

New Jersey Department of Transportation  
Bureau of Research

## Technical Brief



### Fiberglass Composite Material Specification Redevelopment

*This project involved a thorough literature review, evaluation of existing standards, and an engineering analysis of commercially available, polymer based, fiberglass reinforced composite structural members with the focus on revising Section 916 of the New Jersey Department of Transportation Standard Specifications to be inclusive of more commercially available products.*

#### Background

Polymer based structural members have shown to be economically viable when used in marine environments. These polymer materials have higher initial cost than traditional materials (steel, concrete, and timber), but generate return on this investment with longer useful lives. These materials are currently being implemented in a variety of geotechnical structures in the state of New Jersey. This research was performed because the requirements of Section 916 of the New Jersey Department of Transportation Standard Specifications limited the State of New Jersey to a small subset of the commercially available products. Expanding the number of viable products allows for greater competition making it possible for the New Jersey Department of Transportation to spend funds more efficiently.



Figure 1

#### Research Objectives and Approach

The main research objective was to determine the minimum requirements for the polymer based structural members. This was accomplished by evaluating the current AASHTO LRFD Bridge Design Specifications, national and regional specifications for polymer based materials, and the existing peer reviewed literature. With this information, an independent engineering analysis was performed by Hardesty and Hanover; representative designs were created using commercially available products. Finally, requirements for qualification and acceptance testing were created. Simple acceptance tests were specifically selected. It was determined that there are no existing simple tests which could be performed on circular fiber reinforced polymer tubes, and two new standard tests were developed for the New Jersey Department of Transportation as shown in Figure 1. One tests a ring cut from the circular tube with two opposing forces. The other tests an arch segment in flexure.

## Findings

- Currently there are four distinct types of polymer based products with unique properties competing for the same market space
- The engineering analysis found that each of the polymer based products could be successfully implemented in design
- The design properties of all of the polymer based products must be based on full-scale testing
- Due to the unique nature of each of the four polymer products, it was not advantageous to dictate minimum design properties
- A specification, product qualification, and product acceptance standards were created based on statistically determined material properties, maximum allowable degradation, and full-scale structural testing
- Technical issues which complicate the implementation of several national standards for fiber reinforced polymer composites were identified

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A final report is available online at: <http://www.state.nj.us/transportation/refdata/research/>.  
If you would like a copy of the full report, send an e-mail to: [Research.Bureau@dot.nj.gov](mailto:Research.Bureau@dot.nj.gov).

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**NJDOT Research Report No: FHWA-NJ-2017-006**