



FAST FACTS:

Hybrid Composite Beam (HCB)

PROJECT LOCATION:

Boothbay Harbor, ME

PROJECT NAME:

Knickerbocker Bridge

BRIDGE MATERIAL DESIGN OPTION:

Hybrid Composite Beam (HCB)

UNIQUE FEATURE:

HCB with integral FRP composite deck forming “wings,” shell laminated with FRP consisting of glass reinforced, vinyl ester polymer; beams are made continuous at the piers

PROJECT DESCRIPTION:

The Knickerbocker Bridge, located on Barter Island Road and crossing Back River, consists of sixty-four Hybrid Composite Beams (HCB).

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| PURPOSE AND NEED: | The previously existing bridge had deteriorated to the point that rehabilitation was not recommended. Marine borers and ice action had created extensive damage to the timber piles. The bridge had a wooden superstructure on timber pile bents and was only 24 feet wide. Three replacement options were considered, each having a concrete superstructure appropriate to the salt water environment. The solution that resulted in the least traffic disruption was the preferred option for the public and Maine DOT. Barter Island Road is a minor collector with AADT of 2020. The bridge replacement included 1060' of approaches. | |
| CONTRACT AMOUNT: | N/A | |
| ENGINEER'S ESTIMATE: | \$5,410,000 | |
| BID AMOUNT: | HCB \$1,748,928, Bridge Construction \$3,844,824 | |
| FINAL CONTRACT VALUE: | \$5,593,752 | |
| TRADITIONAL APPROACH: | Use box beams for shorter spans and NEBT for longer spans, though box beams can have a longer span for an equivalent beam depth. Address concern about freeboard at the pier caps and at the ends of the bridge. | |
| NEW APPROACH: | Build a parallel bridge 5' south of the existing bridge, allowing the work to proceed separate from traffic, no detours required. Use HCB with FRP shell for the eight spans. Create crest curve bridge profile, producing less freeboard at the ends. Address issue of storm surge, which can add two feet to the tide level on top of wave action, by maximizing the profiling and freeboard, helping to increase the life of the concrete superstructure and pier caps. | |
| BRIDGE DETAILS: | Span: | Eight spans, 540' long (two spans @ 60', six spans @ 70') |
| | Rise: | N/A |
| | Width: | 32' |
| | Skew: | 0 degrees |
| | Arch: | N/A |
| | Headwall: | N/A |
| BENEFITS REALIZED/EXPECTED: | Longer lasting structure; less maintenance due to non-corrosion FRP materials used for beams. | |
| DURATION OF ACTIVITY: | February 2011 to June 2012 | |
| OWNER: | MaineDOT | |
| TEAM/AFFILIATIONS: | MaineDOT; Harbor Technologies, LLC; Advanced Engineered Wood Composites Center, University of Maine; Wyman & Simpson, Inc.; HC Bridge, Inc. | |
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