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Sunniberg Bridge, Klosters, Switzerland

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Abstract

The scheme to by-pass the town of Klosters in the Swiss Canton of Graubünden is currently under construction. The most visually impressive structure of the project is without doubt the Sunniberg Bridge, which carries traffic across the valley in a sweeping curve, high above the Landquart river, before the entrance to the Gotschna Tunnel.

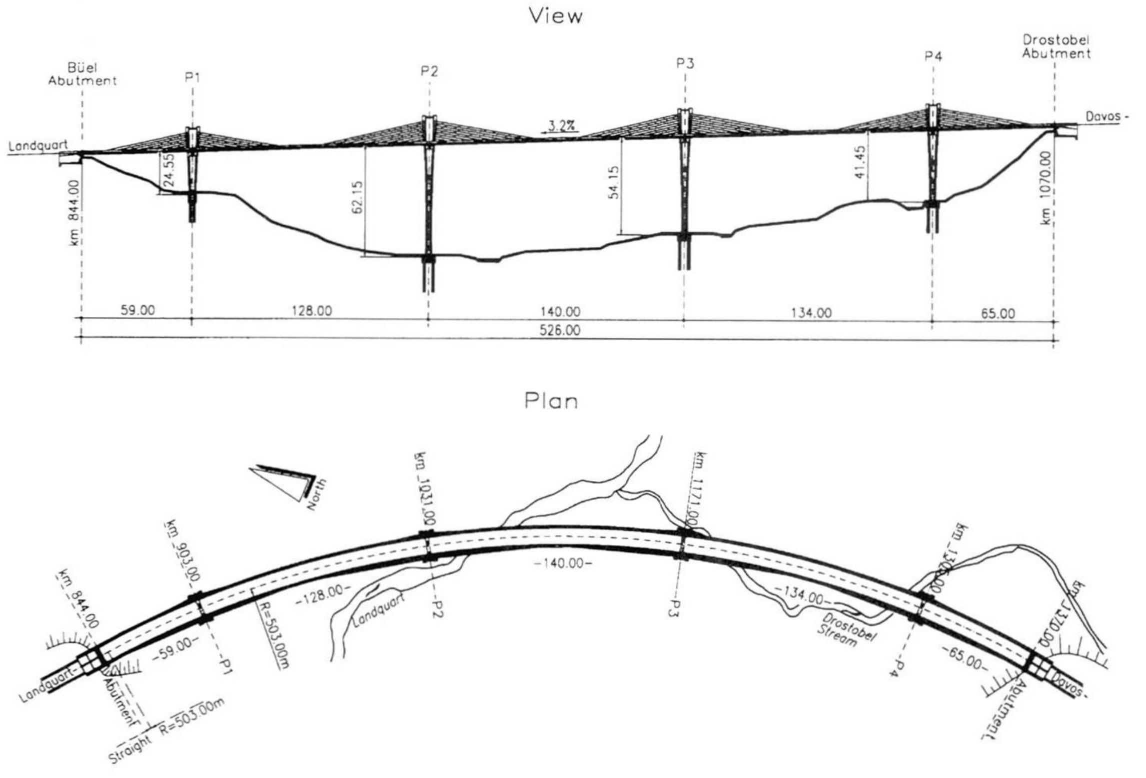

Fig. 1 Longitudinal section

In view of the prominent location of the bridge and the importance of the surrounding, still largely unspoiled, alpine landscape, the aesthetic quality of the design was of particular importance. An elegant, modern and original structure was conceived by Prof. Dr. Christian Menn which, in addition to fully meeting the requirements concerning functionality and safety, is an impressive addition to the cultural heritage of the region. When viewed from the ascending approach road, the bridge appears shorter than it actually is, therefore span lengths of significantly greater than 100m were desirable. The bridge as constructed is curved in plan, with a radius of 503m, measured to its axis, and has span lengths of 59.0m, 128.0m, 140.0m, 134.0m and 65.0m, resulting in a total length of 526.0m.

Due to the curvature in plan, it was possible to connect the bridge deck monolithically to the abutments, with out causing appreciable secondary stresses in the deck cross-section. This arrangement results however in the piers being subjected to horizontal displacement at the pierhead, due to the effects of temperature variations, and they were consequently designed as slender frame constructions.

The pylon rises about 15m above the deck, in the form of two diaphragms outside the deck plate. These two diaphragms are inclined outwards at an inclination of 8:1. The inclined arrangement is prescribed on the one hand by the geometry of the stay cables for the curved structure, and on the other hand by the overall aesthetic appearance of the pier and pylon system.

The stay cables are arranged in a harp configuration, with a 6m horizontal spacing between the cables.

In view of the radius of the bridge deck, this configuration is required to ensure that the planes of stay cables on either side of the bridge deck give the impression of continuous and reassuring "walls". The average inclination of the cables is 1:5, with variations arising from the longitudinal inclination of the bridge deck.

For the stay cables of the Sunniberg Bridge, a pre-fabricated parallel wire system with DINA anchorages was chosen. The wires are anchored in the DINA anchorages by means of button-heads. A special epoxy compound prevents the ingress of oxygen into the anchorage zone, eliminates fretting between wires and the steel anchorage body, and facilitates a smooth introduction of cable forces into the anchorage. The DINA anchorages are designed to withstand fatigue stresses of up to 250 N/mm^2 over 2 million load cycles.

The construction of the bridge took place in the period between June 1996 and August 1998. The bridge deck was constructed in-situ in free-cantilever. The form traveller extended over two 6m stages, with the leading edge beams and the trailing deck slab being poured in each weekly cycle.

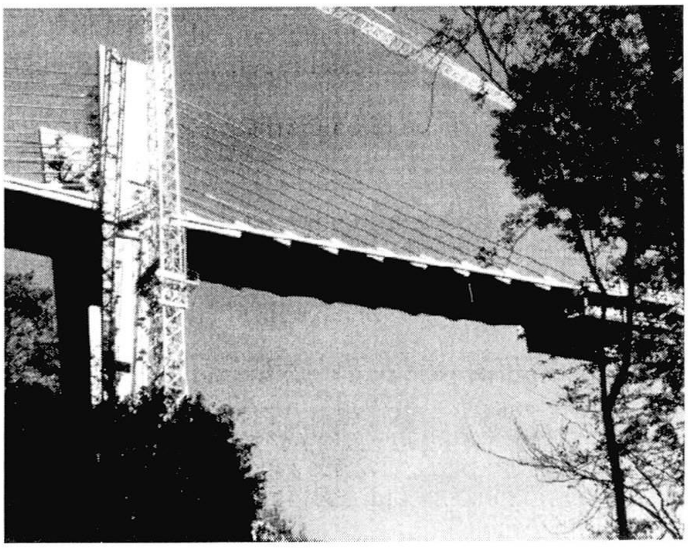

Fig. 2 Cantilever construction