Zeitschrift: IABSE structures = Constructions AIPC = IVBH Bauwerke

Band: 3 (1979)

Heft: C-7: Structures in Switzerland

Artikel: The Ganter Bridge, Simplon / VS

Autor: Menn, C.

DOI: https://doi.org/10.5169/seals-15783

19. The Ganter Bridge, Simplon / VS

Owner and Supervisor: Canton Wallis, Department of Public Works
Structural Engineers: H. Rigendinger, Chur
Bloetzer & Pfammatter, Visp
Schneller-Schmidhalter-Ritz, Brig
Consultant: Prof. Dr. C. Menn
Contractors: Ed. Züblin & Cie AG / Ulrich Imboden / R. Kalbermatten AG / Fux & Co / Losinger AG
Construction dates: 1976 – 1980

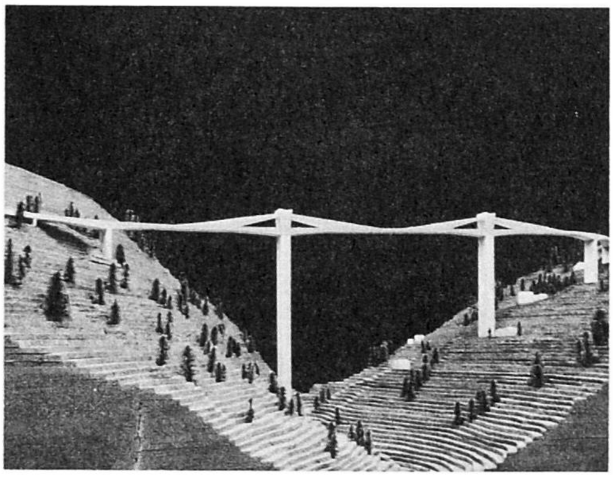

Fig. 1 Bridge Model

Background

The Ganter Valley lies on the northern side of the Simplon Pass. Its crossing represents the last missing link in the redevelopment of the Simplon Road, an important north-south traffic artery within the national road network in Switzerland. Two alternatives were considered during the planning stages. The first one envisaged essentially an extension of the existing road via a small bridge over the Ganter Creek approximately 1 km upstream from the bridge described in this paper. Because of the dangerous rock fall areas on the northern side of the valley, in addition to the bridge, a 1 km long tunnel in heavily fissured rock would have been required. The overall cost of this alternative was in the vicinity of 30 millions Swiss francs. The second alternative was that of a 678 m long two-lane bridge traversing the valley at the height of 150 m. Estimate indicated cost of 15 - 18 millions francs (Fig. 1). This alternative presented some serious problems. The major ones were: the steep northern side of the valley is gneiss, which is badly fractured and weathered at the surface; strongly saturated southern side is composed of deep layer of morain on top of decayed schist, many years of measurements indicated that it is creeping at the rate of 5 - 10 mm per year; the heigth and the narrowness of the bridge coupled with strong winds called for a careful approach to the design for lateral forces.

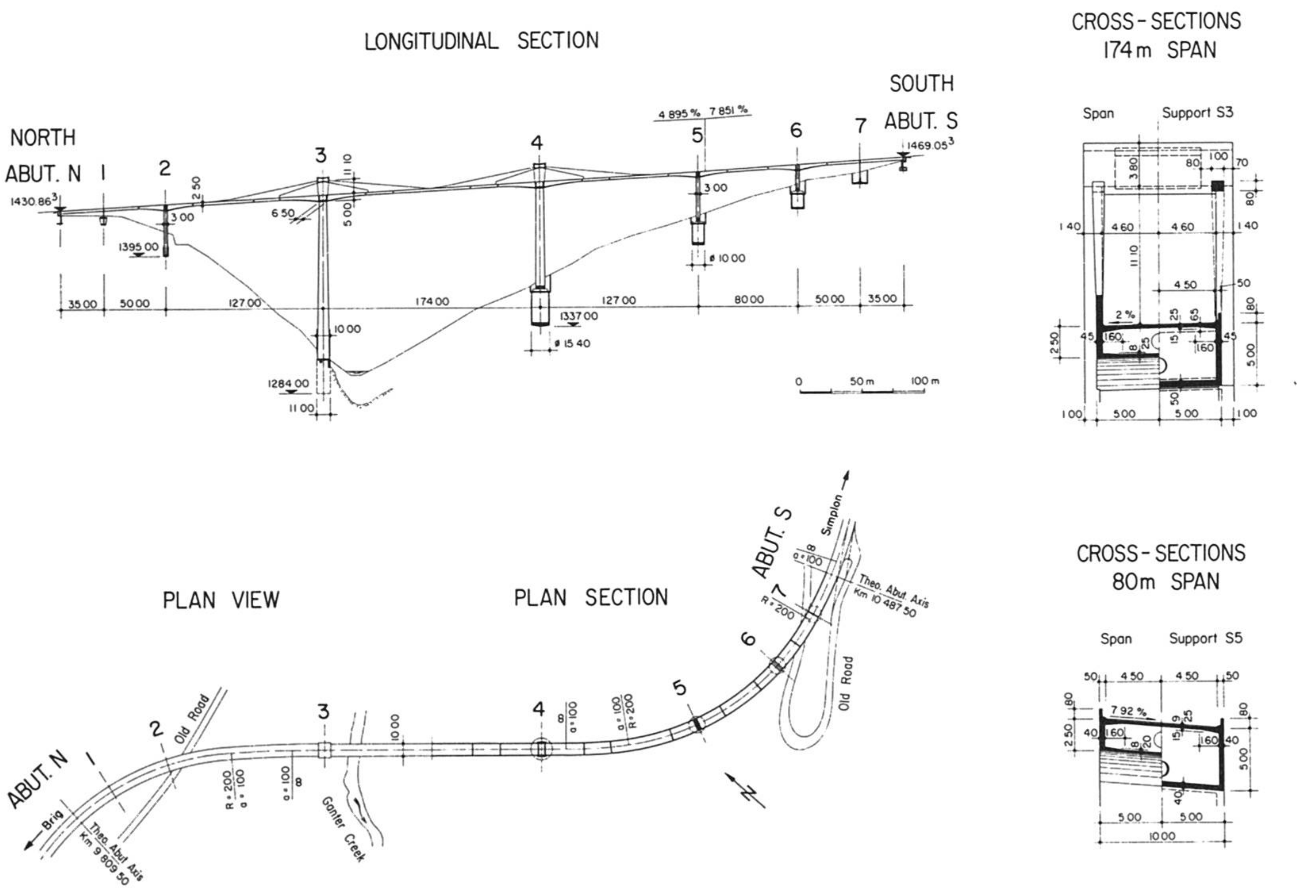

Fig. 2 Plan and Sections of the Bridge

Major Design Features of the Bridge

As a result of an extensive study and research, the following solutions of the problems involved were offered by the designers and their consultant. Two hundred meters radius of the bridge curvature was selected to obtain a smooth junction with the existing road at both ends of the bridge. Span arrangement shown in Fig. 2 minimizes the number of difficult and expensive bridge supports, ensures the utilization of the best available ground conditions and provides good overall construction accessibility. Complete stabilization against creep of the southern valley side was not considered possible, even at the expense of major drainage works. Instead, the following pier to footing arrangement has been adopted. Footings for piers S4, S5 and S6 are round hollow shafts. To provide for the anticipated creep of the valley slopes, piers S4 and S5 are hinged at the bottom and can be jacked back to their original positions, both vertically and horizontally, when it becomes necessary (Fig. 3). Piers S6 and S7 rest on sliding bearings. In addition, in the zone of the footings the valley slopes are dewatered through a system of bores leading into the footing shafts. From there water is discharged through 1.25 m diameter pipes some 40 m long. All piers are rectangular, hollow and are slipformed.
The nature of the bridge crossing made the cantilever method of construction the only one that could be efficiently and economically used. Falsework was required in the two end spans only. Except at pier S1, box girder superstructure is monolythic with the piers. The two main piers S3 and S4 rise above the deck level and serve as pylons for the modified cable-stayed system used in this bridge. Conventional prestressing cables are anchored in the girder webs. During construction the cables act as stays. Subsequently they are used for post-tensioning concrete diagonal ties. The main 174 m long span is currently the largest in Switzerland. It is wholly within the straight portion of the bridge. However, the two adjacent 127 m long spans are partially in the curved sections of the bridge. Because of their curvature, it became necessary to extend the girder webs upwards above the deck level to accommodate the cables and to ensure that they follow the horizontal curvature of the two spans. Triangular shaped web extensions can be seen in Figs. 1 and 2. The decision to have the cables encased in concrete between the web extensions and the pylons was taken for the following reasons: stiffeneing of the slim superstructure, protection against corrosion and aesthetic considerations. During construction the cables are stressed to some 30 percent of their ultimate capacity. Concrete is then cast around the partially tensioned cables and full prestress is applied. In the conventional cantilever method of construction, support sections of the main spans would have required a girder depth of 10 m. The use of the modified cable-stayed system allowed a reduction down to 5 m, thereby obtaining a uniform girder depth throughout the bridge. This in turn enabled the use and reuse of identical trusses and forms.

Construction

The project in the form briefly described in this paper was recommended for acceptance and construction in the middle of 1975. Construction began in the summer of 1976. To date the following sections of the bridge have been completed: all footings and abutments, piers S2, S3, S5, S6 and S7, 40 m long cantilevers at pier S2 and the two end spans. Work or on the construction of cantilevers at piers S3 and S6 is now in progress. Cantilever assembly at pier S3 and the section of the bridge between pier S5 and the southern abutment will be completed in 1979. Finally, with the completion of the cantilever construction at pier S4 the bridge will be open to traffic at the end of 1980. (Fig. 4).

(C. Menn)

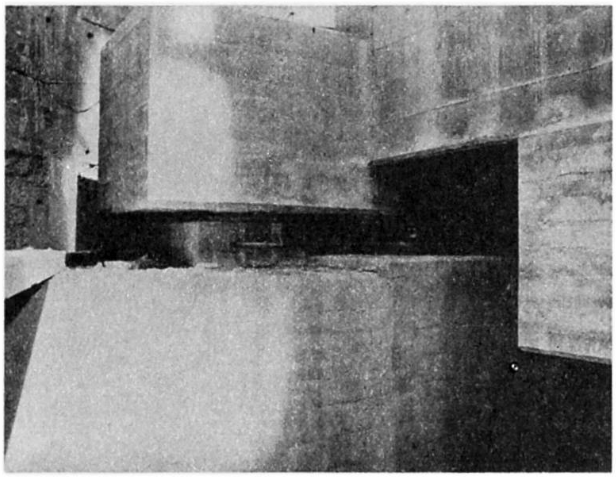

Fig. 3 Pier and Footing S4

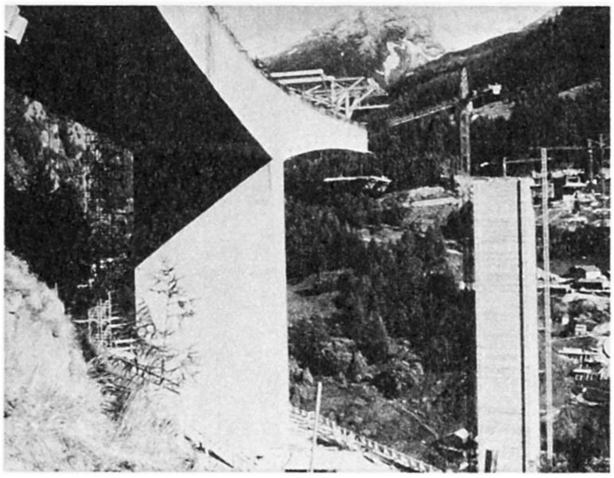

Fig. 4 Ganter Bridge in October 1978