

Composite Strengthening Systems Used to Reinforce Tasmanian Bridges



The Simpson Strong-Tie® Composite Strengthening Systems™ has been used to strengthen 4 bridges across Tasmania, meeting strategic designs for load bearing capacity increases, tight timelines and budget constraints.

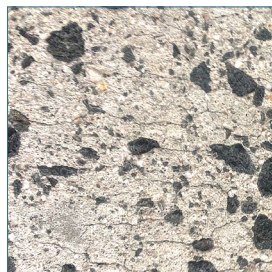
THE CHALLENGE

“The Tasmanian Government is committed to strengthening Tasmanian bridges on key routes to retain the existing levels of service for heavy vehicle freight and community access. These upgrades of state road bridges are in order to allow for high-productivity freight vehicles (HPFV).” Source: Transport Tasmania

With the increase in load requirements of bridges and the need to extend service life, strengthening with Composite Fibre Reinforced Polymer (CFRP) can be considered as an ideal solution.

The following structural deficiencies were identified for these sites:

- Positive bending in the deck longitudinal direction
- Positive bending in the deck transverse direction
- Positive bending in the kerbs
- Shear capacity of girders



PROJECT INFORMATION

Project Category

Bridge Repair and Strengthening

Project Name

Prospect Vale Bridge
Flinders Creek Bridge
Blackman River Bridge
Blackman River Flood Opening Bridge

Project Owner

DSG - Tasmania

Engineer

Pitt & Sherry & GHD

Main Contractor

VEC Civil Engineering Pty Ltd

Structural Restoration Contractor and FRP Installer

AERAMIX Pty. Ltd.

Simpson Strong-Tie Products

S&P Laminate, S&P Resin220

Project Start Date

March 2018

CHALLENGE

To strengthen state road bridges on key routes to retain the existing levels of service and to allow for upgrades that would handle high-productivity freight vehicles (HPFV).

SOLUTION

Strengthening with Composite Fibre Reinforced Polymer (CFRP) has been considered as an ideal solution.

RESULTS

Novel installation methods were developed and met both client requirements, and Simpson expectations.

Simpson Strong-Tie® CASE STUDY

THE SOLUTION

The following retrofit solution was outlined:

1. All cracks would be structurally bonded using an epoxy injection process.
2. All loose delaminated concrete would be repair as per relevant standards and specifications
3. The engineering analysis required CFRP for flexural strengthening on all bridges.
4. Flinders Creek bridge kerbs to be strengthened using steel plates.
5. Blackman River bridges to be strengthened with custom stainless steel shear plates.
6. All strengthening using Laminates will have no splicing
7. Subsequent protective coating required prior to strengthening.

Proposed Strengthening Methodology

Due to the nature of strengthening required on the bridges, the limitations on both the accessibility and time sensitivity of extensive road closures, it was proposed that carbon fibre reinforcement be used to strengthen the underside of the bridges for flexure.

- Flinders Creek bridge required CFRP strengthening in both the longitudinal and transverse direction of the deck for flexure and additional steel plates were required to strengthen the kerbs.
- Blackman River bridges required CFRP strengthening of the girders for flexure along with custom fabricated stainless steel shear plates.
- Prospect Bridge required CFRP strengthening of the deck for flexure.

The strengthening proposed was to consist of:

- 3267m of 150 x 1.4mm thick CFRP Laminates applied longitudinally and transversely under the deck
- 360m of 120 x 1.4mm thick CFRP Laminates applied under the girders
- 4 tons of S&P Resin220



Flinders Creek Bridge

CFRP strengthening design in accordance with AS5100.

This project required extensive coordination between Client, Simpson Strong-Tie and the installer. Initially Simpson Strong-Tie reviewed and made alterations to the proposed designs in order to optimize CFRP layouts and ensure the most economical installation procedures for the installer. Simpson Strong-Tie engineers or RPS specialists coordinated extensive installer training. During the project they were in contact with installers on a weekly basis to not only to assist with project queries but also to observe that the FRP installation was carried out to meet both client requirements, Standard Specification and Simpson expectations.

The strengthening of bridges using CFRP has become a well-established practice within Australia. It provides a cost effective outcome with significant additional capacity to the structure. Along with the obvious benefits:

- Fast return to service
- Durability
- Light weight

Simpson Strong-Tie® were chosen for the repair due to their engineering capabilities, technical knowledge and field support.

THE RESULTS

Due to the unique challenges presented on this project, novel installation methods were developed by the contractor in order to accommodate for the specific requirements that full length laminates be installed along the spans without complete traffic stoppage.



Blackman River Bridge



Prospect Vale Interchange Bridge

**MORE
INFO**

Simpson Strong-Tie® Australia Pty Ltd
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www.strongtie.com.au