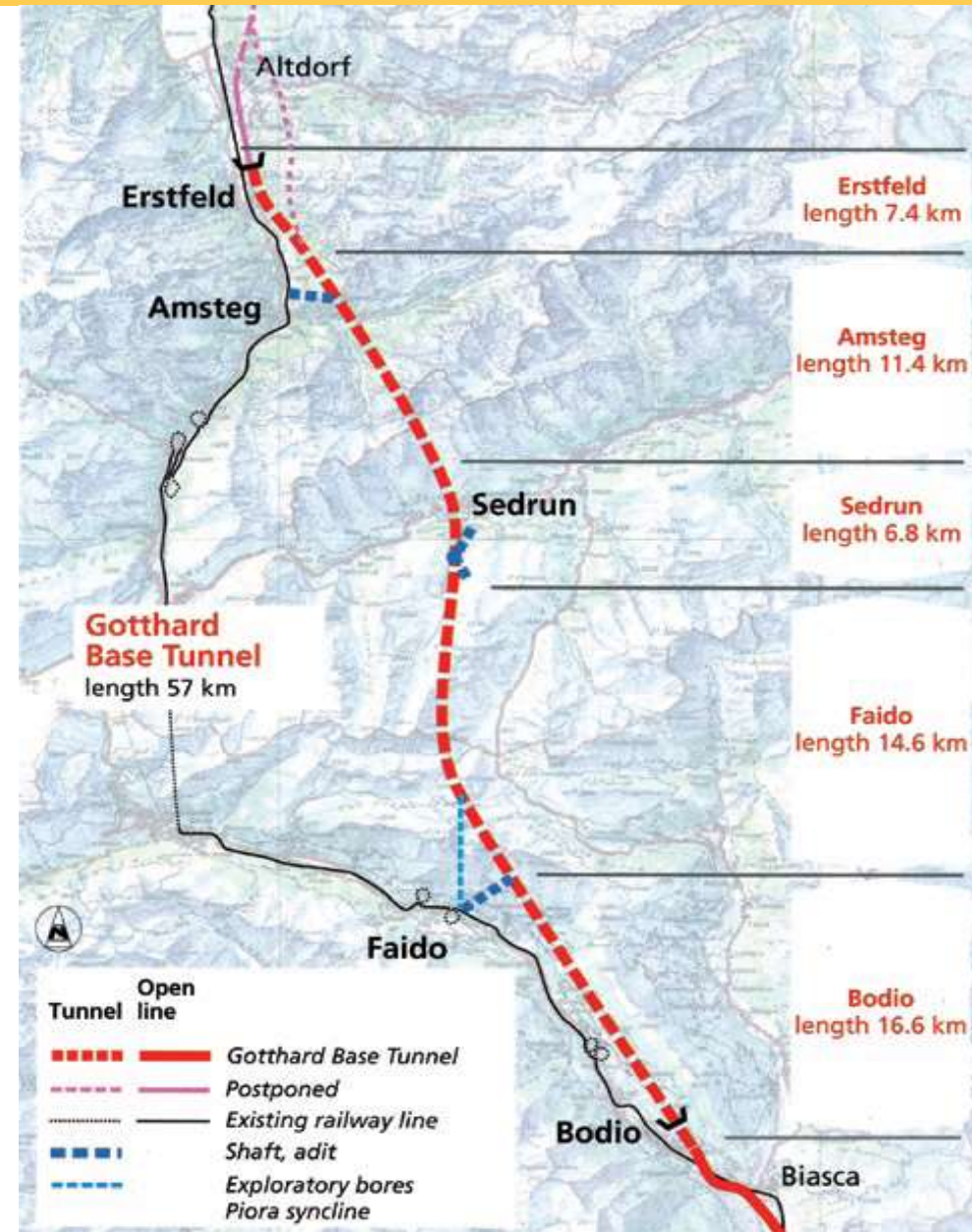


Gotthard Railway Base Tunnel and Sika solutions

Creation a flat rail link for future travel through Alps

Milan Jašek, Sika CZ



Flashback – Sika almost 100 years ago

- **1910** – Sika Company foundation in Zurich, CH by Kaspar Winkler
- **1910** – Developing of Sika-1 – a legendary water and moisture resistant admixture
- **1916** – A big challenge - waterproofing of old Gotthard railway tunnel from 1882 for its impending electrification
- **Sika-1; Sika-3**
– right products at the right time



NEAT

Neue Eisenbahn Alpentransversale

Flashback – Sika almost 100 years ago



Sika®

New Gotthard Base Tunnel



- Revolution in railway traffic between the North and the South in Europe
- Crossing Europe by rail is getting faster than by air... Zurich – Milan by train in 1 hour.
- Utilization by both
 - Massive freight trains - because the line is almost flat, trains can be twice as heavy and go faster than those which have to climb to today's tunnels.
 - Modern high-speed passenger trains (250 km/h)

New Gotthard Base Tunnel – Sika is here again

1. Requirements and conditions

- Concrete service life 100 years
- Concrete transport distances up to 30 km
- Concrete workability up to 6 hours
- High temperatures 30 - 40°C
- High humidity above 80%
- Corrosive mountain water



New Gotthard Base Tunnel – Sika is here again

2. Sika concrete professionals ensure quality

- Variation of admixtures quantities
- Only processed excavation material from rock is used as concrete aggregate
- Samples of freshly mixed so as newly sprayed concrete taken and tested continuously
- Flow diameter of fresh concrete measured more than 15 000 times



New Gotthard Base Tunnel – Sika is here again

2. Sika concrete professionals ensure quality

- Using of excavated material only
 - Reduction of landfill quantities
 - Reduction of raw materials transports – sustainable production
- Continuous variation of the material = continuous adjustment of concrete formula
- Guarantee that the tunnel will hold for 100 years without major renovation work.



New Gotthard Base Tunnel – Sika is here again

3. Fruitful cooperation in the tunnel

- 6 years lasting comprehensive qualification process – forces of concrete and admixtures suppliers were joined
- Sika and Holcim made a collective money and effort investment – formulas improvement like never before
- Order for three of five contract sections was received + Holcim as a special key customer



New Gotthard Base Tunnel – Sika is here again

4. Three of five tunnel sections

- Section 554 Bodio & 452 Faido
 - Two single-track tunnels at 40m centre distance
 - Diameter 8,8m resp. 9,4m
 - Length 2 x 14,4 km resp. 2 x 11,1 km
 - Emergency stop station Faido
- Section 360 Sedrun
 - Two single-track tunnels at 40m centre distance
 - Diameter up to 13 m
 - Length 2 x 7,5 km
 - Emergency stop station Sedrun



New Gotthard Base Tunnel – Sika is here again

5. Sika solutions for New Gotthard Tunnel

- **Sika® ViscoCrete®** - super plasticizers (HRWR)
 - Guaranteed workability for actual mix design (w/c ratio)
 - Flow table spread 30 – 55 cm
- **Sigunit®** - shotcrete accelerator
 - Guaranteed early strength (3 N/mm² after 4 hours)
- **SikaTard®** - long time retarder
 - Guaranteed workability time (6 to 8 hours)



New Gotthard Base Tunnel – Sika is here again

5. Sika solutions for New Gotthard Tunnel

- **Sika®-PM** - shotcrete spraying system
- **SikaPlan®** - waterproofing membrane
- **Sikacrete®** - fire protection mortar
- **Aliva®** - TBM spraying robot



New Gotthard Tunnel – 57km; 2 000m below the rock top

Facts and Figures:

- Qualification process – 1996 - 2002
- Sika pre-investment – 3 MCHF
- Construction period – 2002 - 2017
- Sika Sales – ca 200 MCHF
- Admixture supply – 3,5 mil. m³
- Waterproofing – 3 mil. m²
- „Tailored“ solutions and applications
- Concrete spraying systems installation



Thanks for your kind attention

The Sika logo is a red triangle with the word "Sika" in white, stylized font. A small registered trademark symbol (®) is located to the right of the word.

Sika®