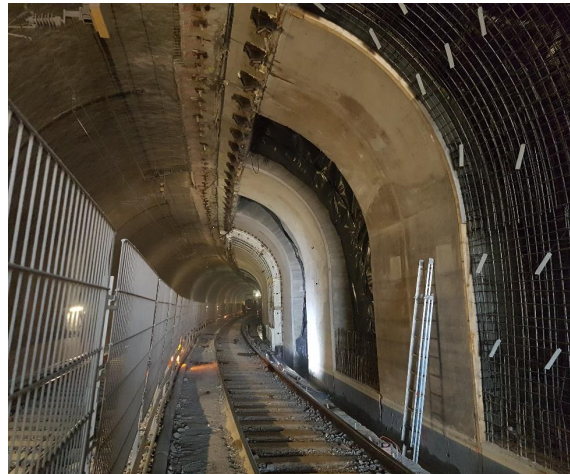


# Maroggia Railway Tunnel

Switzerland

Presented by: Nikolaos Lavdas





**Maroggia Railway Tunnel** is located in the European railway Corridor Rhine-Alpine, connecting the North sea with the Mediterranean sea.

**Corridor Rhine-Alpine** is a project to improve rail freight transportation in Europe and to encourage modal shift from road to rail.



**Maroggia railway Tunnel** is located in a **narrow passage** between the lake of Lugano and a steep mountain slope ensuring the traffic between Switzerland and Italy.

In 2011 the large-scale project "**4m-Corridor**" requested all tunnels along the north – south railway corridor of Switzerland to ensure an operation of **freight trains with a larger profile providing corner height of 4 m**.





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The **570** m long **Maroggia tunnel** of the Swiss Federal Railways (**SBB**) is in operation as double – track railway tunnel since **1874**.

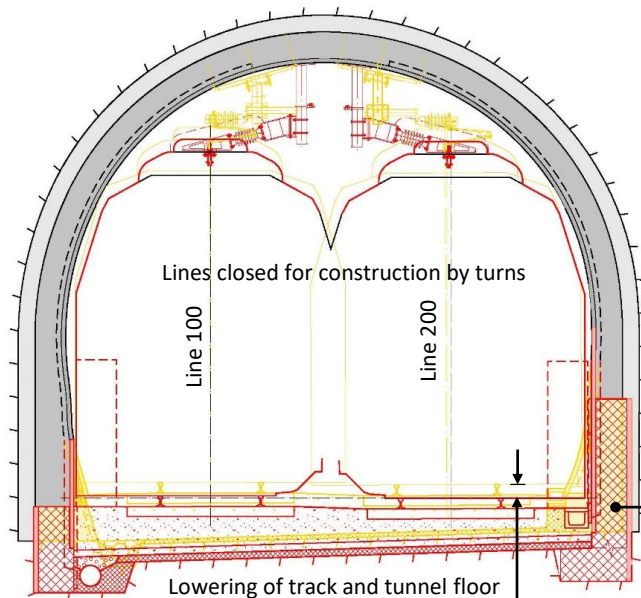
The tunnel is considered as **one of the oldest tunnels in Switzerland**.

The horseshoe shaped tunnel lining consists of **masonry** and is backfilled by stones and blocks.



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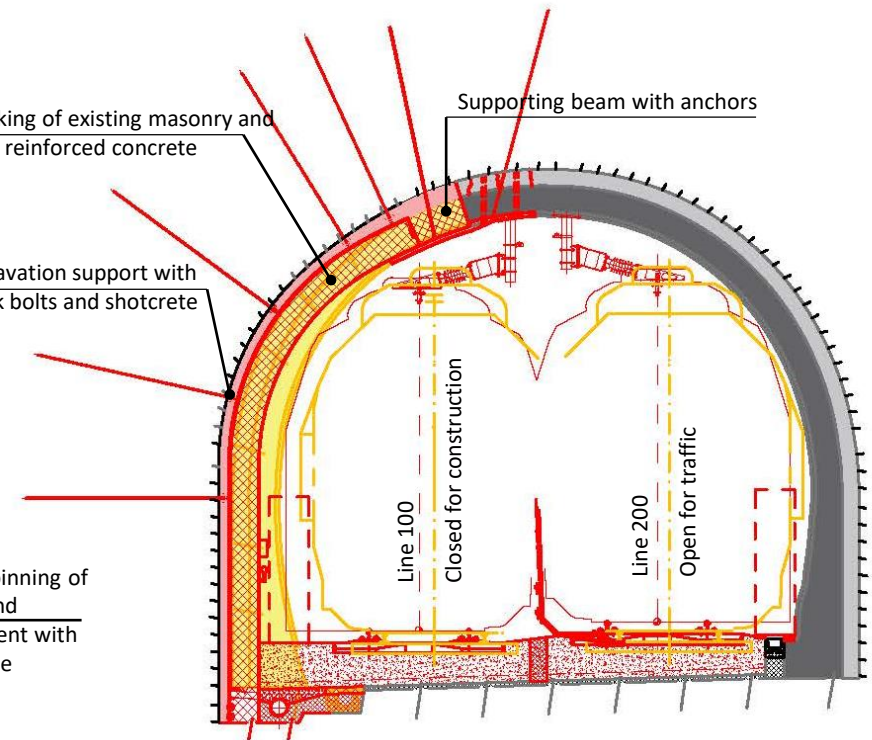
PROJECT  
OF THE YEAR INCL.  
RENOVATION  
- UP TO €50 M -



One-sided breaking of existing masonry and replacement by reinforced concrete

Excavation support with rock bolts and shotcrete

Both-sided underpinning of the tunnel walls and partially replacement with reinforced concrete



In order to meet the new standards, a **track lowering** of ca. 25 cm was planned **initially** requiring a double-sided underpinning of the masonry lining.

Initial project

In the tender offer, an innovative **alternative** solution was brought from a constructor that could clearly reduce the time for completion: **one-sided widening** of the tunnel profile

Executed project (alternative solution)



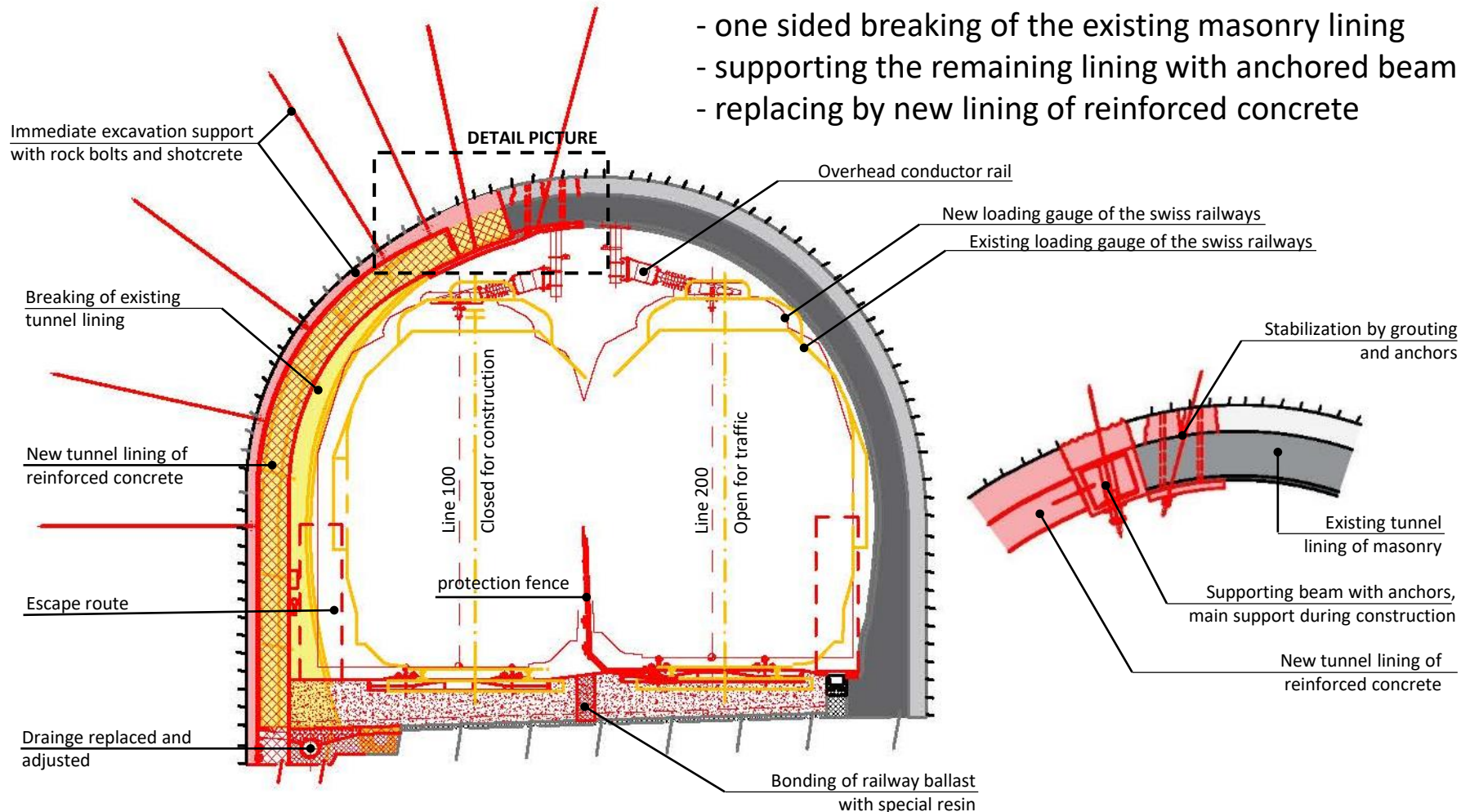


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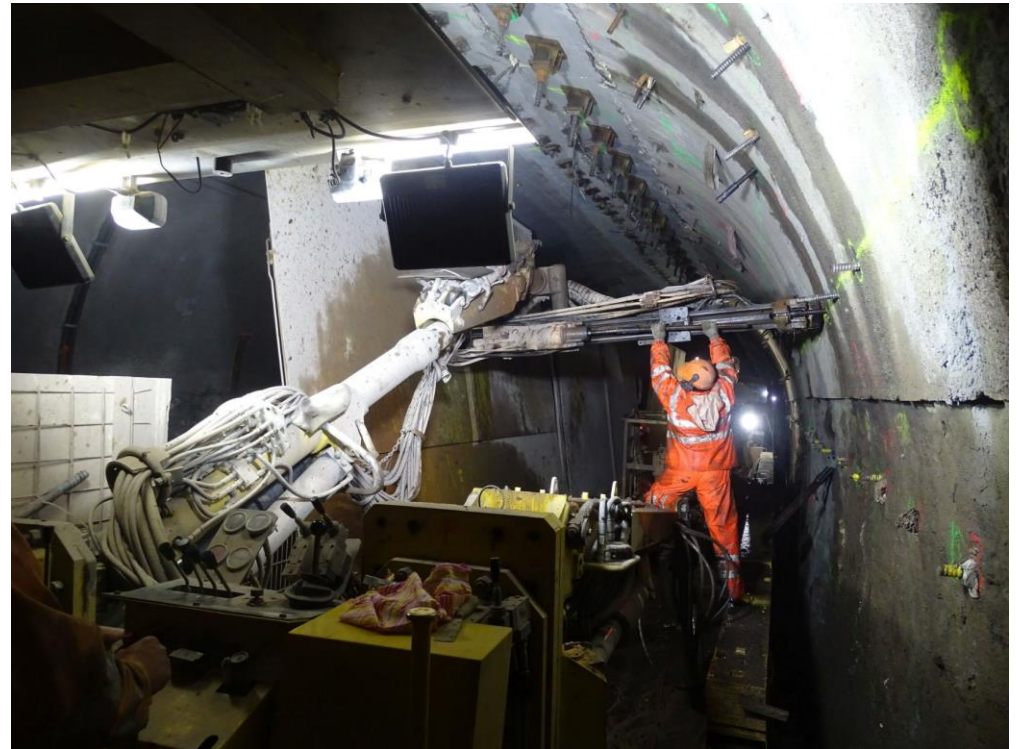
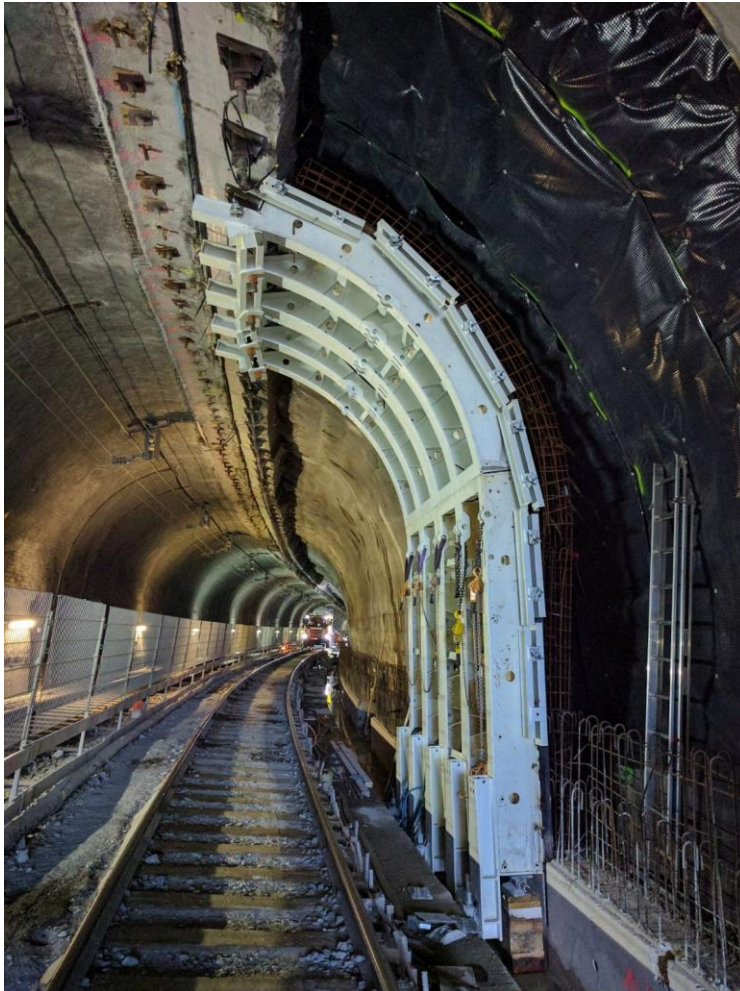
### Alternative solution:

- one sided breaking of the existing masonry lining
- supporting the remaining lining with anchored beam
- replacing by new lining of reinforced concrete



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### Challenges:

#### **Rolling wave planning**

practically no time available for planning in advance

#### **Work Safety**

extremely tight space available in the working track

#### **Railway Operational Safety**

ongoing traffic in the other track inside the tunnel, about 200 trains per day = 1 train every 6 minutes or ca. 70'000 per year





## Challenges:

### **Environmental protection**

drink water protection area, lake of Lugano

### **Difficult Geological Condition**

sliding slope, geological fault zone, soft soil  
near portal (cut-and-cover section), ongoing  
geological exploration

### **Risk of impairment neighbouring structures**

highway tunnel above the Railway tunnel,  
especially in the sliding slope, Church above  
tunnel (UNESCO World Heritage)



## Challenges:

### Innovative Solutions

continuous supporting the remaining masonry over the whole rock section (length of ca. 500 m) with supporting beam

widening the tunnel profile in the portal section of soft soil (cut-and-cover section)

widening the opening of the portal walls and replacing the monumental stones of the edge



## Added - Value:

**Renovation Time:** reduction by ca. 25% toward the time of the initial standard concept d.h. ca. 6 months.

**Cost Savings:** time reduction opened the way for an earlier realisation of neighbouring projects along the “4m corridor”

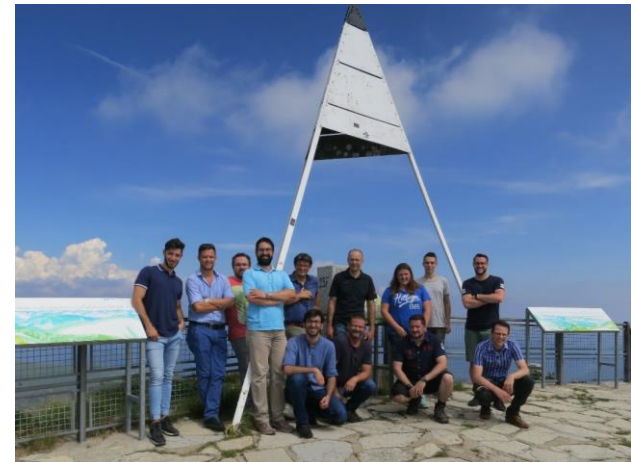
**Minimization impact on the railway traffic** during the renovation.

**Satisfaction of railway passengers** that passes weekly through the Alps professionally or for vacations: “4m corridor” inclusive Gotthard base tunnel reduce travel time up to 30-60 minutes.

Facilitation of european freight transport and modal **shift from road to rail**.

**Quality of tunnel:** renewal of the tunnel lining

**Inspiration of tunnel engineering:** successful innovation







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## Maroggia Railway Tunnel Switzerland

**client:** Swiss Federal Railways (SBB)

**project and construction management:**  
Rothpletz, Lienhard + Cie AG;  
Pini Swiss Engineers SA

**structural work contractors:**  
Marti Tunnelbau AG,  
Mancini&Marti S.A.

Thank you!