2016.

The 15.4-km Ceneri Base Tunnel between Bellinzona and Lugano forms the final section of the transalpine corridor. Thales was also commissioned to install the signalling solutions for this section and had overall responsibility for planning, integration and commissioning of the train command and control systems.

Since its opening, travellers from Zurich can reach Milan in just under three hours. The Ticino commuter train service has also been massively upgraded. For commuters, the journey between Locarno and Lugano is now reduced to around 30 minutes.

Gotthard, the longest railway tunnel in the world
The Gotthard Base Tunnel runs from the north portal at Erstfeld to the south portal at Bodio, comprising two tubes that are 40 metres apart and connected by a cross passage about every 320 metres.

The tunnel runs at a depth of 2300 metres. This makes it not only the longest but also the deepest underground railway tunnel in the world.

Thales was responsible for the installation and integration of the entire signalling infrastructure and carried out all the test procedures under realistic conditions in our specially built test laboratory in Zurich.

Lötschberg, Gotthard & Ceneri
New transalpine rail link

Three base tunnels through the Alps bring the north and south of Switzerland and Europe closer together, helping to further shift freight transport from road to rail. Equipped with modern rail safety systems from Thales, the trains travel through the tunnels with maximum reliability and security.

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Our signalling and train control solutions for the Gotthard Base Tunnel
- ETCS Level 2 RBC in Pollegio, including portal areas with neighbouring RBCs in Axen and Claro
- 4 interlocking systems, including portal areas (Rynächt and Pollegio)
- ETCS Level 2 cab signalling
- 487 ETCS balise groups
- 223 ETCS signal boards
- 606 axle counter points
- 26 high-speed switch points
- 111 point light signals
- 22 cable distributors

Facts & Figures
- Commercial commissioning: 12 December, 2016
- More than 300 trains per day at speeds of up to 250 km/h in two separate tubes
- Travel time through the tunnel by passenger train: less than 20 minutes
30 minutes

The Ceneri Base Tunnel reduces commuters’ journey time between Locarno and Lugano to around 30 minutes.
The safety system realised by Thales follows the architecture already installed in the Gotthard Base Tunnel. Although the installation technically met the requirements of the Gotthard project, the topological peculiarities during all phases of the Ceneri project were a special challenge.

In the south, this involves a distance of only about 200 metres. Both in the south and in the north, extensive construction measures were carried out on the feeder lines. The reconstruction of the Giubiasco station [GIU] took place over several construction phases.

Coordinating the construction phases and the close collaboration with SBB were a key success factor for commissioning the Ceneri Base Tunnel (CBT) on time.

The confined space also meant that within the project perimeter itself, construction phases needed to be determined and the best solution for a balance between provisioning the infrastructure for construction site logistics and completing the definitive installations had to be weighed out.

«In high-speed European rail transport, the smooth interaction of safety and efficiency is of utmost importance. We are very proud of our contribution to the construction of the New Rail Link through the Alps (NRLA). Despite its great complexity, we successfully realised the entire railway safety system – the heart of the railway tunnel – in all three base tunnels.»

Technological challenges in the Ceneri Park

Short distances between portal and main line

The safety system realised by Thales follows the architecture already installed in the Gotthard Base Tunnel. The installation itself is distributed between the engineering buildings in Camorino and Vezia, as well as the engineering building in Bodio and the control centre in Pallegio. One of the special features of the Ceneri Base Tunnel project is the short distances between the portals and their respective connection to the main line.

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A leading role

Thales Rail Signalling Solutions took on a leading role in Switzerland in developing the state-of-the-art ETCS Level 2 train control system.
Borderless
Borderless rail traffic in Europe thanks to ETCS
Our ETCS System Engineering designed the specific solutions for the various requirements of the installations, in accordance with official and operational specifications.

The basis of the solutions is the simple, easy-to-use architecture of our security system, which was tailored to local operating conditions. This requires efficient interaction between the systems at the vertical level (neighbouring systems) as well as at the horizontal level (operations -> controlling -> safety), which can be achieved through interfaces that are as standardised and as proven as possible.

Our interoperable ETCS solutions ensure the transmission of information between the track safety system and the trains along the entire route, thus enabling continuous tracking and controlling of the maximum permitted speed by the radio block centres (RBC) and the units on board the trains.

With track and train data forwarded to the control centre and operations, this makes additional information available that can be used for precise operations and environmentally friendly train controlling.

Line capacities and safety are thus increased considerably, with delays at borders avoided and journey times shortened – because thanks to ETCS, all trains speak the same language.

This means significant cost savings for operators and offers passengers a more pleasant rail journey.

**ETCS expertise and interoperability**

**Key factors in our solutions**

The European Train Control System (ETCS) makes it possible for trains to cross borders without changing locomotives. It is a component of the EU’s unified European Rail Traffic Management System (ERTMS), to which Thales made a significant contribution in its development.

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**Interoperability (IOP) is the key**

An essential aspect of the overall system is a communications interface between the infrastructure and the vehicles, i.e. its interoperability – the core of our ETCS solutions.

This was already identified as an important issue at the beginning of the Lötschberg project, so that corresponding initiatives for the coordinated, successful synchronisation and implementation of this interface could be launched and continuously improved.

Interoperability tests are currently standard. They form part of network access conditions, so that trains in Switzerland can run with ETCS L2. During the tests, both the behaviour within ETCS L2 and the changes from or to the optical sector, which is equipped with ETCS L1LS, are intensively tested in the IOP laboratory. If the test results meet the conditions, Thales issues the certificates to its on-board unit (OBU) suppliers.

Thales has built up a team of recognised specialists in the field of safety installations in Switzerland and created a centre of excellence for IOP services for ETCS-compliant solutions.

This centre of excellence has been accredited as a test laboratory for integrated, technical, ETCS interoperability by SAS, the Swiss Accreditation Service (STS 0659).
Before software goes into the field, it is tested in the lab
Safe, reliable railway operations are only possible if the interaction between monitoring and rail safety systems is extensively tested. To this end, highly complex testing facilities – unique in this form – were set up at the headquarters of Thales Rail Signalling Solutions AG in Zurich.

Real-life conditions
Original systems – from power supply to interlocking computers – make real-life conditions possible in the lab. As a component of the driver’s cab ETCS L2 signalling system, the radio block centre (RBC) is an important link between the interlocking, the control system and the driver’s cab. The RBC is therefore integrated as fully operational in the lab. The control centre, which plans, controls and monitors train operations, is also tested and checked in the lab with original systems. In addition, the interaction of interlocking hardware and software is verified, and the high demands on the safety installation data networks are tested under real conditions. This also includes automatic, near-schedule testing that maps and tests near-operational train traffic.

The testing engineer acts as a train driver
Because no real trains can pass through the lab, they are simulated. A complex testing environment allows the replication of train traffic with up to 90 trains at the same time. Testing scenarios reproduce the various train types in real terms with their acceleration and braking behaviour.