Conference Proceedings 4th ICTB (2022)
https://doi.org/10.24451/0akb-5816

ICTB 2021 PLUS
4th International Conference on Timber Bridges
Biel/Bienne, Switzerland, 9 -12 May 2022

First Swiss wildlife bridge made with timber

Lukas Rüegsegger[1]

1 Introduction

With the building of roads, railways, infrastructure buildings, estates as well as industrial and commercial areas, wildlife connectivity is limited in heavily built-up Switzerland. The habitats of the animals are geographically demarcated with insurmountable barriers, which suppresses the animals' natural urge to move.

In Switzerland, 305 wildlife corridors of transregional importance are recorded. Of these, 14% are interrupted and can no longer be used by animals. More than half of the corridors (58%) are impaired and only 28% are classified as intact.

In 2001, the Federal Office for the Environment (FOEN) set the goal of rehabilitating 51 transregional wildlife corridors with wildlife-appropriate structures so that animal populations can mate again across different geographical areas.

In the Rynetel area, between Gränichen and Hunzenschwil, the wildlife corridor was restricted due to buildings and estate areas and completely desrupted by the A1 motorway. This is where the first wildlife overpass with timber construction was built.

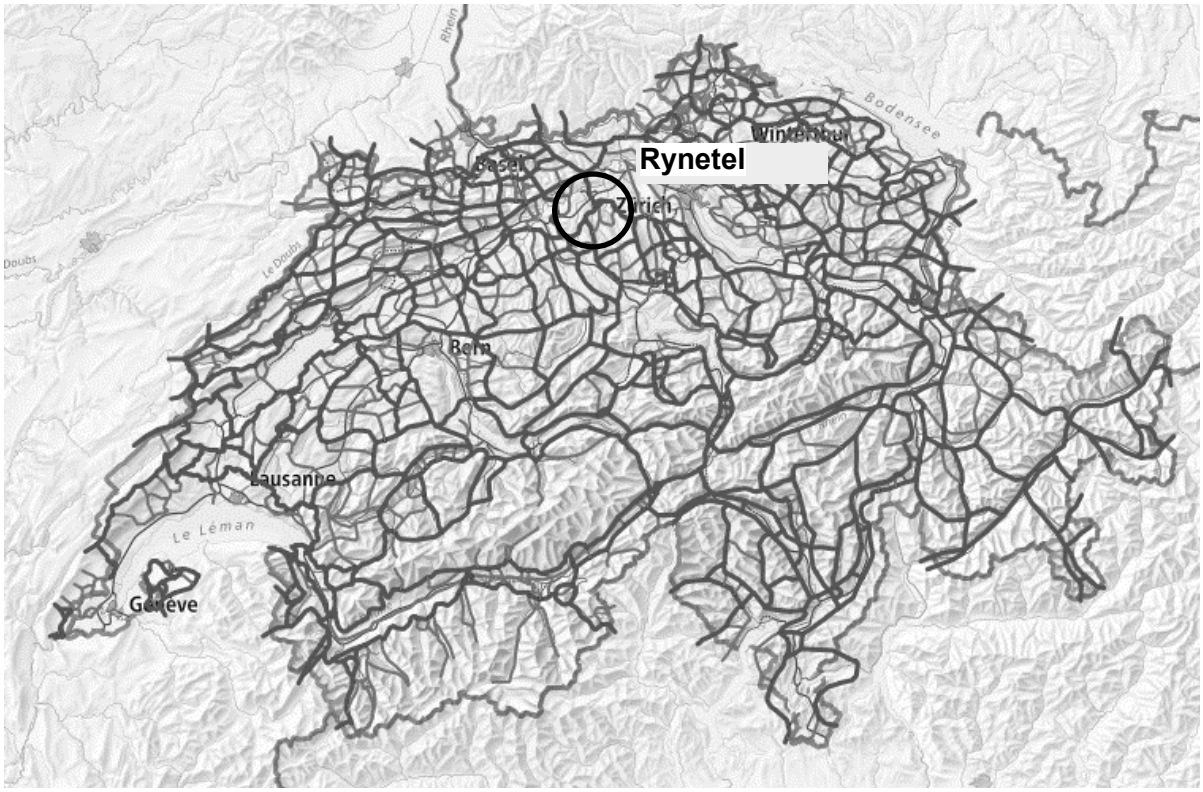

Figure 1 Wildlife corridors of supra-regional importance and location of the Rynetel wildlife crossing. Source: map.geo.admin.ch

[1] Lukas Rüegsegger, Timbatec Holzbauingenieure Schweiz AG, Switzerland,
Lukas.Ruegsegger@timbatec.ch

2 Wildlife Bridge Rynetel

The overpass structure should fit well into the topography and landscape. To equip the top of the bridge appropriately for wildlife, a useful width of 50 meters is predefined. In addition, an economical and low-maintenance construction with a durability of 100 years was required. A possible motorway expansion to 6 lanes was taken into account in the clearance gauge. As an important motorway link, the A1 cannot be completely closed. Therefore, the construction process had to be carried out while traffic was maintained.

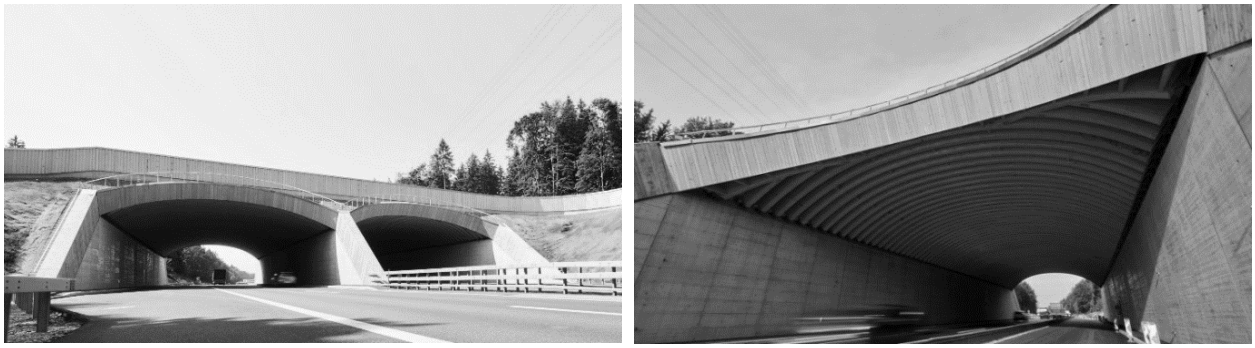

Figure 2 Photos of the completed bridge

2.1 Construction

In cross-section, the structure has a concrete wall with a thickness of 80 centimetres at the sides as well as in the middle. The approximately 17-metre span width on each side is traversed by arched trusses made of glulam GL28h. The trusses have profiles of 240 x 760 millimetres and are mounted on the concrete walls with a step span of 80 centimetres. A steel joint connects the wooden trusses to the solid construction.

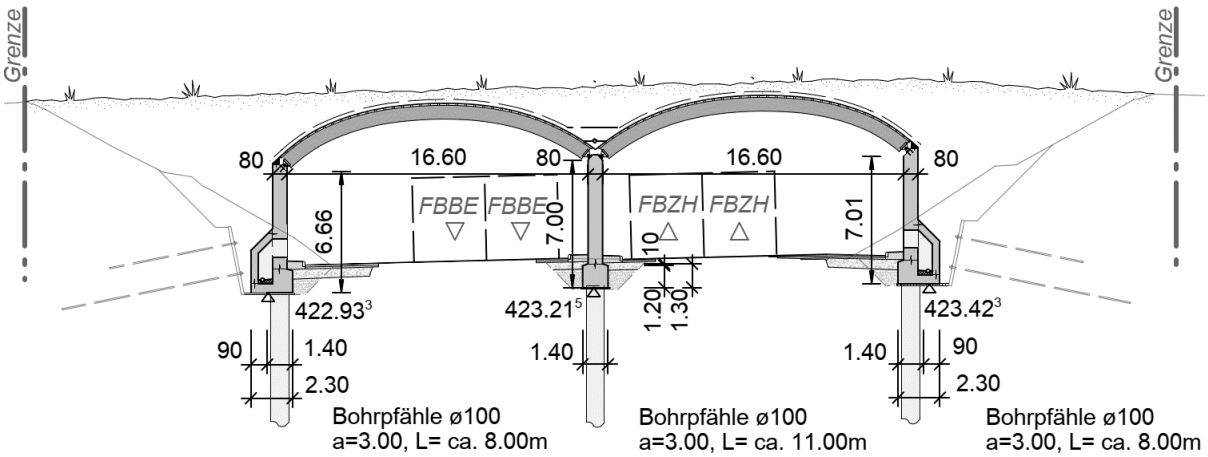

Figure 3 Cross section of the bridge

The secondary structure consists of unbent glulam beams with a profile of 100x400mm, which are fixed horizontally to the arched trusses. A laminated veneer lumber panel fixed to the secondary girders serves as the final substrate for the waterproofing. A coat of PUR bitumen serves as an adhesive base for the double and fully welded polymeric bitumen waterproofing. The root protection made of a TPO plastic cover is consistently welded and thus protects the substrate from root penetration. For mechanical protection, the waterproofing is additionally covered with a rubber mat. A drainage layer of seepage gravel is covered with a filter fleece and conducts the seepage water from the apex to the side walls, where it seeps away, or to the centre of the double arch where the water is collected by means of a seepage pipe and fed to the road drainage system via a downpipe. The final layer consists of soil with various substrates, which is planted.

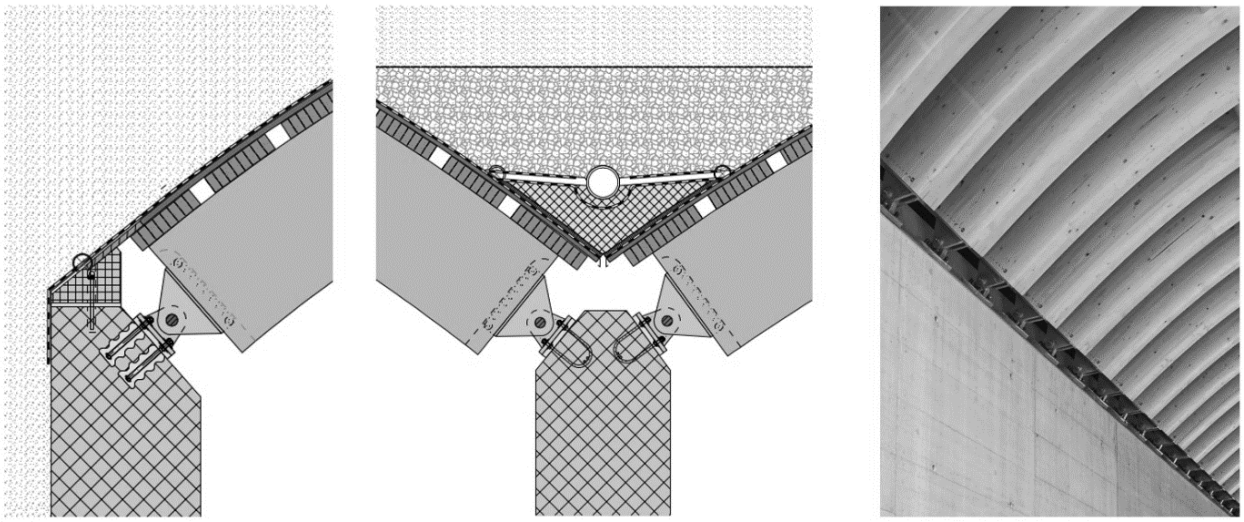

Figure 4 Construction of the support areas of the side wall (left) and the centre wall (right). Middle: Section through steel joint

In the apex area, the construction is covered with 70 centimetres of soil and seepage gravel, and in the outer walls over 4 metres high.

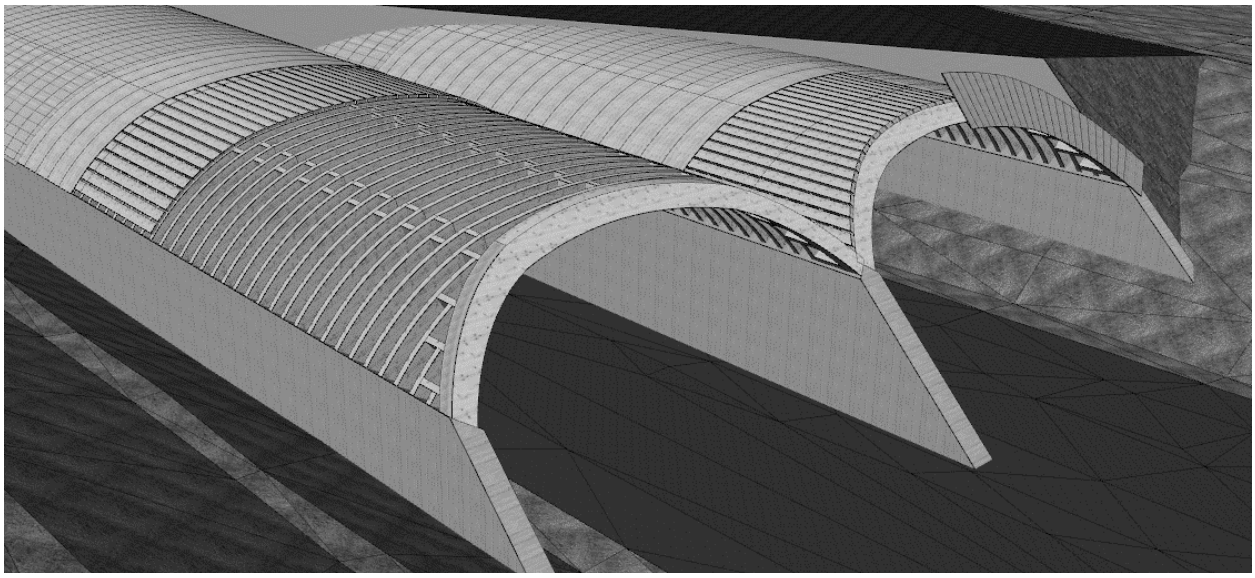

Figure 5 Visualisation of the design of the construction components

To generate the smallest possible earth loads on the structure and thus also to optimise the earth movements of the backfill or cover to a minimum, the supporting structure was arranged higher than would have been necessary due to the clearance profile for road use. This created an almost even area for the wildlife to pass. The two portals are inclined so that the various cover heights can be closed off with an embankment.

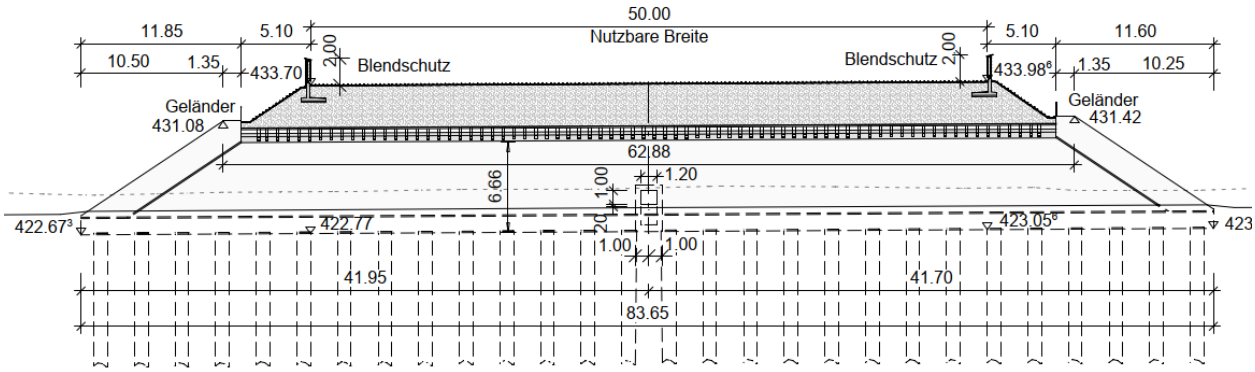

Figure 6 Longitudinal section of the bridge with inclined portals and the anti-glare elements as demarcation.

A two-meter-high glare shield delimits the bridge. On the side of the bridge, the glare shield is connected to the wildlife fence so that no animals cannot step onto the motorway. The glare shield is an important element that protects against headlights so that the animals can cross the bridge as undisturbed as possible.

2.2 Assembly

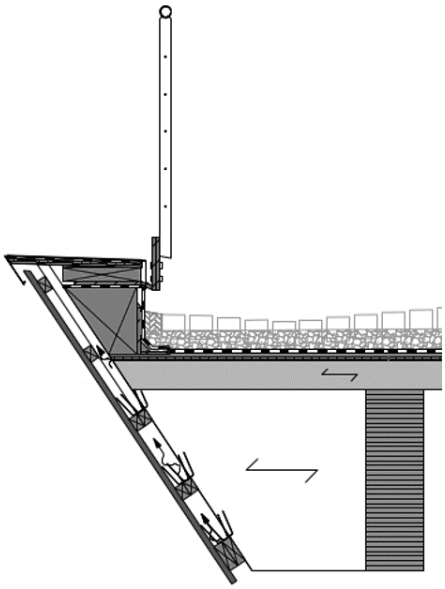

Figure 7 Section through portal and glare shield at the apex of the arch

The bridge structure had to be erected while the motorway was in operation. Therefore, the timber construction was completely assembled during the night. For this purpose, traffic could be diverted to the opposite carriageway so that the work could be carried out directly from the carriageway.

Due to the complex work on the portals, they were pre-assembled as modules on a nearby company site and transported to the construction site and assembled by special transport. The intervening trusses were erected individually, the secondary supporting structure and the veneer plywood were then assembled. As the last night work process, the portal cladding and the portal railing were mounted so that the sealing work could be carried out during the day.

Figure 8 Assembly of the individual trusses between the portal modules.

2.3 Project participants

Building owner:
Federal Roads Office FEDRO
Zofingen branch

Builder support:
Helbling Consulting + Construction Planning AG

Planning:
Engineering consortium IG WUEF:
- Bänziger Partner AG (lead)
- Timbatec Timber Construction Engineers AG

Landscape architecture:
SKK Landscape Architects AG

Execution:
ARGE FERA:
- Solid construction: Aarvia Bau AG
- Timber construction: Häring AG