



# SIKA AT WORK

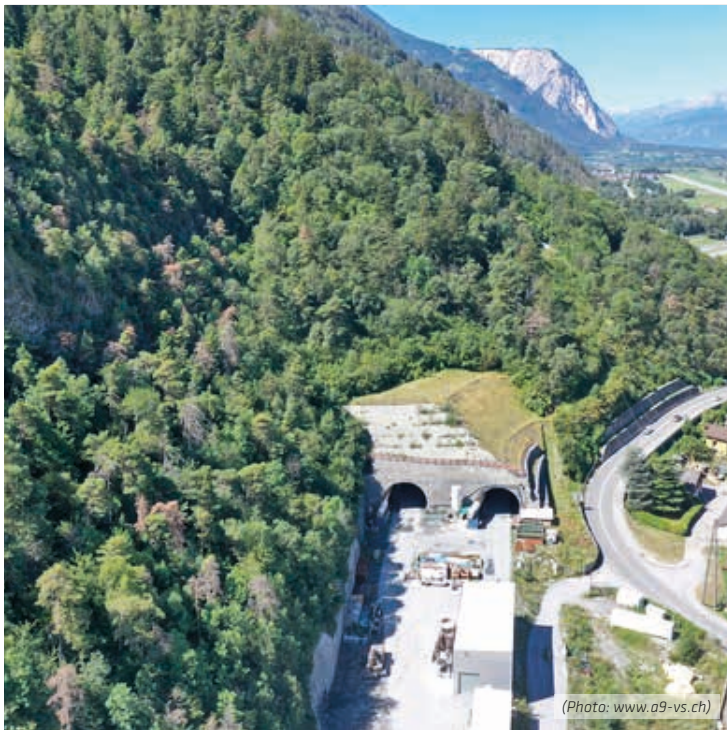
## RIEDBERG TUNNEL, SWITZERLAND

WATERPROOFING: SikaProof®, Sikaplan® WP Drainage Angle, Sika Boom®

CONCRETE PRODUCTION: Sika ViscoCrete®, Sika® Sigunit®, Sikacrete®,  
SikaPump®, SikaRapid®, Sika® Cosmetic, Sika® Stabilizer

BUILDING TRUST





The engineering challenges associated with the Riedberg Tunnel on the A9 motorway are significant. The opening of the 500-meter-long tunnels is planned for 2026.



In spring 2017, excavation work resumed with elaborate reinforcement using steel beams and reinforced in-situ concrete rings. The profile in the already excavated section was widened.

## TUNNEL CONSTRUCTION AS A SPECIAL CHALLENGE

**Sika stands for expertise in tunnel construction. The know-how of specialists was in high demand for the demanding Tunnel Riedberg project in the Upper Valais region – from technical consultation to the supply and application of waterproofing system solutions.**

### PROJECT DESCRIPTION

The Riedberg Tunnel is a significant structure on the A9 motorway in the Upper Valais region. The geological conditions in the section near Gampel-Steg, next to the main road heading towards Goppenstein-Kandersteg, pose a particular challenge as the mountain slope is sliding. Investigations revealed that over the past 60 years, it has moved downward at an average rate of around 1 cm per year.

As a result, just one year after the start of excavation work for the two 500-meter-long road tunnels, construction had to be halted in August 2005 due to slope movement and profile deformations – after only 133 m of excavation in the north tunnel and 192 m in the south tunnel.

A task force immediately implemented various measures in the following months, such as drainage drilling to minimize water pressure and reduce slope creep. This was carried out in 2006. In 2007, radial jetting with cement injections and toe fillings were implemented. Subsequently, work was stopped to monitor slope movement and to develop a new detailed project.

The aim was to design the tunnel in such a way as to minimize the effects of slope movements and maximize the service life. As a result, the monitoring system was expanded, and since 2012, constructive measures have been implemented. These include stiffening elements in the portal areas, reinforced excavation profiles, ductile design of the inner shell, and 35 cm reserve for any adjustments to the alignment in the standard cross-section.

In spring 2017, excavation work resumed with elaborate reinforcement using steel beams and reinforced in-situ concrete rings. The profile in the already excavated section was widened accordingly. In spring and summer 2022, drainage angles for the lateral drainage system were installed. Shortly thereafter, the drainage layer and waterproofing system started using the innovative fully bonded system SikaProof®-200.

### PROJECT REQUIREMENTS/CHALLENGES

The demanding geology surrounding the Riedberg Tunnel posed major challenges for planners, engineers, and contractors. Special waterproofing system was needed to ensure full watertightness also with the expected massive movements. The system had to be redundant, maintainable, and repairable. Here is an overview:

1. Protective layer to compensate for unevenness of up to 30 mm in the area of the steel arches.
2. Waterproofing: Wrinkle-free installation and good bonding with the concrete inner lining.
3. Waterproofing: Even in case of punctured membrane, the waterproofing is resistant to water migration. Tested at 7 bars.
4. Special block joint design to accommodate high deformation.
5. Concrete inner shell: Self-compacted concrete (SCC) filled up to the roof gap injections are still possible.
6. Inspection of the membrane bonding to the concrete with video cameras.





To protect the tunnel structure from water ingress, SikaBau AG, as the contractor, utilized the SikaProof®-200 in a drained waterproofing system.



In spring-summer 2022, Sikaplan® WP Drainage Angles were installed, followed shortly after by the bottom part (kicker) of the drainage layer and SikaProof®-200.

### SPECIAL FEATURES OF THIS PROJECT

Due to the challenging geology with a sliding slope, a special concept of permanent bearing excavation support was developed. The rock support concrete was aerated on site when placed in situ. The inner lining was poured with self-compacting concrete (SCC).

10 cm wide block joints capable of accommodating larger movements were engineered. The SikaProof®-200 fully bonded waterproofing allows independently sealed blocks without the risk of water migration between the membrane and concrete vault.

### SIKA SOLUTIONS

To protect the tunnel structure from water ingress, SikaBau AG, as the applicator, used the SikaProof®-200 system solution as an “umbrella” waterproofing. The waterproofing FPO sheet, fully bonded to the fresh concrete, was installed on approximately 28,000 m<sup>2</sup> area in the two Riedberg Tunnel tubes with lengths of 536.90 m and 565.30 m and in the cross-passages.

Also applied were heavy protective geotextiles such as SK Protect and Sikaplan® WT Protection Sheet, which meet the requirements of SIA 272 for buildings below ground. For the production of shotcrete and special concrete such as Sikacrete®-16 SCC, various products from the Sika range were used, Sika ViscoCrete® SC-403, Sika® Sigunit® L-53 AFS, Sika ViscoCrete®-4027, SikaRapid® C-100, and Sika® Stabilizer-4 R. Enkadrain 20 mm was used as drainage material.

### PROJECT PARTICIPANTS

Customer:	Canton of Valais, Department of National Roads
Contractor:	ARGE = JV Tunnel Riedberg Frutiger AG, Prader Losinger AG, Interalp Bau AG
Engineer:	Amberg Engineering AG, AFRY + CSD Ingenieurs AG, Site supervision
Applicator:	SikaBau AG, Visp

### SIKA PRODUCTS

- Sikaplan® WT Disc
- SikaProof®-200
- Sikaplan® WT Protection Sheet-20 H, 50 cm strips
- Sikaplan® WP Drainage Angle
- SikaProof® Fix Tape-50
- SikaProof® Patch-200 B
- Sika Boom®-131 Multiposition

### Concrete admixtures:

- Sika ViscoCrete® SC-403
- Sika® Sigunit® L-53 AFS
- Sikacrete®-16 SCC
- SikaPump® Start-1
- Sika® Cosmetic
- Sika ViscoCrete®-4027
- SikaRapid® C-100
- Sika® Stabilizer-4 R

# NEW GENERAL TUNNEL WATERPROOFING WITH SikaProof®



Our most current General Sales Conditions shall apply. Please consult the most current local Product Data Sheet prior to any use.



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