STRESSHEAD Ltd
INNOVATIVE STRENGTHENING OF STRUCTURES

Heron Bridge, Ottawa (CAN)

Project

The Heron Bridge in Ottawa is a multi-span bridge with a total span of 275m and is divided in two halves. There is a separate main bridge support beam or girder for both sides. Both have 9 stringers which are connected together by the deck and transverse beams.
The bridge was in poor condition and already had some cracks. Repair and strengthening was necessary.

Solution

In addition to concrete repairs on the bridge deck, the transverse beams were strengthened against bending forces with post-tensioned CFRP plates. The concrete quality at the end of the girder made concentrated transfer of force by anchors impossible. Therefore the compressive force was transferred onto a larger area through a flat steel plate. In all, 36 StressHead systems were installed.

Parties involved in the construction

Client:	Ottawa Infrastructure Services Department (W. Newell, Project ENG.)
Civil Engineer :	Remisz Consulting Engineers Ltd. Ottawa, Ontario Pomerleau Montréal Canada
Tensioning System:	StressHead AG
Year:	2011/12

Tschingeley Bridge, Grindelwald (CH)

Project

The Tschingeley Bridge in Grindelwald spans the Schwarze Lütschine river near Burglauenen. It consists of a deck with 2 longitudinal stringer beams. The bridge was in a seriously defective condition and because it had to be used as the main access to a landfill site for the next 10 years, it had to be strengthened. The aims of the repair were to restore its efficiency for the next 10 years and increase its bearing capacity to accommodate 40 tonne loads.

Solution

Four tensioning systems were installed on each stringer beam to strengthen the bridge. Since 2 systems were sufficient for strengthening at the outer ends of the bridge, 2 systems were only located in the centre of the span. Six tendons were already installed in both stringers, which made the choice of suitable anchorage points difficult. The concentrated transfer of the post-tensioning force was achieved with a steel shear connector designed and installed to cause only minimal weakening of the existing concrete structure.

Parties involved in the construction

Client:	Gemeinde Grindelwald
Civil Engineer :	PlüssMeyerPartner AG, Luzern
Contractor:	Walo Bertschinger AG BE, VSL Schweiz AG
Tensioning System:	StressHead AG
Year:	2007

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Ländten Bridge, Biel (CH)

Project

The 65 year old bridge on Ländtenstrasse Ost in Biel had been designed for maximum load capacity of 20 tonnes as its requirement many years ago. The bridge now had to withstand the current maximum load of 40 tonne loads, which therefore required extensive strengthening work.

Solution

The design of the downstand beams with side arches made them well suited to a structural strengthening system using CFRP plates. The bending resistance and shear resistance both beams had to be increased. Two post-tensioning systems were therefore installed on each downstand beam and they were end-anchored in the bridge abutments.

Parties involved in the Project:

Client:	Tiefbauamt Stadt Biel
Civil Engineer :	Aeschbacher & Partner AG, Bauingenieure und Planer, Biel
Contractor:	De Luca AG, Sika Bau AG, Kriens VSL-Schweiz AG
Tensioning System:	StressHead AG
Year:	2004

Clinton & Hopkins Bridge, Ohio (USA)

Project

The two multi-span bridges were originally prefabricated. Up to 16 box girder beams were prefabricated by the prestressed bed process and then joined together on site. Leaking drainage pipes and defective mains drainage routing had eventually caused corrosion damage over time to the tendons, making strengthening of the box girder beams necessary.

Solution

The prefabricated box beams were very slender in form. In the CFRP plate end anchor areas, the concrete was therefore locally strengthened horizontally with CFRP fabric. Tensioned CFRP plates supplemented the damaged bending reinforcement and the tendons. The bearing capacity was then restored.

Parties involved in the Project:

Client:	State of Ohio, Dept. of Transportation
Civil Engineer :	WOOLPERT LLP, Dept. Of Transportation, University of Dayton, Dept. of Civil Engineering
Contractor:	SPS/VSL (Structural Preservation Systems)
Tensioning System:	SIKA AG-StressHead AG
Year:	2003

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Hütten Bridge, Werthenstein (CH)

Project

The Hütten Bridge was built in the 1950s and was then designed for vehicles with a maximum total load of 28 tonnes. The management of the surrounding forests now required the bridge to be usable by timber transporters and trucks with loads of up to 40 tonnes. The two stringers on the three-span bridge could not take that stress and therefore had to be strengthened for bending and shear.

Solution

The two bridge stringers were strengthened on both sides with post-tensioned CFRP plates up to 30m long. The end anchorage of the tensioned plates was formed by shear connectors right through the stringers, which concentrated the post-tensioning forces within them. CFRP fibre loops were then used for the shear strengthening. Vertical slots were first cut in the bridge deck so that the loops could completely surround both the tension and compression zones of the stringers. The loops were threaded through in several layers and then bonded.

Parties involved in the Project:

Client:	Landwirtschaftsamt Kanton Luzern
Civil Engineer :	Peter Stalder Ingenieur AG, Malters
Contractor	SIKA Bau AG, Kriens, VSL-Schweiz AG
Tensioning System:	StressHead AG
Year:	2003

Sung San Bridge, Seoul (KOR)

Project

The deck of this multi-span bridge had large transverse cracks in several places. The cracks were the result of the ever-increasing traffic loads for which the longitudinal deck reinforcement was not designed. Soffit-mounted bending strengthening was required, and specifically around the abutments and supports. Part of the transfer of force of the CFRP plate end anchors had to be located right by the support, in other words in the arches.

Solution

The longitudinal strengthening was carried out with post-tensioned CFRP plates. The plates were rerouted in the arch areas by a steel saddle to prevent them detaching. The plate end anchorage force could thus be transferred in the sloping part of the arch.

Parties involved in the Project:

Client:	Western Roads & Bridges Maintenance Office Seoul
Civil Engineer :	SUKWOO Corporation
Contractor:	Sika Korea Ltd, SUKWOO Corporation
Tensioning System:	SIKA AG-StressHead AG
Year:	2002

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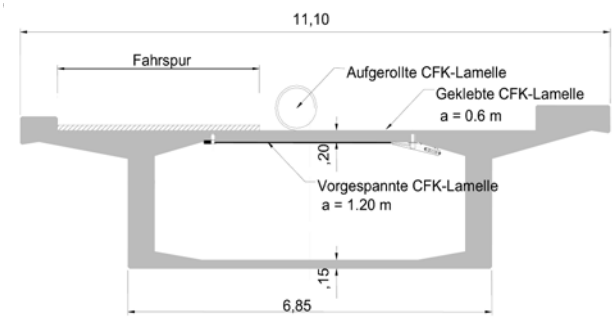
A3 Escher Canal Bridge, Glarus (CH)

Project

The three-span bridge on the A3 Sargans-Zurich motorway was built in 1957 and crosses the Escher Canal near Weesen. The superstructure is a fully prestressed box beam. During routine inspection a crack was found to extend along the whole length of the bridge in the centre of the deck soffit. Strengthening was required

Solution

The deck was strengthened transversely in the span in the bay for positive and negative moments with CFRP plates. The tensioned CFRP plates on the deck soffit act as external post-tensioning. The post-tensioning force is transferred into the concrete at the plate ends only, and so could be located where it was required to achieve the optimum strengthening effect.



Parties involved in the Project:

Client:	Amt für Tiefbau Kanton Glarus
Civil Engineer :	Ingenieurbüro Locher AG, Zürich
Contractor:	Spaltenstein AG, Zürich SIKA Bau AG, VSL-Schweiz AG
Tensioning System:	StressHead AG
Year:	2002

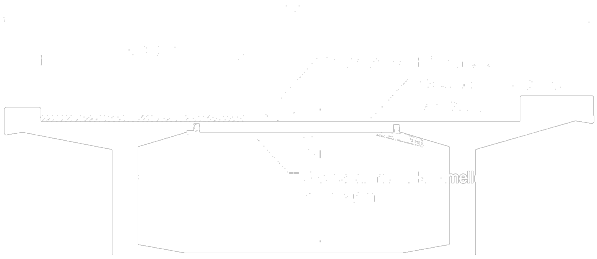
Commonwealth Bridge, Singapore (SIN)

Project

The Commonwealth Bridge in Singapore, with a span of 23m, crosses a railway line. Three lanes of traffic use the prestressed bridge, which carries these loads with a single beam. A review under the new structural standards showed that the load bearing capacity was no longer assured. The bridges load bearing capacity therefore had to be increased by 20%

Solution

Two options were proposed to strengthen the bridge. The first option using 3 additional prestressed steel systems was rejected, due to the complex construction works required and the additional dead weight placed on the bridge. It was decide to alternatively strengthen the structure with post-tensioned CFRP plates. Therefore 16 StressHead systems in total were installed for strengthening of the stringers.



Parties involved in the Project:

Client:	VSL-International AG
Civil Engineer :	Dr. Tan Kiang Hwee, Department of Civil Engineer, National University of Singapore
Contractor:	VSL-International AG
Tensioning System:	StressHead AG
Year:	2008

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