SIEMENS

siemens.ch

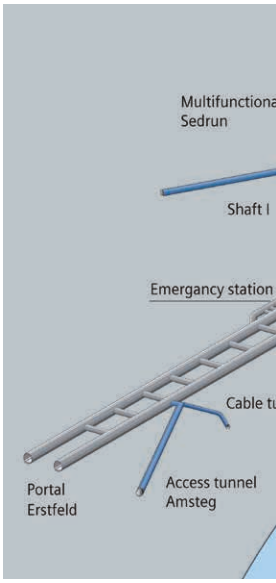
LP60 Tunnel Control System

Fully integrated Tunnel Control System for the Gotthard Base Tunnel

Answers for mobility and logistics.

The longest railway tunnel in the world

The 57 km Gotthard Base Tunnel, which is set to be the world's longest railway tunnel, is currently under construction between Erstfeld and Bodio (Switzerland). It is scheduled to go into commercial operation in December 2016. The Tunnel Control System operating in the Tunnel Control Center (TCC) is the core element that has overall control of the tunnel's electromechanical equipment and oversees the management and execution of the tunnel's operational processes.



To ensure problem-free operation of the Gotthard Base Tunnel, 100% availability of the overall system is required. For that purpose two control centers are under construction at the north and south portals of the Gotthard Base Tunnel. In these control centers two fully redundant Tunnel Control Systems (TCS) will be installed which will monitor and control all of the tunnel's electrical systems. All required data is consolidated and visualized in these centers. Systems for maintenance management as well as for emergency response are also part of the Tunnel Control System.

Alcatel-Lucent Switzerland, one of the four partners that make up the Transtec Gotthard consortium, commissioned Siemens Switzerland Ltd to produce and install the Tunnel Control
System.

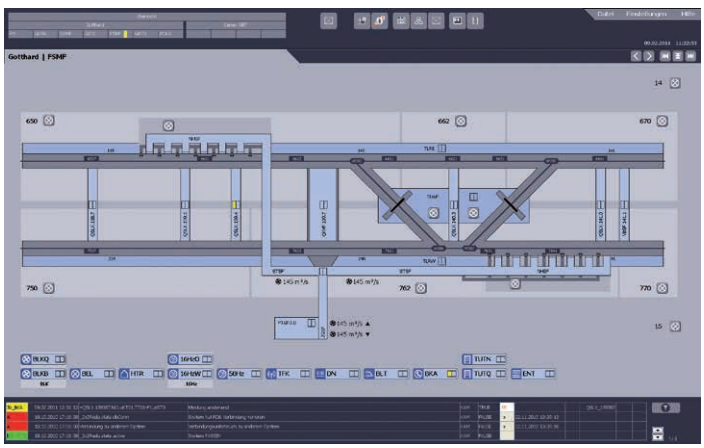
To fulfill the high requirements on availability, identical Tunnel Control Systems will be installed in the TCCs, which are in themselves fully redundant.

This 2x2 redundancy guarantees a high level of safety against failures: if for example one of the TCC computers at the south end fails, its tasks will be taken over by the second computer. If both computers fail then the Tunnel Control Center at the north end will automatically maintain emergency operation.

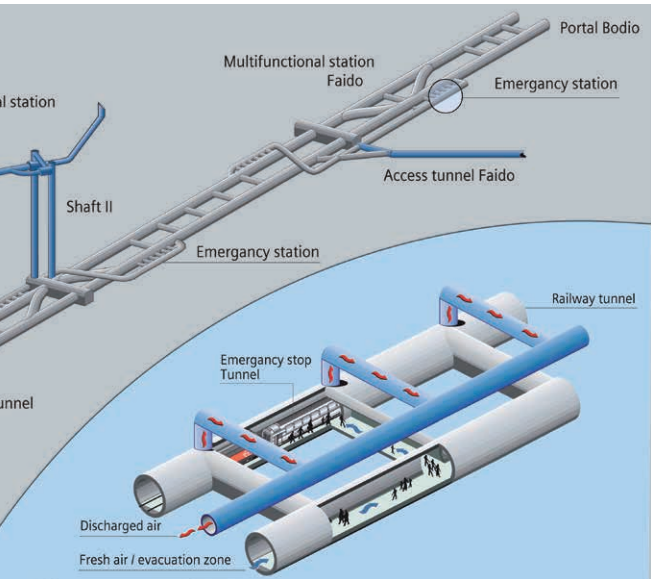
Comprehensive monitoring
All the electrical equipment in the tunnel is continuously monitored. All malfunctions are immediately reported on the user interface of the Tunnel Control System. The universal message navigation system directs the operator straight to the source of the problem. The Tunnel Control System's user interface also displays all messages that are relevant to operations, for instance:

- status of radio communication equipment
- emergency calls
- status of lighting systems

The Tunnel Control System uses the information it receives to provide a visual overview. This shows both the status of all the electrical and mechanical systems and the location of all the trains that are currently in the tunnel. The operator can call up this overview on the wall display and/or on any of the individual operator stations.



Multifunction station is the operator interface to the tunnel control system



Concept pattern LP60 schematic

Picture of a tunnel control center with display wall

The tunnel control system will be ready for operation from the summer of 2015.

Emergency scenarios
Emergency scenarios for the Gotthard Base Tunnel are of particular importance. Their starting point is in the rail traffic monitoring functions of the train control system

Any malfunctions in rail operations will be detected by the train control system and forwarded to the relevant electrical systems via the "tunnel reflex" facility. This automatically initiates all the necessary scenarios for dealing with the event.

For example, appropriate ventilation is activated, lights are switched on and doors opened at the next emergency stopping place for the affected train. If necessary, further actions may be taken, for instance draining the storm water reservoir at the north or south end so that it will be available if necessary to hold contaminated run-off from firefighting operations. Alternatively, it might be necessary to switch over the ventilation of the tunnel's technical rooms to prevent smoke from damaging the equipment.

In such emergency scenarios the Tunnel Control System monitors that these emergency procedures are handled correctly by setting up a time control to monitor each individual step. If procedures are not initiated automatically and correctly in time the operator is informed via appropriate messages on his/her control station.

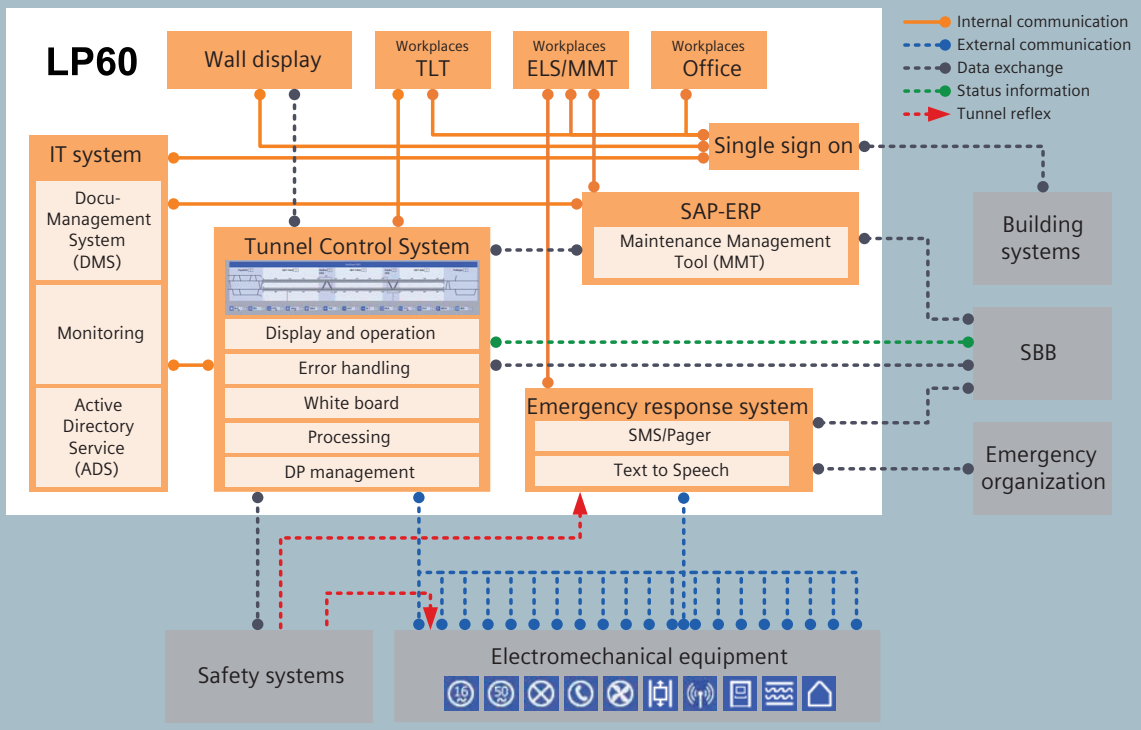
The emergency response system that is part of the Tunnel Control System also triggers all other necessary measures to handle an emergency. For that purpose a database of appropriate actions and information measures for each type of occurrence is included in the emergency response system. In the event of an emergency, this enables the head of operations to alert the appropriate rescue services, such as the police, fire service and/or ambulance service. The system also offers a convenient way to surveil intervention areas.

Maintenance
A rail tunnel the size of the Gotthard Base Tunnel requires a comprehensive maintenance system. As an additional component of the Tunnel Control System, the maintenance management tool allows centralized planning of maintenance work.

This system keeps a record of all the installed system components to an appropriate level of detail necessary for maintenance activities. For each such component the system knows which company supplied it, where the relevant spare parts are stored, which tools would be needed to replace them and where to find the relevant maintenance manuals. If a malfunction is reported in any of the tunnel's electrical installations this is automatically reported to the maintenance management tool and forms the basis of the maintenance plan.

Comprehensive testing
The complex Tunnel Control Center, comprising the Tunnel Control System, maintenance management tool, emergency response system and the supporting IT infrastructure, will be comprehensively tested at an early stage. For that purpose there will be a six-month period of trial operation in the west tube between Faido and Bodio, starting in December 2013. The experience gained from these tests will allow optimizations to be incorporated before completing the installations for the whole tunnel.

LP60 System Overview – Gotthard Base Tunnel



Highlights of the Tunnel Control Center

- double, fully redundant tunnel control system
- emergency response system
- maintenance management tool
- standardized user interface for all the installed systems
- approx. 70 000 input/output messages and commands in the final configuration

Integrated systems

- power supply
- catenary system
- ventilation and air conditioning
- lighting
- drainage
- elevators
- data network
- tunnel radio
- communication equipment
- gate and door operation
- building control system
- many more sytems besides

Client

On May 4, 2007 Alp Transit Gotthard AG, the building controller for the New Transalpine Rail Link (NEAT), appointed the Transtec Gotthard consortium as general contractor for the installation of rail technology in the Gotthard Base Tunnel. Transtec Gotthard comprises the companies Alpiq, Alcatel-Lucent/Thales RSS (as a consortium), Alpine-Bau and Balfour Beatty Rail.

In 2009 Alcatel-Lucent Switzerland awarded Siemens Switzerland Ltd a contract to install and implement the tunnel control system.

Siemens Switzerland Ltd
Infrastructure & Cities Sector
Mobility and Logistics
Hammerweg 1
8304 Wallisellen
Schweiz
Tel +41 585 580 111
Fax +41 585 585 501
www.siemens.ch

Order no.: A 19100-V010-B103-X-7600 | HTS 9067/213

Printed in Switzerland | Subject to change