2011 – I-5 / US 12 Bridge at Grand Mound

Description

Meta Fields
Other Related Url 0 Other Related Link : http://www.wsdot.wa.gov/eesc/bridge/ABC/
Specifications 0 Spec File : 2240
Abc Construction Equipment : Conventional
Miscellaneous Prefabricated : CIP reinforced concrete closure joints; Grouted key closure joints; Grouted duct connection (in precast substructure); Precast diaphragms
Prefabricated Bridge Elements : Adjacent deck bulb T beams; Precast cap & column(s)
Project Delivery : Design-bid-build
Longitude : -100
Latitude : 46.8027763
Nbi # : 0017998B0000000
State Id # : 12/118
Construction Equipment : Conventional
Total Bridge Length Ft : 176
Max Span Length Ft : 88
Beam Material : Concrete
Spans : Two-span
Location : Urban
Owner : State
State : WA
Year Abc Built : 2011
Other Related Url : 1
Contract Plans : 1
Incentive Program : HfL (Highways for LIFE): $400,397
Funding Source : State Only
Costs : The engineer’s estimate for the project was $22.37 million. The low bid was $15.52 million ($6.85 million = 30% lower than engineer’s estimate). The engineer’s estimate for the bridge portion of the project was $3.05 million, and the low bid for the bridge portion was $2.46 million. There were 15 bidders. The cost per square foot of bridge deck was $160 (including mobilization and approach slabs), compared to $211 per square foot of bridge deck for conventional construction in this region in 2011. The bid price for precast beams was $1,500 per linear foot. The bid price for precast columns was $1,200 per linear foot.

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Stakeholder Feedback : This is the first bridge for WSDOT with precast columns, precast beams, and all precast superstructure with seismically-resistant connections. As this was the first experience for the contractor, no substantial time savings were achieved but safety in the field was improved. As more experience is gained, WSDOT believes more time savings will be seen. The contractor indicated that they would have preferred the columns to be cast in place; however, they could see the benefit to using a single (full-height) precast column with the grout connection at the precast pier cap only. This would eliminate the cure time for the concrete and require bracing for only one day. With the installation of all the segments and precast pier cap prior to grouting, bracing was required for an extended period of time. Lessons Learned Duct grout tubes should be identified to their respective grout duct. This will help in post grouting inspection and in grouting construction troubleshooting. Details for the shear and torsion reinforcing at the crossbeam closure should have been detailed to show interlocking ties instead of “U”-shaped stirrups with hooks for ease of longitudinal rebar placement.
Construction Method : To place the precast column segments into the cast-in-place footings, the contractor first excavated for the footing and installed the footing forms. The leveling pad was placed and the first column segment erected. Footing reinforcement was placed, and the footing was cast. The footing forms were removed, and backfill was placed.To place the precast column segments and pier cap, the contractor placed and shimmed the middle and top column segments, installed column bracing, and placed and shimmed the precast pier cap segments. The contractor used the typical WSDOT practice of integrating the prestressed girders with the integral full-depth diaphragm over a first-stage cap beam to provide longitudinal moment transfer from the bent columns to the superstructure. The precast first-stage cap beam was built in two pieces to have manageable lifting and hauling weights; the pieces were connected with a closure joint near the cap mid-span. To grout the joints between column segments and the column to cap, the grout forms were installed and sealed, grout was pumped and grout tubes closed, grout forms were removed and grout in the joints and grout tubes was inspected, and unfilled grout tubes were repaired and back grout tubes were patched.The deck bulb tee girders were erected, girder bracing installed, ties between girders welded, deck reinforcement placed, and topping cast. The pier diaphragm concrete was cast 10 days after the topping was cast. The traffic barriers and sidewalks were cast, and other finish and approach work done prior to opening the bridge to traffic on its new alignment. No overlay was applied.No incentives or disincentives were included in the contract.
Replacement Or New Bridge : The replacement bridge has four 12-ft-wide traffic lanes (two lanes in each direction), a 13-ft-wide turn lane in the middle, a 5-ft-wide bike lane, and two 6.5-ft-wide sidewalks. The cross-section consists of fifteen 35-inch-deep prestressed deck bulb tee girders (W35DG), with a 5-inch-thick cast-in-place topping over the deck bulb tees. The outside girders have a 5.5-ft-wide top flange, and the 13 interior girders have a 5.75-ft-wide top flange.As part of this Highways for LIFE project, the University of Washington performed a number of tests to prove the precast column-to-footing connections details. The objective of the US 12 Bridge project was to demonstrate the constructability of the bent system details on an actual bridge project. It is a replacement bridge that was built just north of the existing bridge on a parallel alignment. The prefabricated elements are precast columns, precast pier caps, precast deck bulb tee girder superstructure, and precast end and intermediate diaphragms. Based on research results, the exterior of the precast column segment that extends into the footing is roughened to improve shear stress transfer and is octagonal-shaped to provide more uniform interface surface.
Existing Bridge Description : The existing three-lane four-span prestressed concrete girder bridge

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was 255 ft long and 49 ft wide, supported on spread footings. It had three 12-ft-wide traffic lanes and two 4.5-ft-wide shoulders. Built in 1963, the bridge was deteriorated and required replacement.
Traffic Management : Traffic management alternative, if constructed conventionally: traffic not impacted since built on an adjacent parallel alignment
Average Daily Traffic At Time Of Construction : 59000
Dimensions : 176-ft long and 84-ft wide two-span (88 ft – 88 ft) prestressed deck bulb T girder bridge; 29.4º skew
Primary Drivers : reduced traffic impacts; reduced onsite construction time; improved site constructability; improved work-zone safety; improved material quality and product durability • reduced life-cycle cost
Impact Category : Tier 5 (within 3 months)
Mobility Impact Time : ABC: 3 months of bridge construction; no lane reduction since built on adjacent parallel alignment; Conventional: 5 months
Project Location :

US 12 over I-5 at Grand Mound in Thurston County, south of Olympia

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