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THE MISSION RIVER BRIDGE



TEAM VALUES

Safety | Integrity | Collaboration | Determination | Passion for improvement | Responsibility and accountability

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

The Mission River Bridge is an integral asset for the Rio Tinto Alcan – Weipa Operation and the local community. It provides a rail link from the Andoom Mine to the Lorim Point Operation where the ore is stockpiled and shipped. It also provides an access point for Rio Tinto employees, local people and tourists to travel from Weipa to Andoom and north to the peninsula.

In the mid 90's the structural integrity of the Mission River Bridge was found to be in a poor condition. Rio Tinto then teamed up with a design consultant and formulated a methodology to restore the integrity of the uncertain piles using large steel splints and a cementitious grout. Although this system worked, the bridge had to be closed for 24 hours allowing the grout to reach the required structural properties. This was not only frustrating for the users, but delayed the transporting of the ore to the washing plant and the ship loader.

The Solution

Epoxy Formulation

In 2007, Dynaciv were approached to formulate an Epoxy blend that can be used under water to grout the inside of the piles and the structural steel splints.

The product required to reach the set structural criteria in a short time without reaching excessively high temperatures.

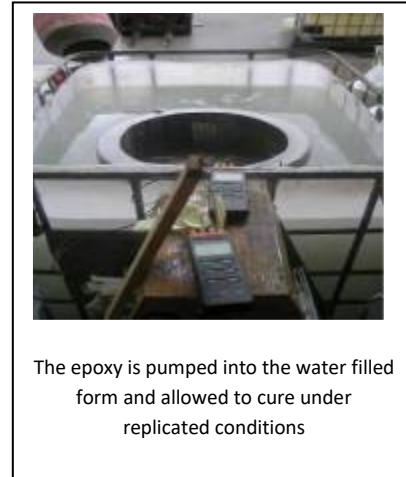
The formulations were done and tested under strict conditions. Temperature, cure time, shrinkage, rheology and other structural properties were monitored closely in order to develop the suited compound. The test was done in an insulated drum that was placed in an IBC, where temperature and water flow were monitored and controlled. This was done to replicate conditions underwater.



The illustration below shows some of the testing equipment.



An insulated drum representing the insulated pile splint



The epoxy is pumped into the water filled form and allowed to cure under replicated conditions

Once the desired results were achieved, the unique blend was locked in. This blend of epoxy resins, hardeners and fillers would be used to encase the damaged piles along the 1020 m bridge.

Grouting the piles

The conditions on site are never ideal. The Mission River has large fast changing tides, poor visibility and large predators.

However, most of these difficulties and safety concerns were mitigated through thorough risk assessments carried out with Rio Tinto and other contractors.

The steel splints that serve as the structural formwork for the epoxy are manufactured from 12 mm rolled steel plate. They are fitted with grout ports and tell tales to indicate the level of epoxy during pumping.

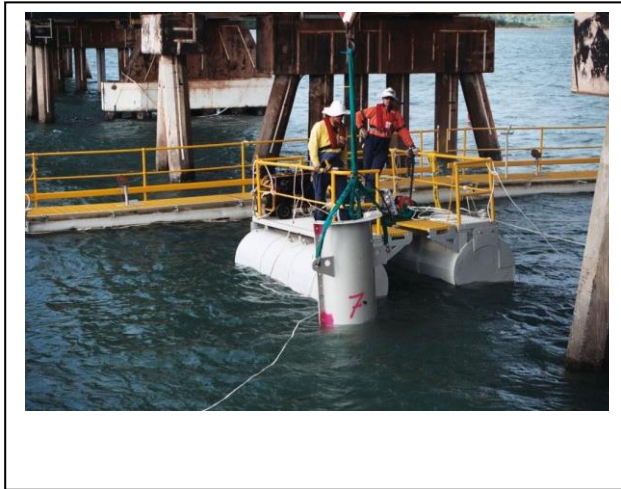
The piles are prepared by grit blasting to expose clean surfaces.

The two sections of the splints are then lowered into the water and bolted together. The bottom 500 mm of the splint is first sealed using a fast curing epoxy plug mix. Once the plug mix has cured, the splint grout (pump mix) is pumped displacing the water as the grout rises. The hose is moved to the next grout port when the grout reaches that level. The pumping will carry on until the grout reaches the bottom of the concrete soffit. A fast curing grout is used to grout the void between the splint shell and the concrete section.

When the grouting operation is completed, the bridge is immediately opened for traffic up to 3 tonne.

After 90 minutes the road and rail is opened to all traffic limiting the inconvenience to the public and cost saving to Rio Tinto Alcan.

This has successfully been used to improve the integrity of the Mission River Bridge piles since 2007.



Benefits

The benefits of using the epoxy are:

- Reduced risk of Alkali-aggregate reaction (AAR) in Concrete piles.
- Fast efficient installation
- Early high strengths means the bridge can be opened to traffic earlier. A massive saving for the mining company.
- Properties can easily be adjusted to suite all site conditions.
- Extended life of the bridge.