

Application of Fiber-Reinforce Polymer in Rehabilitation and Construction of Structures Colorado Department of Transportation

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As part of a national initiative sponsored by the FHWA under Innovative Bridge Research and Construction Program (IBRC), CDOT was awarded 3 grants in the amount of \$1,600,000 to participate in the evaluation of 1- Fiberglass Composite Bridge Deck, 2- Precast FRP Reinforced and Prestressed Bridge Decks, 3- Use of FRP Wrap in Strengthening of Arches and Struts of a Historic Bridge. The program's primary objective was to promote, foster the application of new, innovative, emerging technologies in the field of bridge construction, repair and rehabilitation. In my presentation I will provide the participants with information on the construction, laboratory and field testing of different FRP materials including Glass FRP, Carbon FRP, FRP bridge decks and FRP wraps for the following projects:

- I-225/Parker Road Interchange- For the first time in its history, CDOT used carbon fiber reinforce polymer (CFRP) strands as prestressing agents in precast bridge deck panel in place of the reinforcing steel tendons. Glass FRP was also used as mild reinforcement in the bridge deck and rails of the Interchange. In addition, as part of this experiment and as an extension of previous work done on high performance concrete (HPC), CDOT developed an HPC mix for bridge decks to improve durability by reducing shrinkage cracking, thermal cracking, and reducing permeability while maintaining current standard for workability and strength (Ref 1).
- O'Fallon Park bridge- CDOT was awarded a grant in the amount of \$500,000 to use and evaluate fiberglass composite bridge deck panels in place of the traditionally used concrete deck panels. The primary objectives of this study were two folds:
 1. Demonstrate the use of fiberglass panels as a bridge deck and evaluate its constructability and performance.
 2. Validate the quality and mechanical properties of fiberglass materials through field and laboratory testing (Ref 2)
- Castlewood Canyon Bridge- This is the most interesting of all the IBRC projects, dealing not only with innovative materials, but also innovative techniques. This time around, CDOT used carbon FRP wrap in strengthening of arches and struts on a historic bridge located in the Castlewood Canyon south of the town of Parker, Colorado. In addition, to expedite the rehabilitation time, an innovative splicing system, precast decks, precast pier-caps, and precast columns were used (Ref 30)

References:

- (1) Benson Shing and Yunping Xi, "Studies on the Use of High-Performance Concrete and FRP Reinforcement for the I-225/Parker Road Bridge" December 2003.
- (2) Benson Shing and Yunping Xi, "Evaluation of GFRP Deck Panel for the O'Fallon Park Bridge" February 2004.
- (3) Benson Shing and Yunping Xi, "Use of Carbon Fiber Reinforced Wrap in Strengthening of an Historic Bridge in Colorado" January 2005.