



2004 Mill Street Bridge

Description

Meta Fields

Project Location :

on Mill Street over the Lamprey River in the town of Epping in Rockingham County

Mobility Impact Time : ABC: 8 days to erect bridge; 2-month closure; Conventional: 5-month closure

Impact Category : Tier 3 (within 2 weeks)

Dimensions : 115-ft long and 28-ft wide single-span adjacent box beam bridge

Average Daily Traffic At Time Of Construction : 500

Traffic Management : Traffic management alternative, if constructed conventionally: extended use of half-mile detour

Existing Bridge Description : The existing 28-ft wide two-lane bridge consisted of two 30-ft long spans separated by a 60-ft long center pier causeway. Built in 1935, the spans were deteriorated and required replacement.

Replacement Or New Bridge : The two-lane replacement bridge consists of a pretensioned concrete adjacent box beam superstructure on full-height cantilevered precast concrete abutments founded on precast concrete spread footings. Thirty-two precast concrete segments were used to construct the bridge. The 32.4-ft wide 5,000 psi precast reinforced self-consolidating high-performance concrete (HPC) abutments consist of 10 spread footing segments and 11 abutment wall and wingwall segments. The superstructure consists of seven 4-ft-wide 3-ft-deep adjacent box beams made of 8,000 psi pretensioned HPC. The use of HPC in combination with 0.6-inch diameter pretensioning strands allowed the use of a single span.

Construction Method : All precast segments were shipped 170 miles from the precast plant to the jobsite. The spread footings and other substructure components were fabricated in segments as determined by the contractor and precaster to facilitate shipping and handling, and were standardized to reduce fabrication costs. The precaster used a template in the plant fabrication to ensure adequate tolerances between the abutments, wingwalls, and footing segments. The contractor developed the assembly plan. Following placement of the footings, a minimum 3-inch thick flowable grout bed was injected through grout tubes in the footings to provide a sound bearing surface for the roughened bottom surfaces of the footings. Proper grading was assured by using leveling screws cast in the corners of each footing segment. The abutment walls and wingwalls had splice sleeve connections to accommodate the reinforcing bars protruding from the tops of the footings. The walls were lowered into place, and the splice sleeves were then grouted to complete the bar splices. All horizontal joints are full-moment connections with grouted reinforcing bars, and vertical joints have grouted shear keys. The beams were erected. A precast concrete pilaster was then set along the top of the stem wall on each side of the outside beams to provide lateral load transfer between the superstructure and substructure and to also provide a more finished look. Full-depth shear keys were then cast between each box beam, and the span was transversely post-tensioned in six locations to complete the connection between beams. A 3-bar aluminum railing was then installed. A waterproofing membrane was applied to the top surfaces of the box beams, followed by an asphalt overlay. The low traffic volume crossing the bridge in combination with a short half-mile detour allowed complete closure of the bridge during its replacement. The erection of the abutments took two days, plus a third day to cure the grout and prepare for the backfill; similar conventional cast-in-place abutments would have required 6 separate concrete placements and two months to construct. A maximum of 14 days to erect the bridge was required in the contract. The contract also included an incentive of \$5,000 per day if less than 14 days, and a disincentive of the same amount if more than 14 days. The erection of the bridge, from start of footing placement to opening to traffic, required 8 days. At \$5,000 per day, the contractor received a total incentive of \$30,000. The bridge won two awards in the 2005 Precast/Prestressed Concrete Institute (PCI) Design Awards Program – one for –Best Bridge with Spans Between 65 and 135 ft– and the other for –Best All-Precast Solution.–

Stakeholder Feedback : This bridge was selected for the NHDOT’s first use of totally precast cantilevered substructure construction. The location minimized the overall risk of using the precast abutment system that was newly developed by a team with members from the NHDOT, FHWA, University of New Hampshire, PCI’s Northeast Region Technical Committee, and local

