Project Details

Harkers Island Bridge Replacement: Material Characterization and Structural Performance

NCDOT Research Project Number: 2022-08

Executive Summary

The Harkers Island Bridge replacement is North Carolina's first bridge in which all primary load-carrying components use internal fiber-reinforced polymer (FRP) reinforcement. The project combines carbon FRP (CFRP) prestressing strands and spirals with glass FRP (GFRP) bars in piles, girders, substructure, and deck.

This companion research program documents bridge construction, characterizes the FRP materials, and develops practical recommendations for project-level quality assurance/quality control (QA/QC), detailing, and future code development. An extensive material-testing program showed that all CFRP strands from 73 production lots exceeded the specified minimum strength and tensile modulus. Bent bar tests on CFRP spirals confirmed substantial strength reduction at bends, while GFRP bar tests verified compliance with ASTM D7957 but exposed gaps in sampling and traceability. Statistical analyses indicate that 2 to 5 tension tests per lot can provide acceptable confidence levels for project-level QA/QC.

Field observations informed recommendations on end-region detailing, lifting systems, handling practices, and tagging. Overall, the project demonstrates that all-FRP reinforced, prestressed concrete bridges are technically feasible within conventional schedules and highlights where specifications, standards, and QA/QC practices must evolve to support broader implementation.

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Related Documents

FINAL REPORT

Harkers Island Bridge Replacement: Material Characterization and Structural Performance
[https://connect.ncdot.gov/projects/research/RNAProjDocs/RP2022-08_Final Report.pdf]

Additional Information on:

Project Participants: Researchers, Managers, Chairpersons
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[https://connect.ncdot.gov/projects/research/Pages/ProjUsers.aspx]

Report Period

August 1, 2021 - December 31, 2025

Status

Complete

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Bridge Construction

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