

Sika at Work



Adlertunnel





Project Description

The Adler railway tunnel lies between Liestal and Muttenz near Basle in Switzerland; it is 5.3 km long and the original construction took 5 years with completion and opening in 2000. The tunnel was part of 'Bahn 2000' (a major extension and renewal project for much of the Swiss rail network). However, only 10 years after completion, arch cracks occurred at about 40 meters due to excessive swelling of Gypsum Keuper in the surrounding geology, so substantial repair works were urgently required. The forces exerted had actually lifted the tunnel invert by up to 70 mm over a 40 m section. To permanently solve this problem, additional concrete beams were installed as abutments along the lifted section and these were firmly anchored with rock bolts, to transfer any future forces directly into the bedrock of the mountain.

Project Requirements

To protect the reinforced concrete beams and rock bolt head plates in case of fire, a passive fire protection system also had to be installed. The fire protection requirement was the fire load scenario in International Standard ISO 834 - 'Fire curve for an exposure time of 60 minutes'. The inner lining and abutments structures were also specified to not exceed a temperature of 200°C, with a maximum temperature of 120°C allowable for the steel bolt head plates after the same time period. These head plate recesses also had to be easily accessible at all times in operational service, so that the bolts can easily be monitored and retightened as required.

Due to the limited structural dimensions, the fire protection system layer thickness was also ideally to be limited to a maximum of 3 cm, plus in operation the fire protection layer had to withstand loadings of 4.0 kN/m² from the air pressure / wind suction created by the rail traffic.

Additionally a single track rail operation had to be maintained continuously during the fire protection works.

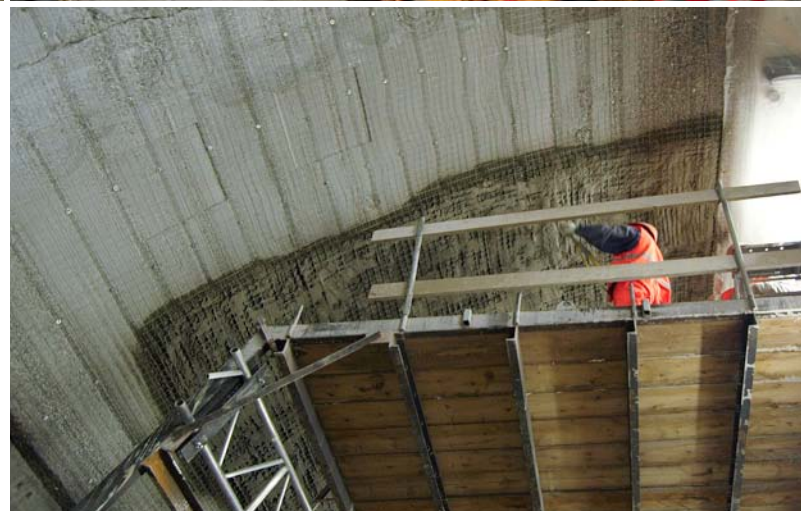


Sika Solutions

Sikacrete®-213F was selected as the fire protection system in the repaired tunnel section as it could meet all of the requirements at a layer thickness of just 3 cm. To ensure optimum adhesion to the substrate, the concrete surfaces were initially prepared by high pressure water jetting. Wire mesh was also fixed onto the concrete to reinforce the fire protection system, where it is exposed to the suction pressure stress from the trains. Removable fire protection panels were produced and installed in the bolt head recesses to make monitoring and re-tightening as easy as possible. As single-track rail operations were continuing the **Sikacrete®-213F** fire protection mortar was spray applied in stages, first the apex, then the abutment structure and around the removable fire protection panels. The traffic was then switched to the other track and the fire protection was installed on the other side. A total area of more than 750 m² was protected with the **Sikacrete®-213F** system.

Sika Products

- Fire protection mortar
Sikacrete®-213F





Project Participants

Owner: **Swiss federal railways SBB**

Engineer: **Basler & Hofmann**

Contractor: **Marti Bauunternehmungen AG**

Applicator: **Viktor Wyss AG**

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