

# Reconstruction of the Small Marchlehner Avalanche Gallery

## L 240 Venter Straße

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### Introduction

Located close to Sölden, the mountain and climbers' village of Vent can only be accessed via a single road through the valley of the same name. A number of avalanche galleries ensure almost entirely avalanche free and rock slide safe access on the L 240 Venter Straße between the villages Zwieselstein and Vent in the municipality of Sölden im Ötztal. Through the reconstruction of the small Marchlehner gallery which closes the gap between two existing galleries (Glasair and Bruchscheiben gallery), the currently unprotected stretch of the road from km 9.5 to km 9.73 will be permanently protected against rockfall and avalanches.

### Order

TEERAG-ASDAG AG (T-A), Tyrol branch, was commissioned with the construction of the 228 m gallery in May 2013 by the Provincial Government of Tyrol, department for bridge and tunnel construction on behalf of the Federal Ministry of Agriculture, Forestry, Environment and Water Management and the Forest Engineering Service for Torrent and Avalanche Control, Tyrol branch. Apart from the reconstruction of the avalanche galleries and the associated roadwork as well as comprehensive rock supporting measures on the mountainside, a downhill access ramp to the top of the gallery was to be built. Execution planning (statics, reinforcement and form work plans) were drawn up by engineering office Baumann + Obholzer ZT GmbH.

### Project

The small Marchlehner gallery has a length of some 228 m and has been constructed in 19 block sections of 12 m each. On a length of 180 m, the gallery's structure was executed as a level frame including separate downhill wall panels with openings of 2.7 m x 3 m ("column structure") as a rectangular cross section and in the area of the ramp, on a length of approx. 45 m, as a closed design. The clear internal cross-section of the gallery is 8.25 m x 4.9 m. Strip foundations were used on both uphill and downhill.

During the entire construction period, traffic had to be guided through a clear space 3 m wide and 4.5 m high across the building site and therefore also through the form work carriage since closing down the L 240 Venter Straße in the area of the construction section was impossible. Construction work commenced in June 2013. According to the building contract, the main construction work – gallery structure including roadworks – had to be completed by November 2013. Outstanding work was carried out in spring of 2014.

### Digging, earthworks and supporting work

The construction scheme posed great challenges to the staff

of T-A in terms of technology and construction logistics. In order to process the project, for instance, extensive preparatory uphill digging, slope and rock stabilisation work had to be carried out. At the same time, Vent's existing waste water collector was relocated in the entire construction section area and subsequently, also in the areas of the existing galleries beyond the small Marchlehner gallery.

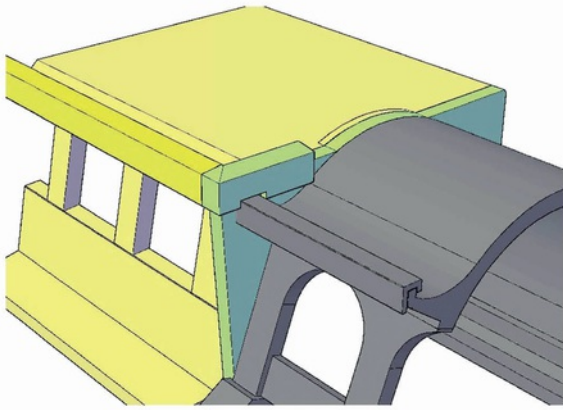
Rock was removed by means of blasting. In the area of the loose material, an anchored jetcrete wall was erected. In parts, the slopes reached heights of more than 8 m. Work had to be carried out while keeping the road open for traffic (single lane, controlled via light signal system - up to 1,000 vehicles per day). Only brief 10-minute traffic blocks for blasting and subsequent removal of rock material were permitted.



Rock stabilisation and excavation work  
Image: PORR AG

### Concrete frame superstructure

Since the existing Glasair gallery was executed as an arch superstructure, a 50 cm thick "transitional slab" to block 1 of the rectangular frame superstructure had to be installed first. Subsequently, the downhill and uphill strip foundations were constructed. Then, an 80 cm thick uphill wall was installed that was, however, only concreted up to a line two thirds the height of the frame structure. On the downhill side, 2.5 m high wall slabs with columns on top (cross-section 60/100 cm) were erected simultaneously. In mid-July 2013, the gallery form work carriage was set up (approx. 10 working days) and the first of a total of 19 superstructure blocks was cast. On average, two blocks per week were installed until the end of this work in September.



Transition – existing structure – new gallery  
Image: PORR AG



Laying of reinforcements at frame superstructure  
Image: PORR AG



Downhill wall columns  
Image: PORR AG



Laying of reinforcements at frame superstructure  
Image: PORR AG



Uphill strip foundations  
Image: PORR AG



Gallery form work carriage  
Image: PORR AG

Due to the fact that the traffic had to be guided underneath the form work carriage it posed a great challenge to use the confined spatial conditions of the intermediate storage areas at the downhill edge of the building site. At the same time as the construction of the gallery structure took place, the uphill drainage holes and drainage lines for the draining of slope waters had to be installed. Also, sealing work on the gallery had to be drawn in. After completion of the gallery structure, a 50 m access ramp to the gallery's roof and the 180 m long edge beam on the gallery's cantilever arm were built.





Keeping the road open for traffic  
Image: PORR AG



Access road to intermediate dumping area  
Image: PORR AG



Keeping the road open for traffic  
Image: PORR AG



State of construction November 2013  
Image: PORR AG

**Backfilling / roadwork**

Once the concrete and sealing work was complete, backfilling was immediately started at the completed sections of the gallery. A 50cm thick gravel layer with (aggregate 80mm) had to be applied to the frame superstructure for the purpose of sealing protection. Subsequently, the backfilling was executed by layers. Only material excavated at the construction section was used for this purpose. It was temporarily stored close to the downhill Glasair gallery, processed for backfilling and installed afterwards. Thus, unnecessary deliveries and removal transports of excavated soil could be prevented in the tourism-heavy Vent valley.

Roadworks in the area of the carriageway were carried out on one lane at a time to be able to keep the road open for traffic. The uphill slope waters were being separately collected using drainage lines and guided into the Venter Bach stream via three drainage holes.

After frost layer filling and laying of the kerb stones, the still bound base layers were applied. By the end of November, the main work was completed on schedule and the gallery could be opened for traffic. After the winter break of 2013/2014, outstanding work such as application of the top layer and restoration work etc. had to be carried out.



State of construction September 2013  
Image: PORR AG



Completion of construction in summer 2014  
Image: PORR AG

**Final remark**

Thanks to excellent collaboration between all those involved in the project – from the client to the local building supervisors – the works could be carried out to everyone's full satisfaction. Construction was finished and the site cleared in May 2014. The greatest challenges for TEERAG-ASDAG AG and all other parties involved in the project was keeping the road open for traffic in the area of the construction site, the unpredictable weather conditions and the confined spatial conditions and the site's difficult alpine location. In the course of the project, TEERAG-ASDAG AG, an essential part of the PORR group could once again prove its experience and know-how in infrastructure and road construction just like it did with all other major Tyrolean gallery projects it has processed in the past years.

**Project data**

Start of construction	June 2013
Time of final completion	June 2014
Length of construction project	228 m
Road surface	1,500 m <sup>2</sup>
Excavation/earthwork	8,100 m <sup>3</sup>
Frost layer	900 m <sup>3</sup>
Ready-mix	700 t
Tunnel/gallery structures	48 m/180 m
Concrete volume	5,100 m <sup>3</sup>
Reinforcing steel	600 t
Jetcrete surface	1,500 m <sup>2</sup>
Injection drill bolts	6,600 m /950 pc.