Team

Owner:
Colorado Department of Transportation, Denver, CO

Designer:
CH2M Hill, Englewood, CO

Engineer:
Summit Engineering Group Inc. Littleton, CO

General Contractor:
Ames Construction Inc., Aurora, CO

Reinforcing Bar Fabricator:
EnCon Bridge Co. LLC, Denver, CO

Total Project Cost:
$30 million

Total Project Size:
80,875 sq ft

Award:
2010 CRSI Design Award Honorable Mention – Bridges Category

Photography:
Summit Engineering Group Inc. Littleton, CO

SH58 Ramp A Flyover Bridge
Golden, CO

STRUCTURAL FRAMING SYSTEM

Creating the Ramp A flyover along State Highway 58 in Golden, Colorado, required handling a variety of complexities. The ramp spans Clear Creek and connects eastbound IH70 to westbound SH58, spanning challenging site conditions with numerous traffic crossings.

The bridge’s superstructure consists of a conventionally reinforced concrete deck supported by two lines of curved, precast reinforced concrete U-girders. The superstructure is supported by conventional concrete abutments at each end and along its length by a combination of fixed and expansion piers that consist of reinforced concrete columns founded on side-by-side drilled shafts. The fixed piers are connected to the superstructure with integral concrete caps that are post-tensioned through the curved precast reinforced concrete girders.

The bridge is divided into three units of three and four spans, ranging in length from 140’ to 235’, separated by expansion joints. Cast-in-place diaphragms that connect the two girder lines and provide anchor zones for the longitudinal post-tensioning support the bridge at the expansion piers and abutments at the end of each separate unit of the superstructure.

Curved and straight precast reinforced concrete U-girders work together to create a spliced, longitudinally post-tensioned superstructure that provided long spans capable of handling the complex geometry. A number of independent U-girder segments were erected and stabilized on vertical shoring, after which they were spliced, torsionally strengthened with intermediate lid slabs and connected to the substructure with reinforced and post-tensioned concrete diaphragms. This approach created a continuous composite girder prior to post-tensioning.

Once the longitudinal post-stressing was completed, the continuous composite concrete girders became self supporting, and all temporary shoring was removed. A conventionally reinforced deck slab was cast to complete the bridge structure. The deck slab was designed to be replaced or widened in the future as needed.

The structure’s design is similar to typical cast-in-place, post-tensioned, reinforced concrete box girders with similar advantages and aesthetic appeal. However it was constructed more rapidly with less disruption to existing site conditions.

The use of reinforced concrete allowed the project to be built on an accelerated schedule, thanks to the use of local facilities, materials and capabilities. Lead time for the delivery of structural elements was significantly reduced, and transportation costs and environmental impact were minimized.

The design blended the benefits of precast reinforced concrete with those of cast-in-place reinforced concrete to create a structure that was cost-effective. It offers a strong solution for high-profile bridges, where aesthetics and urban geometries are significant design considerations.

The curved precast reinforced concrete girders provided a good solution for a project that accommodated challenging site conditions and numerous traffic crossings.