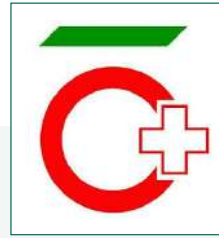


# Switzerland



being made for the next phase of the rehabilitation.

## Second Gotthard Tunnel Tube

The project for the second tube of the Gotthard Road Tunnel includes the construction of a new two-lane tunnel with a length of 17km which runs parallel to the existing Gotthard Road Tunnel, 67 new cross-passages to the existing service gallery, five new underground ventilation caverns linked to the existing ventilation shafts of the existing tube, two new technical buildings in the portal areas Göschenen and Airolo and several comprehensive preparatory works, such as two access adits of 5km length each, and two new sections of the service and emergency gallery.

In 2022 the project achieved several milestones:

- The civil works on the southern service gallery (lot 342) were successfully completed. The new gallery and the new ventilation building were handed over to the equipment's contractor, who will equip and lead the commissioning of the new service gallery.
- In the northern area, lot 243 completed the excavation of several logistic galleries and caverns. These excavations were performed by D&B and includes a cavern with an excavation section of 260m<sup>2</sup> and a length of 148m. This cavern will house the future concrete production plant for the main north lot.

**Name:** Swiss Tunnelling Society (STS)

**Type of Structure:** Non profit, open association

**Number of Members:** 541 members (thereof 120 young members), 88 corporate members

## ASSOCIATION ACTIVITIES DURING 2022 AND TO DATE

- **April:** STS General Assembly in Zug, Switzerland
- **June:** Swiss Tunnel Congress and Colloquium in Lucerne, Switzerland
- **October:** European Underground & Tunnel Forum (EUTF) annual meeting in Bologna, Italy

Additionally, the STS young members (STSym) hosted the following events:

- **April:** Excursion to the tunnel sites "Vispताल/Riedberg", Valais, Switzerland
- **June:** STSym event at the Swiss Tunnel Congress in Lucerne, Switzerland
- **August:** Geological excursion tunnel "Les Evouettes, Valais, Switzerland
- **September:** Excursion to the "Second Gotthard Tunnel Tube", Uri/Ticino, Switzerland
- **Nov/Dec:** STSym Drinks in Lausanne and Zurich, Switzerland
- **December:** Part of the young member digital celebration of World Tunnel Day

## CURRENT TUNNELLING ACTIVITIES

### Belchen rehabilitation tunnel

The 3.3km-long Belchen rehabilitation tunnel opened to traffic on July 1st, 2022. Preliminary construction work began in 2014. In 2016, the largest TBM ever used in Switzerland at that time – weighing approximately 2,000 metric tons – began tunnelling through the largely heave-prone Jura rock. The breakthrough took place on June 21st, 2017. Before the rehabilitation tunnel could be commissioned, further construction works were required, which included building the roadway and the portal control centers as well as installing and testing operating and safety equipment such as lighting and ventilation.

The third Belchen tunnel will enable the two existing tunnels to be renovated without affecting the accessibility of the A2 highway, which is one of Switzerland's major trunk routes. In the central tunnel, which is inaccessible to traffic, the connector shafts leading to the rehabilitation tunnel are currently being completed, and preparations are

- The two TBMs for the northern and the southern access adit were successfully launched in summer 2022. The excavation of the northern access adit, with a length of 4km, is being performed using an open Gripper TBM, with an excavation diameter of 7.03m. In the southern access adit a closed shield TBM, with an excavation diameter of 7.46m, is being used to excavate the 5km long access adit.
- The works on the three main lots were successfully awarded and launched. The main lot north (lot 241) was awarded for US\$520M (including VAT), the main lot south (lot 341) was awarded for US\$556M (including VAT) and the lot responsible for the material management and logistics of the whole project (lot 111) was awarded for US\$268M (including VAT).

**New Road Tunnel in Geneva**

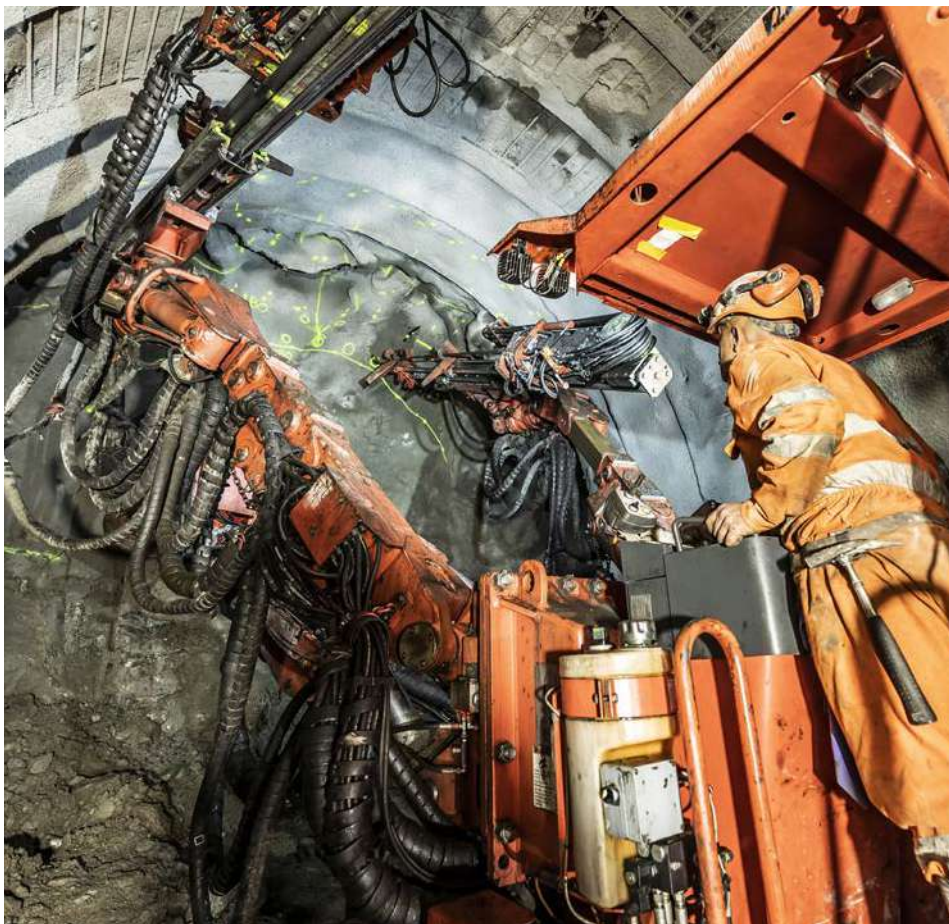
The Tunnel of Nations in Geneva is a part of the new axis from Le Gd-Saconnex (Geneva Airport) to the United Nations district. The entire new construction has a length of 1.2km, the tunnel itself is 500m long, a bidirectional single tube.

The construction works started in 2017 with opening to the traffic foreseen for December 2023.

The tunnel is entirely excavated underneath the city and through a very uneven geology and groundwater. The first action before excavation works could start consisted of lowering the groundwater using several pumping wells. Once the groundwater was lowered, two pilot galleries were excavated over the whole length. In each gallery a concrete foundation was built as a support before the excavation of the main section. The main section was planned as a heading and bench from both sides simultaneously. The heading section was excavated under a steel pipe umbrella with GFRP anchors in the front. The bench was excavated afterwards from one side. The inner lining is composed of a fully waterproofing injectable double layer and a concrete ring.

**Nant de Drance**

The Nant de Drance pumped storage power station project, where work began in September 2008, was inaugurated on 9th September 2022 after 14 years of construction in the western Swiss Alps. During construction, hundreds of workers from all over Europe and even from Asia worked under difficult conditions to complete the project. Up



to 650 people worked and lived on site at the height of the project. The gigantic machine cavern, 194m long, 52m high and 32m wide, is located 600m underground. 1.5Mm3 of rock were extracted from the mountain to drill the eight caverns and 16km of tunnels that now make up the hydroelectric scheme. No serious accidents were reported, which is remarkable for such a large-scale project. The six pump-turbines, each with a capacity of 150MW are state-of-the-art. They were installed on site, in the heart of the mountain, and tested for months to ensure their optimal operation. The plant started operation on 1st July 2022 and is characterized by the availability of its machines enabling it to react very quickly to fluctuations in the electricity grid.

**Celebration for the completion of the HL-LHC Civil Engineering works at Points 1 and 5**

The Large Hadron Collider (LHC) is the most recent and powerful accelerator constructed on the CERN site. The LHC consists of a 27km circular tunnel, about 100m underground, with eight sites positioned around the tunnel circumference. The data collected by this unique instrument has allowed CERN experiments ATLAS and CMS to discover the Higgs boson in 2012. High-Luminosity

LHC (HL-LHC) is a new project aiming to upgrade the LHC, at Point 1 (ATLAS in Switzerland) & Point 5 (CMS in France), will maintain scientific progress and exploit its full capacity with new underground and surface structures. It will be operational in 2026.

The project required new technical infrastructures near each of the two main detectors (ATLAS at Point 1, CMS at Point 5): an additional shaft and cavern, approximately 500m of tunnels connected to the LHC tunnel, and additional technical buildings at the surface.

The HL-LHC design has been developed in Point 1 and Point 5. Two supply contracts have been dedicated to the construction of both the underground and surface structures at Point 1 and Point 5.

The construction works started in April 2018 and in January 2023 a ceremony was held to mark the completion of civil engineering works at Points 1 and 5.

**FUTURE TUNNELLING ACTIVITIES**

**Rail Tunnels**

Lötschberg Basetunnel II (BLS, 35,000m), Stadelhofen Tunnel (SBB, 7,000m), Brüttener Tunnel (SBB, 11,000m), Zimmerberg Tunnel II (SBB, 11,000m), Crossrail – Lake Crossing Luzern (SBB, 5,500m), Geneve Station Expansion (SBB, 1,500m), Heitersberg Tunnel II (SBB,

5,000m), Grimsel Tunnel (SBB, 21,720m)

### Road Tunnels

Morschacher/Sisikoner Tunnel (Kt. SZ/UR, 8,037m), Vingelz Tunnel (Kt. BE, 2,300m), City Tunnel (Kt. BE, 700m), Port Tunnel (Kt. BE, 1,800m), Safety Gallery Fäsenstaub Tunnel (ASTRA, 1,460m), Bypass Luzern (ASTRA, 3,450m), Bypass Bern Ost (ASTRA, 4,000m), Rosenberg Tunnel 3rd Tube (ASTRA, 1,435m), Safety Gallery Tunnel Gei and Brusei (ASTRA, 485m), Twann Tunnel (ASTRA, 1,700m), Nischenberg Tunnel (ASTRA, 1,640m), Rhein Tunnel (ASTRA, 4,500m), Tunnel Melide-Grancia (ASTRA, 1,800m), Tunnel Cargo Station St. Gallen (ASTRA 2,400m)

### Other Projects:

Cargo Sous Terrain Zurich Haerkingen (CST, 70,000m)

## EDUCATION ON TUNNELLING IN THE COUNTRY

ETH Zurich, Department of Civil, Environmental and Geomatic Engineering University of Applied Sciences, in various cities

## STATISTICS

### 1. Length of tunnels excavated during 2022

6,000m / 45% TBM

### 2. Amount (USD or EUR) of tunnelling / underground space facilities awarded in 2022

€600M.

### 3. List of tunnels completed

Rehabilitation Tunnel Belchen (ASTRA, 3,200m), LEB Tunnel Lausanne (LEB, 1,700m), Safety Gallery Leissigen Tunnel (ASTRA, 2,200m), Safety Gallery Crapteig Tunnel (ASTRA, 1,984m), Nant de Drance Pumped Storage Power Plant

### 4. List of tunnels under construction

#### *Rail Tunnels:*

Albula Tunnel (RhB, 5,860m), RBS Bern Station Expansion (RBS, 1,200m), Ligerz Tunnel (SBB, 2,119m), Wylerfeld Tunnel (SBB, 300m)

#### *Road Tunnels:*

Second Gotthard Tunnel Tube (ASTRA, 16,918m), Safety Gallery Cholfirst Tunnel (ASTRA, 1,250m), Safety Gallery Kerenzlerberg Tunnel (ASTRA, 5,504m), Visp Tunnel 2nd Tube (Kt. VS, 2,600m), Gubrist Tunnel 3rd Tube (ASTRA, 3,230m), Riedberg Tunnel (Kt. VS, S: 555m, N: 483m), Safety Gallery Rofla Tunnel (ASTRA, 1,018m), Tunnel de déviation des Evouettes (Kt. VS, 657m), Tunnel des Nations (Kt. GE, 870m), Gallery Schwamendingen and Schöneich Tunnel (ASTRA, 1,680m), Kaiserstuhl Tunnel (Kt. OW, 2,081m), Tunnel Melide-Grancia (ASTRA, 1,800m)

#### *Other Projects:*

Hydro Power Plant Ritom, CERN HILUMI LHC Project