PROJECT SHEET

CFRP STRENGTHENING – 3 BRIDGES

PROJECT SUMMARY

Asset Owner: Queensland Government

Location: North Queensland

Duration: 7 weeks

Major Challenges Overcome:

- Uneven diaphragms
- Unfavourable environmental conditions
- Remote locations
- Amount of work required in the short period

The Project

Dynaciv was engaged to carry out the structural strengthening of three bridges in North Queensland. The three bridges, namely: Palmer River Bridge, Spear Creek Bridge and Spring Creek Bridge are situated on the Mulligan Highway far north Queensland. They are critical for road transport access to northern towns such as Weipa. Constructed 60 years ago, all three bridges were in a poor state and required a significant amount of carbon fibre strengthening to increase their capacity for the increased load demand.

Over **150 m^2** of carbon fibre wrap and over **1,700 m** of carbon fibre strips were required to strengthen the diaphragms on all three bridges. The sheer amount of carbon fibre reinforced polymer (CFRP) required in the short timeframe coupled with unfavourable environmental conditions presented many challenges.

PALMER RIVER BRIDGE

SPEAR CREEK BRIDGE

SPRING CREEK BRIDGE

Project Scope

Dynaciv's scope of work:

- Palmer River Bridge:
  - Concrete repairs and profiling
  - CFRP Laminate – 724 m
  - CFRP Wrap – 77 m^2
- Spring Creek Bridge
  - Concrete repairs and profiling
  - CFRP Laminate – 716 m
  - CFRP Wrap – 55 m^2
- Spear Creek Bridge
  - Concrete repairs and profiling
  - CFRP Laminate – 343 m
  - CFRP Wrap – 33 m^2

The laminates were applied to the undersides and sides of all the diaphragm beams, and the wrap was applied to the ends where the diaphragm met the girder.

Completed Works

The following works were successfully carried out:

Concrete repairs and profiling

All three bridges required a form of concrete repair and profiling prior to the application of CFRP. It is a general requirement for CFRP to be applied to an even surface.

Above: A typical diaphragm where the deflection on the surface was in excess of the minimum 5mm allowance. The diaphragms required a significant amount of profiling.

The illustrations below show how the surface was re-profiled, and corners rounded to meet both the laminate and wrap specifications.

Below: Corners rounded in preparation for CFRP wrap

Below: Concrete profiled to meet strict CFRP specifications

Below: CRFP laminate and wrap applied to bridge diaphragms

Below: Completed bridge end diaphragms

Dynaciv places high importance on quality and testing. We therefore have invested in high quality testing equipment to continually monitor and ensure we apply the products to specifications.

The photos below show some of the testing performed.

Below: adhesion testing

Some testing is destructive, therefore a separate area is allocated for carrying out these tests. It is imperative that the test area work is done exactly as it is done at the work face.

Below: moisture content testing

Below: Testing of environmental conditions