



## Evaluation and Analysis of Decked Bulb T Beam Bridge

### Description

#### Meta Fields

**Project Completion Year :** 2015

**Project Starting Year :** 2011

**Other Documents 0 Other Documents File :** 2543

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**Project Length :** 36

**Budget :** 415000.00

**Key Words :**

Decked bulb T beam, bridges, transverse post-tensioning, longitudinal cracks, transverse diaphragms, ultra high performance concrete. CFRP prestressing strands, Un-bonded strands

#### Abstract :

A new corrosion-free decked bulb T beam bridge system has been developed to overcome some of the problems associated with the construction of side-by-side box beam bridges such as the lack of inspection space between beams and the longitudinal deck cracking. The new bridge system is reinforced and prestressed with carbon fiber reinforced polymer (CFRP) materials instead of the conventional steel reinforcement. In addition, the longitudinal keyways between the top flanges of the beams are grouted using ultra-high performance concrete (UHPC) instead of conventional non-shrink grout. The top flange of the beams with the UHPC shear key joints substitutes the need for a cast-in-place deck slab, a technique that saves time and labor at construction site and ensure the quality control of the product. Through this research project, an experimental investigation and a numerical analysis were conducted to confirm the superiority of the new system. The experimental investigation included the flexural and shear testing of five control beams and a complete bridge model as well, while the numerical analysis was developed, after verification, to evaluate the need for transverse post-tensioning in the system. Results from the experimental investigation and the numerical study indicated that the flexural and shear performance of the new bridge system conforms to the theoretical prediction and the UHPC shear key joints are sufficient to laterally distribute the loads across the bridge width. No signs of longitudinal cracks were observed over the shear key joints of the bridge model even when loading an exterior beam to twice its load carrying capacity. In addition, the CFRP reinforcement was

proven to be a proper alternative to steel reinforcement in decked bulb T beams. No premature failure or un-predicable behavior was experienced. The study also showed that a transverse post-tensioning may not be necessary for the system provided that the shear key joints are properly constructed using UHPC. Overall, it can be concluded that decked bulb T beam bridge system with CFRP reinforcement and UHPC shear key joints is an excellent alternative for side-by-side box beam bridge system that promotes expedited construction, access to inspection, reduced maintenance work, and an effective approach to eliminate the longitudinal deck cracking problem.

**Subject :** Decked Bulb Ts

**Group :** Superstructure

**Category :** Completed Projects