

 **Miscellaneous****Reference Details:****Owner** CEI Construct
Engineering +++**Engineering**Association
momentanée PMD-
DEKEYSER-
TRACTEBEL
INDUSTRY
ENGINEERING +++**Rehabilitation for
existing tendons**
ATEAV-DSI**DSI Services** New
prestressing Strand and
bar tendons; 8.2tons of
DYWIDAG External
Tendons Type W 15-
0.62"; 1.2tons of
DYWIDAG Single Bar
Tendons 36mm dia. St
1080/1280, *GEWI*[®]
bars dia. 32 and dia.
63.5mm; Supply of
material by DSI
Belgium.**DYWIDAG-Technology strengthens a railway bridge under traffic - Dufenco-Clabecq railway bridge, Brussels-Charleroi Canal, Belgium****The railway bridge, located on the property of the DUFERCO-CLABECQ company, crosses the Brussels-Charleroi canal and provides the link between the blast furnace, the steelworks and the rolling mills.**

The 1961 constructed bridge consisted of a single 53.5m prestressed concrete span that rests on abutments on both sides of the canal. The owner had been worried about the existence of damage to the abutments for a number of years. This damage led to the execution of temporary reinforcement work to the abutment on the Clabecq side.

Various preliminary studies convinced the owner of the necessity of immediate and extensive conversion and renovation works in order to return the structure to a normal safety level and renew its life expectancy. As factory production could only be interrupted for a short period of two weeks corresponding to the maintenance of the blast furnace, the renovation work on the bridge had to take place while maintaining heavy rail traffic. The structural renovation extended the bridge with two new 14m long reinforced concrete spans on both sides. The original single span girder was transferred into a three span continuous girder with 23.5m, 42.5m and 17.5m long span lengths. The conversion of the caisson girder required the replacement and complete modification of the prestressing tendon layout. This reconstruction was remarkable in all aspects of engineering, technical execution, organization and job site logistics, further complicated by the ongoing heavy rail traffic on the bridge and barge traffic on the canal.

- Replacement of the existing exterior prestressing tendons with 8 new pieces DYWIDAG external tendons type W 15-0.62" consisting greased and HDPE-sheathed strands,
- Extensive use of DYWIDAG single bar tendons for localized vertical and horizontal reinforcement,
- Installation of *GEWI*[®] bars as passive anchors,
- Application of a patented injection system to stop corrosion in the existing tendons

The 1961 construction used a very common system of that time: both internal and external tendons consisted of twelve 7mm diameter prestressing wires. Judging from the state of corrosion of these wires and the number of injection voids encountered it became apparent that a curative treatment was urgently needed.

The stabilization of corrosion in the existing tendons was achieved using a proprietary system called "PMD-ATEAV". On equal distances the tendons are carefully probed with a drill. Then a corrosion inhibitor solution is forced into the cement grout using a pulsating high frequency pump that produces the propagation of a pulsating effect within the corrosion inhibitor while working under low pressure. The pulsating ultrasonic pressure forces the liquid into the cracks and completely saturates the cement grout with the corrosion inhibitor. Measuring the time elapsed for the liquid to flow from injection port to inspection hole and plotting these measurements results in a detailed mapping of cement grout quality. After injection of the inhibitor, a micro-fine cement grout is injected into the interstices between and around the wires using traditional post-grouting techniques, in order to fill the cracks and injection voids thus achieving a durable protection of the prestressing steel.

