DYNACIV PTY LTD

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Deep Crack Injection

Company Profile

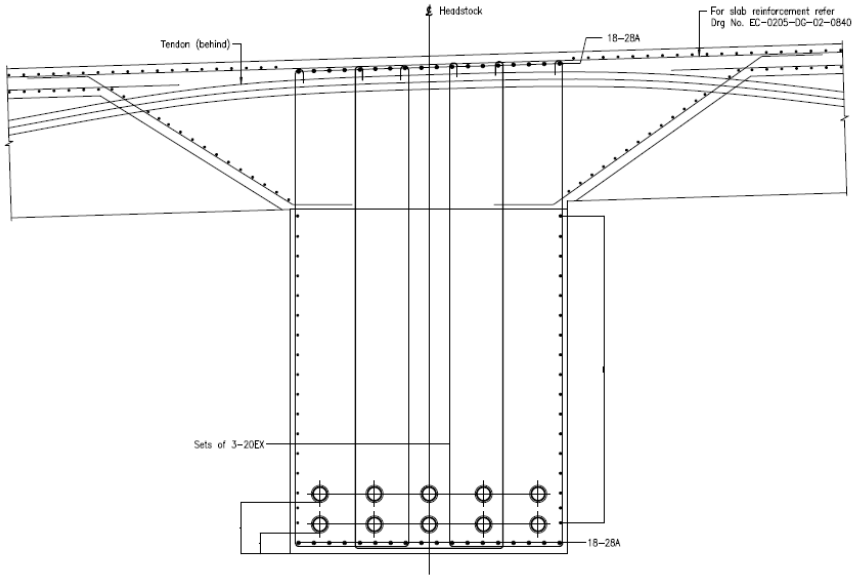
Dynaciv is the culmination of many years of experience in the application of various epoxy resins to strengthen structures. We have learnt how to adapt epoxy compounds to specifically suit the purpose to improve quality and increase value.

We pride ourselves on our technical expertise and how it knits well with the practical experience we have gained working on large underground infrastructure projects to the smallest repair project.

The Situation

A 28 metre long, post tensioned beam was constructed to support high loads above moving traffic. The beam is supporting the roof structure of the cut and cover tunnel at the Eastern side of the Legacy Way Tunnel.

The beam is 2.8 metres wide, with an average height of approximately 3.5 metres. The large beam has 10 ducts of 135 mm running longitudinally through the beam. These ducts carry the high strength tension cables that will be used to stress the beam once it has reached full strength. A section through the beam is shown below.



SECTION THROUGH POST-TENTIONED BEAM SHOWING TENSION DUCTS

The entire beam was cast in a single pour. This mass of concrete would have generated much heat. This, along with the behaviour of the high strength concrete blend, caused the beam to crack horizontally and vertically. The cracks varied in size, however all cracks greater than 0.2 mm required repair. After a thorough investigation by the engineers, 5 cracks were identified for repair.

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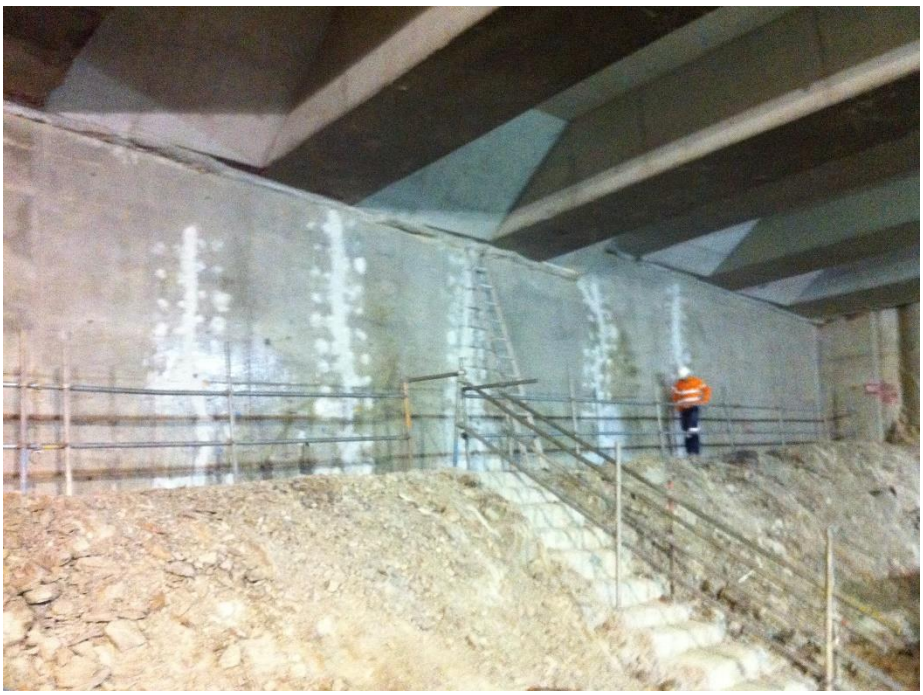
The photo below shows the north side of the beam with the 5 verticle cracks



NORTH SIDE OF THE BEAM SHOWING THE FIVE CRACKS

The Solution

Dynaciv was engaged by Transcity JV to propose a suitable product and methodology to repair the beam. The methodology needed to be approved by the contractor's design consultant, Brisbane City Council and council's engineering representative.

Dynaciv proposed a high-pressure crack repair system using the CHEMRITE® CILV Epoxy. This blend of epoxies is specifically made to achieve high strength, whist still maintaining a good pot life at a very low viscosity. The repair proposal comprised of low-pressure injection around the duct (it was thought that the low viscosity CHEMRITE® CILV may be forced into the duct if a high-pressure system was used). To ensure coverage across the whole beam, Dynaciv proposed a system where 1.6 metre holes would be drilled into the beam at predetermined angles to intersect the crack deep within the beam. This was done at regular intervals to better the chances of penetration. Dynaciv's proposal was accepted.

The low pressure injection started below the bottom duct and the bottom of the beam. This was done using CHEMRITE® CILV cartridges as shown in the photo below. Volumes and back pressure were closely monitored to reduce the risk of epoxy entering the ducts.

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LOW PRESSURE INJECTION

After the low pressure crack injection was done, the epoxy was allowed to cure for 24 hours while drilling continued above the ducts to cater for the high pressure packers. As with the low pressure injection, the high pressure holes were also drilled deep into the beam. Once done, the packers were attached and a planned sequential injection process begun. Although high pressure pumps were used, the pressure was capped at 600 psi to limit unnecessary pressure being exerted on the beam.

HIGH PRESSURE INJECTION PACKERS

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The injection was done with great care, making sure the epoxy filled all the cracks concerned. Volumes used were closely monitored against pumping pressures to ensure that the beam was not being over pressurised or that the epoxy was leaking into the ducts.

After 7 days, cores were taken to confirm penetration. Approximately 20 cores were taken across the five cracks. Many of the cores were 1000mm deep, thus confirming deep penetration. All cores tested yielded positive results – a great win for the client and Dynaciv.

SHOWING DEEP END OF A 1000 MM CORE

Benefits

The repair of this beam was on the critical path of a multi-billion dollar project that was slightly behind plan. As time was critical, the job had to be right, first time.

Dynaciv met the requirements of the project and ascribed our success to our methodology and product expertise.

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