

Zeitschrift: IABSE structures = Constructions AIPC = IVBH Bauwerke
Band: 4 (1980)
Heft: C-12: Structures in Austria

Artikel: Alm Bridge in Upper Austria
Autor: Reiffenstuhl, H.
DOI: <https://doi.org/10.5169/seals-16529>

Nutzungsbedingungen

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. [Mehr erfahren](#)

Conditions d'utilisation

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. [En savoir plus](#)

Terms of use

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. [Find out more](#)

Download PDF: 20.08.2025

ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>



13. Alm Bridge in Upper Austria

Owner: Amt der Oberösterreichischen Landesregierung

Design: Hans Reiffenstuhl, Ö. Univ. Prof. Dipl. Ing. Dr. techn.

Contractor: Allgem. Baugesellschaft A. Porr AG

Subcontractor for the post-tensioned reinforcement: Vorspanntechnik Gesellschaft mbH, Salzburg

Subcontractor for the post-compressed reinforcement: Reiffenstuhl Druckspanntechnik Gesellschaft mbH, Salzburg.

In 1977 a 76 m single span bridge for road traffic was built in Upper Austria. The main feature of this prestressed concrete bridge is the use of a new structural element, that of postcompressed reinforcement. It consists of high strength steel bars of round cross section which at first lie unbound in sheaths. After hardening of the concrete and stressing of some of the conventional tendons the bars are stressed in compression by means of hydraulic jacks, then anchored in the structure and grouted.

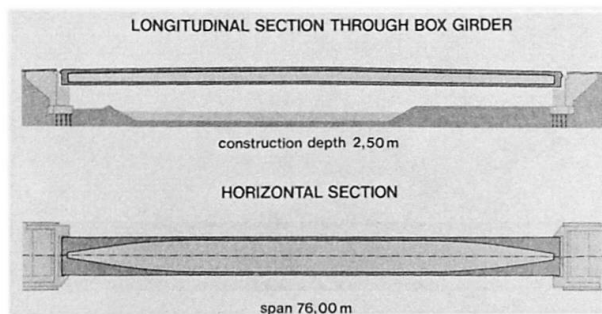


Fig. 1: Alm Bridge, longitudinal sections

Mode of action

The mode of action of the postcompressed reinforcement is shown in fig. 3. The upper and the middle beams develop stresses at midspan under the named effects drawn at the right side of the beams.

The lower beam is armed with postcompressed reinforcement. The compressive force of the high strength steel bar, introduced into the beam by end anchorage (fig. 3) produces tensile stresses uniformly distributed over the depth. The forces due to deflection of the bar push upward and cause bending stresses of the same sign as the bending stresses due to conventional prestressing.

Adequate use of both post-tensioned and postcompressed reinforcement leads to a large bending moment counteracting external loads, with only a small portion of normal force due to prestressing. By means of the postcompressed reinforcement it is possible almost to double the bending moment capacity of a cross section of ordinary prestressed concrete.

Anchorage

Although the option of a combined anchorage of two tendons and one compressed bar in one plate was available, single anchorage of each compressed bar was chosen for the reason of easy access. (fig. 4)

The compressed bar (diameter 36 mm S 1080/1320) transfers its force by means of a thread and nut into the anchor plate. The plate is fixed in the beams's concrete by means of 8 buttonheaded cold-drawn stressing steel wires (diameter 12.2 mm, S 1370/1570 with undulated ends). The anchorages of the postcompressed bars have to be placed in such a manner that they cannot push out the surrounding concrete. This is easily done, e.g. by setting the anchorages of the bars between anchorages of tendons. The anchorage used in the Alm bridge is designed for 13.5 MN ultimate load.



Fig. 2: Completed bridge

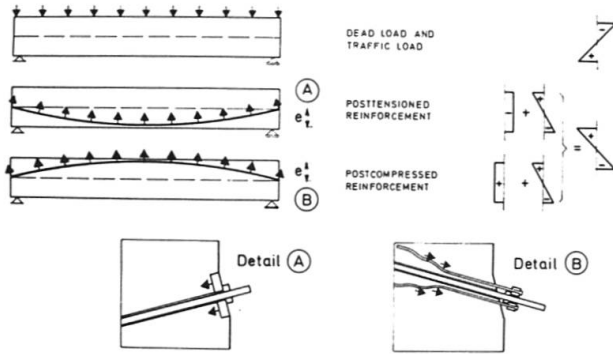


Fig. 3 Mode of action

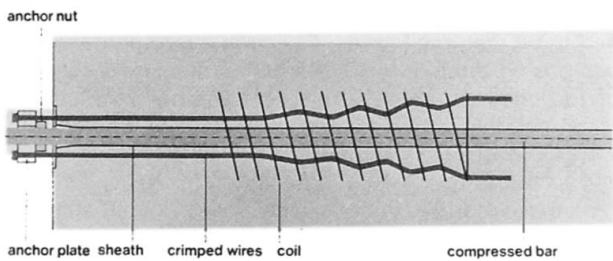


Fig. 4 Anchorage

Friction of the compressed rod in the sheath

The dominant demand for groutability of the sheath does not allow narrow round sheath which would be satisfactory with respect to friction and buckling stability of the highly compressed bar. Intensive investigations led to a specially swaged sheath (patent pending). It is made of an ordinary sheath swaged locally to an oval shape in such a way that the minor axis of the oval allows only very little lateral play to the bar. The minor axes of two successive ovals are perpendicular to each other. The distance between two

corresponding swagings is much less than the buckling length of the bar. These equally situated swagings are so closely spaced that a reasonably curved bar under compression does not notably deflect to form a wave line, and thus a great increase of friction is avoided. Precise swaging is done by a small machine specially designed for this purpose.

Significant data at midspan

bending moments	
dead weight (structure)	$M = 142.6 \text{ MNm}$
dead load (cantilever caps etc.)	$M = 21.4 \text{ MNm}$
traffic	$M = 48.9 \text{ MNm}$

Max. Concrete compressive stresses under working loads

under max. working loads:	
after shrinkage and creep	upper fiber -12.2 MN/m^2
	lower fiber $+2.0 \text{ MN/m}^2$
before shrinkage and creep	upper fiber -13.9 MN/m^2
	lower fiber -1.1 MN/m^2
under dead load and prestress at the time $t=0$:	
	upper fiber -3.9 MN/m^2
	lower fiber -14.5 MN/m^2

required concrete quality: 37 N/mm^2 cylinder strength
tendons: 12 strands $\frac{1}{2}$ " with $12 \times 0.99 \text{ cm}^2$ cross section
compressed bars: $\varnothing 36 \text{ mm}$ with 10 cm^2 cross section
prestressing forces at midspan

	$t=0$	$t=\infty$
tendons	102.4 MN	92.4 MN
compressed bars	43.2 MN	52.0 MN
shrinkage factor		$\epsilon_s = 17 \cdot 10^{-5}$
creep factor		$\phi = 1.80$

(H. Reiffenstuhl)

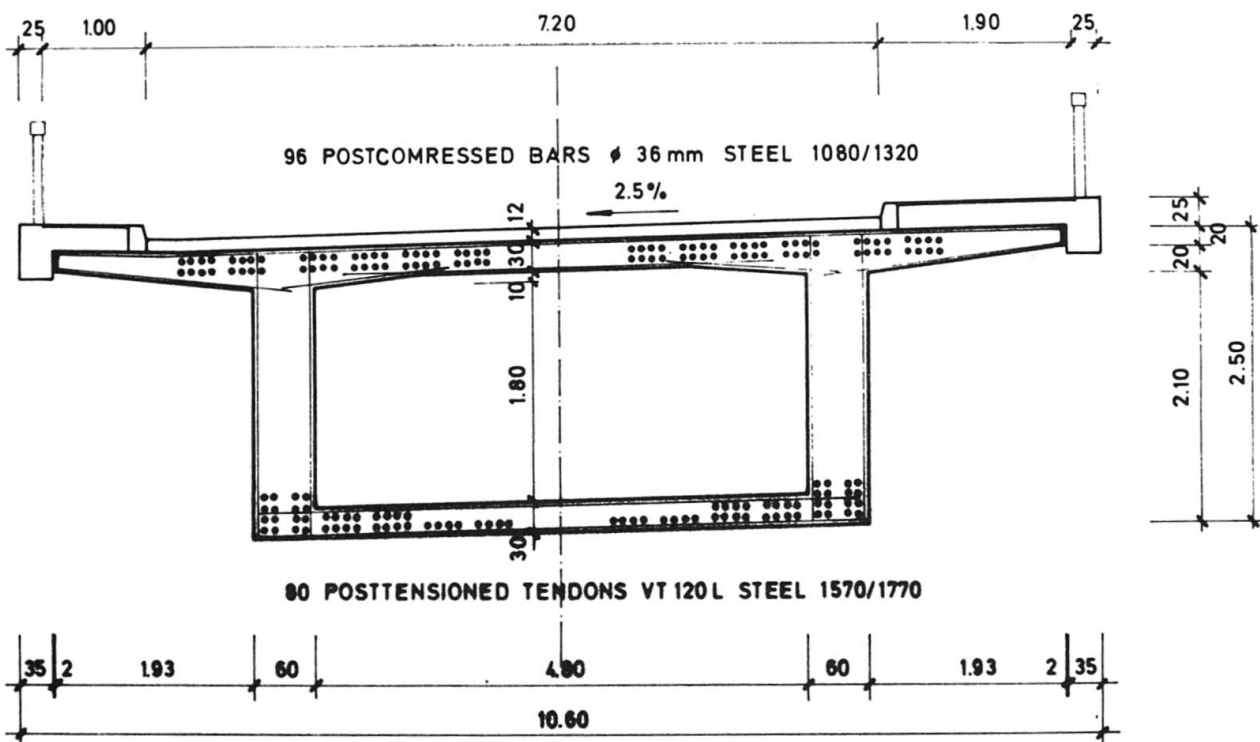


Fig. 5 Cross section at midspan