

FDOT Transportation Innovation Initiative: FRP – Design Innovation



Fast
Facts:
Glass
Fiber
Reinforced
Polymer

UNIVERSITY
OF MIAMI



Project Location: Coral Gables, Florida

Agency: University of Miami

URL: <http://www.fdot.gov/structures/innovation/FRP.shtm>

Project Name: Innovation Pedestrian Bridge

Project Description: Although this pedestrian bridge is a simple, single-span, 70 ft.-long construction, it offers a number of features intended to ensure a 75-year service life to its owner, the University of Miami. The bridge consists of the following concrete elements reinforced with FRP: auger-cast piles; cast-in-place pile caps and back walls; precast prestressed girders; and, cast-in-place deck topping and curbs. Stainless steel is used for the bearing plates of the girders, the anchor bolts for the lampposts, and the railings.

Project Purpose & Need: The University of Miami deliberately chose this type of structure to demonstrate its commitment to innovation and sustainability for a pedestrian bridge used by students to access the sports and intermural fields on campus.

Overall Budget/Cost Estimate: \$ 750,000.

What was unique about this project? There is not a single pound of “black steel” (carbon steel) in any element of the bridge; in fact, all reinforcement and tendons are made of composite materials.

Describe Traditional Approach: This project initially specified the use of steel-strand prestressed girders supported on traditional steel reinforced concrete piles and pile caps.

Describe New Approach: This project achieved special impact because it allowed the use of non-corrosive reinforcement, addressing sustainable practices towards low maintenance with zero anticipated repair costs due to corrosion. For the first time, this simple structure combines novel materials including Basalt FRP (BFRP), Glass FRP (GFRP), Carbon FRP (CFRP) and novel composite manufacturing technologies (continuous closed stirrups and automated-preassembled cages) to ensure that degradation due to steel corrosion no longer reduces the longevity of the transportation infrastructure.

Top Innovations Employed:

- a) Prefabricated reinforcing cage for auger cast piles. Cages consisted of six #6 BFRP bars and #3 spirals made by taking advantage of precision manufacturing.
- b) Girders in the shape of double-tees prestressed with nine 0.6-inch diameter, seven-wire CFRP strands. CFRP tendons have been used for other precast or post-tensioned applications, but never before in the fabrication of double-tees. The reinforcement grids for both stems and flange were made of pre-assembled interwoven BFRP bars (#3 and #4, respectively).
- c) Cast-in-place elements such as curbs and pile caps reinforcement consisted of a combination of continuous closed BFRP stirrups and straight BFRP bars.

Primary Benefits Realized/Expected: FRP reinforcement eliminates the need for additional concrete cover for corrosion protection as well as the use of waterproofing sealants. This project allows for significantly lower labor and equipment costs because of the lightweight reinforcement handling. Other benefits of this projects range from low maintenance costs for the owner.

Project Start/Completion Dates: 11/2015 – 4/2016

Affiliations: General Contractor: OHL Arellano Construction Co.
Engineer of Record: Brill Rodriguez Salas & Associates Inc.

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