



2011 ??? Boothbay Knickerbocker Bridge

Description

Meta Fields

Project Summary : This bridge is the first application of Hybrid Composite Beams (HCBs) with wings.

Project Location : Barters Island Road over Back River, connecting the town of Boothbay with Hodgdon Island

Mobility Impact Time :

- ABC: 17 months to construct bridge on new alignment; one span of eight HCBs erected in one day & filled in one day
- Conventional: 18 months

Impact Category : Tier 6 (longer but reduced by months/years)

Dimensions : 540-ft-long and 32-ft-wide eight-span continuous-for-live-load Hybrid Composite Beam (HCB) replacement bridge (60-ft-long end spans, six 70-ft-long interior spans); each 70-ft-long beam weighed 5,100 lbs without compression reinforcement and 17,900 lbs with compression reinforcement

Average Daily Traffic At Time Of Construction : 1550

Traffic Management : parallel bridge

Existing Bridge Description : The existing two-lane 38-span timber bridge with timber pile foundation was 535-ft long and 24-ft wide. Built in 1930 with major superstructure rehabilitation in 1983, it was deteriorated due to the harsh marine environment, and required replacement.

Replacement Or New Bridge : The replacement bridge has two 11-ft-wide traffic lanes and two 3.33-ft-wide shoulders. It was built adjacent to the existing bridge on a new alignment and is composed of 64 adjacent 33-inch-deep winged Hybrid Composite Beams (HCBs) with 7-inch-thick cast-in-place concrete deck and 3-bar Wyoming steel bridge railing. This bridge is the first application of HCBs with wings projecting from the upper edges of each beam for a total top flange width of four feet. The winged HCBs are abutted so that deck formwork was not required. The substructure consists of conventional cast-in-place concrete abutments and cast-in-place concrete caps on concrete-filled steel pipe piles. The only expansion joints are located at the abutments.

Construction Method : Traffic was maintained on the existing bridge, except for limited closures, while the new bridge was built parallel to the existing bridge. Special provisions allowed the existing bridge to be closed to traffic for a maximum of 12 calendar days. The closures were limited to the hours of 8:30 am to 3:30 pm. If the existing bridge remained closed beyond those hours, a lane rental fee of \$500 per hour would be assessed for the first and subsequent hours that the closure extended at least 10 minutes outside the specified hours. Special provisions also included supplemental liquidated damages of \$500 per day for each day the bridge remained closed to traffic beyond the specified date. Traffic on the existing bridge was allowed to be reduced to one lane during daylight hours with approval by the owner. The replacement bridge's substructure construction began in spring 2010. In fall 2010 erection of the winged HCBs began before completion of the substructure. Because of their light weight, the HCBs were transported by truck onto the adjacent existing bridge, from which they were then erected with the same barge and crane used for substructure construction. Erection of the HCBs averaged one span of eight beams per day. After HCBs were erected on the first four spans, their compression arches were filled with concrete. The filling of each HCB required approximately 20 minutes, with one span of eight beams completed per day. Deck reinforcement was placed after the HCBs were filled. In October 2010 the first half of the deck was cast. Construction of the remaining piers was completed over the winter, and the remaining HCBs were erected in April 2011. The waterproofing membrane and asphalt overlay were placed. The bridge was opened to traffic in June 2011, ahead of schedule. The bridge is anticipated to have a service life of 100 years, compared to a typical service life of 50 to 75 years in Maine.

Stakeholder Feedback : The project was a successful use of composite materials for bridge infrastructure and was well received by the local community.

High Performance Material : Hybrid Composite Beam (HCB) with wings:

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- galvanized prestressing strands
- fiber-reinforced polymer shell

