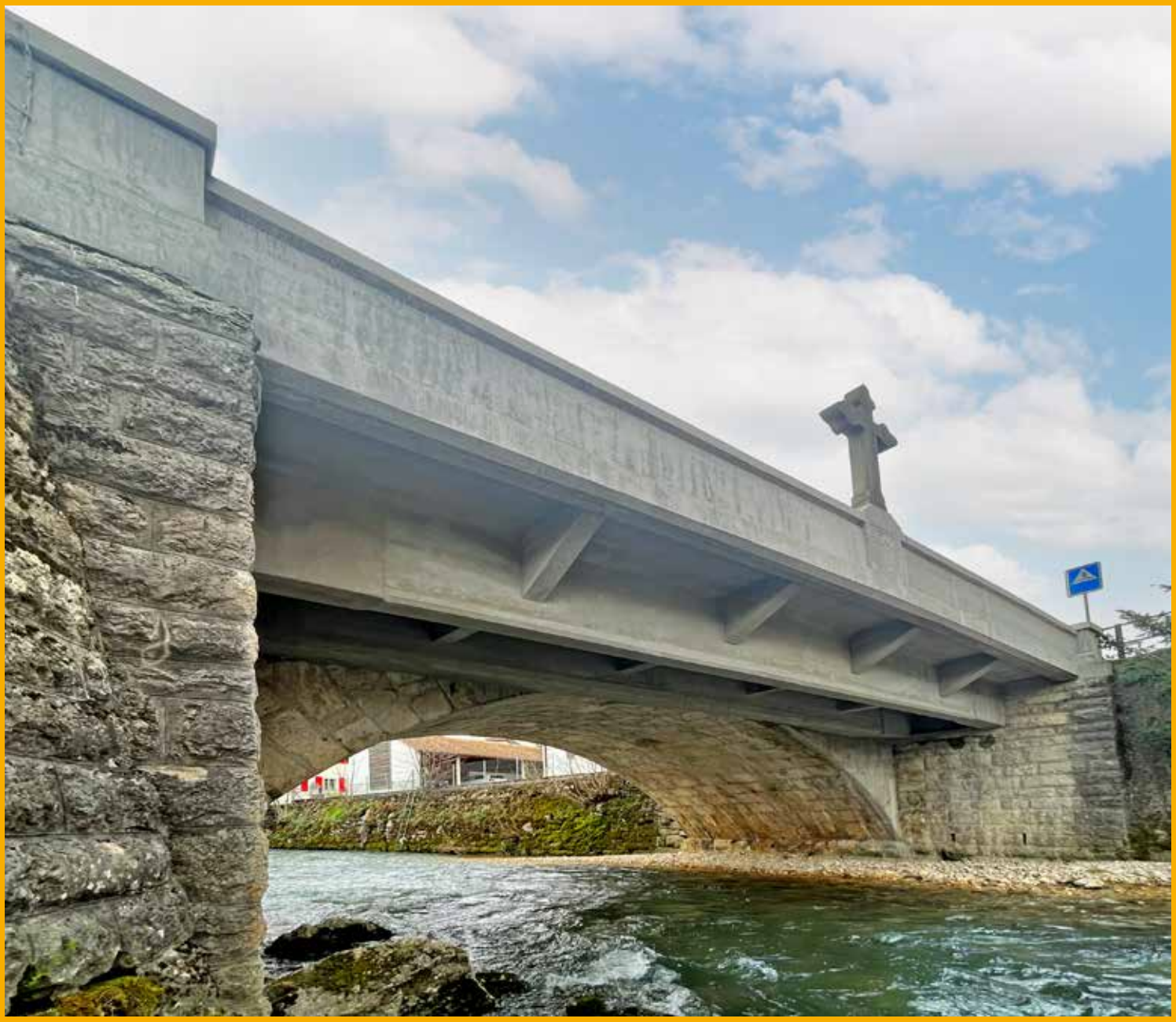


SIKA AT WORK
STRENGTHENING BRIDGE RC6 IN COURRENDLIN (JU), SWITZERLAND

STRUCTURAL STRENGTHENING: SikaReinforcer®
CONCRETE REPAIR AND PROTECTION: Sika MonoTop®
JOINT SEALING: Sikaflex®

BUILDING TRUST

STRENGTHENING BRIDGE RC6

PROJECT REQUIREMENTS

A natural stone arch bridge on a cantonal road in Courrendlin (Jura, Switzerland) was widened on one side in 1958 using a reinforced concrete construction consisting of two girders and a parapet. The girders rest on abutments and are connected by struts and a slab. On the widened section, the concrete near the surface is carbonated and the internal reinforcement is partially corroded. Furthermore, according to the current Swiss structural standard SIA 269/1, the bridge extension has a considerable load-bearing deficit, especially when applying the traffic loads of today. For this reason, as well as in view of the planned geometric adjustment, it was agreed with the client that traffic should not be allowed to circulate on the pavement. The installation of road bollards between the carriageway and the pavement was recommended.

However, it was still necessary to reinforce the longitudinal beams to meet the requirements of the standards. A robust strengthening measure with the aim of specifically extending the life expectancy of the bridge extension was targeted. Static calculations also showed that reinforcing the slab between the struts in the longitudinal direction was necessary, as the existing load-bearing strength were insufficient here.

SIKA SOLUTION

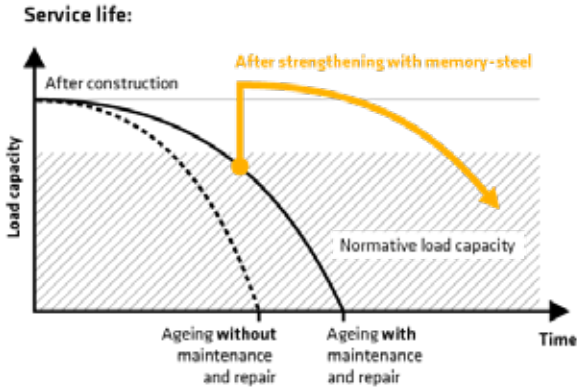
On the longitudinal girders, the corroded steel reinforcements were first cleaned and the damaged excess concrete in the area of the bending tensile reinforcement was removed hydromechanically. The surface was roughened to create a base for the Sika MonoTop®-412 Eco spray mortar. Sika MonoTop®-910 Eco bonding agent was applied to all re-profiling surfaces, providing additional corrosion protection for the existing reinforcement. Three SikaReinforcer®-16 Rebar were applied to the lower tension side of each of the two bending beams and end-anchored over a length of one metre at both ends. After the curing of these mortar segments, the bars were activated with a gas torch. Heating the bars, using controlled temperature increases, activates the memory effect, shaping the steel and creating the pre-stressing in SikaReinforcer®-16 Rebar. In the area of the one-meter-long end anchorage, U-bolts made of B500B structural steel were arranged over the entire height of the web. This allowed a robust anchorage of the bending tension reinforcement in the compression zone. After prestressing, the bars were embedded over the entire length between the end anchorages with Sika MonoTop®-412 Eco spray mortar.

The reinforcement of the slab segments was carried out by means of two post-tensioned SikaReinforcer®-1215 Plate per segment. These reinforcing strips are mechanically anchored to the concrete substrate, which had the compressive strength required for this process. The underside of the bridge slab was also reprofiled with Sika MonoTop®-412 Eco, with an aggregate size of 2 mm, before reinforcement with SikaReinforcer®-1215 Plate was carried out. The external prestressing partially closes the tensile cracks in the concrete on the tension side and prevents the ingress of pollutants such as chloride-containing water. The reinforcing strips were coated with a suitable corrosion protection at the factory. To protect the coating during application, a glass fleece was placed underneath the mechanical end anchorage. On the sides, the re-plates were sealed with Sikaflex® PRO-3 joint sealant. This prevents water and chlorides from getting behind the plates.

Finally, the entire concrete surface was coated with Sika MonoTop®-723 Eco fine filler.

Advantages of the strenghtening method
The chosen reinforcement method allows the existing structure to be pre-stressed simply and easily, thus relieving the load on both the concrete and the internal steel reinforcement. This makes it possible to increase the service life compared to conventional reinforcement without prestressing. The shape memory effect makes it possible to completely dispense with complex prestressing presses. As the rebar can be easily integrated into repair measures such as concrete removal and sprayed mortar work, the additional costs are very low. The additional mortar layers provide additional protection for the existing structure.

In addition to the structural advantages, memory-steel can be integrated into the production cycle of stainless steel in the event of future dismantling and can thus be completely recycled. This minimises the ecological footprint compared to non-recyclable products. In addition, only recyclable mortar products from Sika with a reduced CO_2 footprint were used, which makes the preservation work on this old building structure not just economical, but also sustainable.



STRENGTHENING BRIDGE RC6 IN COURRENDLIN (JU), SWITZERLAND

PROJECT PARTICIPANTS:
Building owner: Service des Infrastructures (SIN), Canton Jura
Engineer: GVH-BP Jura SA, Delémont
Construction company: Marti Arc Jura, re-fer AG

SIKA PRODUCTS USED (SIKA AND RE-FER):
- Sika MonoTop®-412 Eco Reprofiling mortar
- Sika MonoTop®-910 Eco Bonding bridge/corrosion protection
- Sika MonoTop®-723 Eco Fine filler
- SikaReinforcer®-16 Rebar
- SikaReinforcer®-1215 Plate
- Push bar iron B500B

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