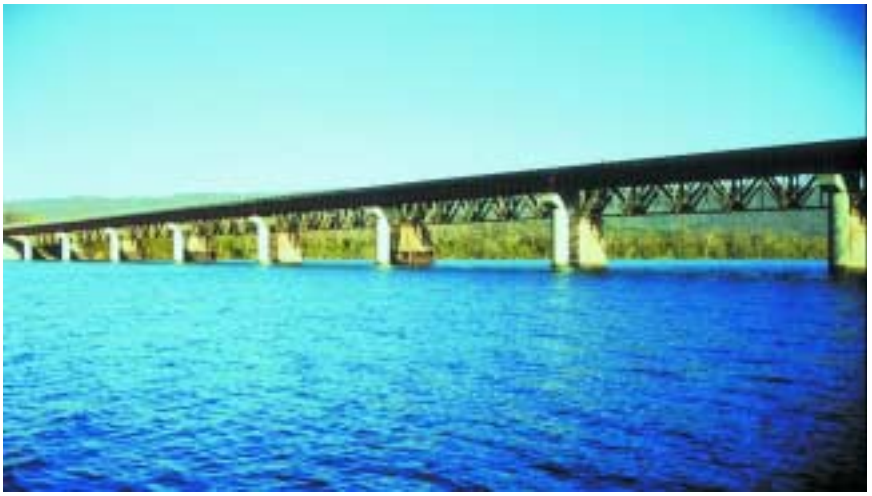
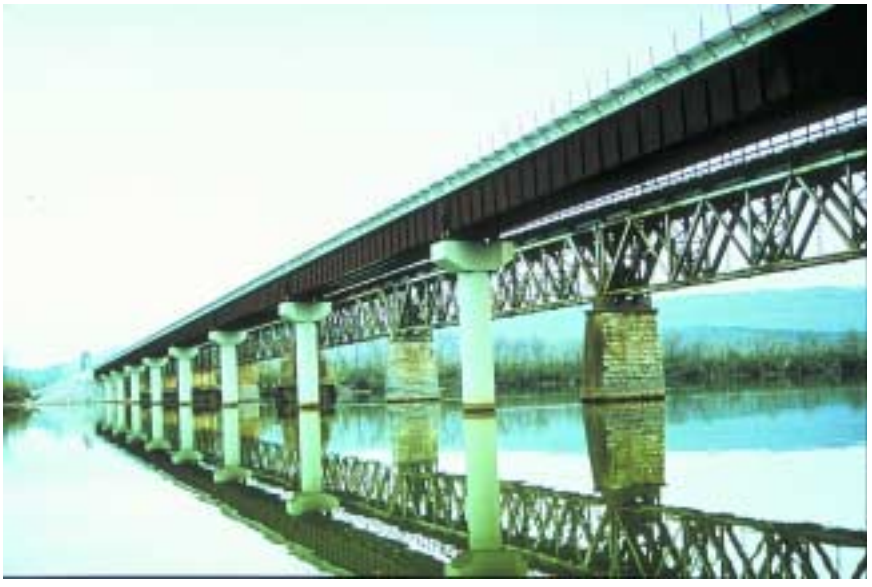
CSX Bridge over Tennessee River Slough

Bridgeport, Alabama





The new CSX Bridge spans over the Tennessee River Slough at Bridgeport, Alabama and is a modern single-track railroad structure, 1469' in length, with ten simply supported, steel composite deck plate girder spans and a ballast deck. The bridge is located on the CSX Nashville-Chattanooga main line, an sees an average of 27 trains per day. Bridgeport is located in the northeast corner of Alabama, approximately 30 miles downstream from Chattanooga, Tennessee. The new bridge replaces an historic deck truss structure on a separate parallel alignment.

The new span layout has two end spans at 147'2" and eight interior spans at 146'10" between piers. The actual girder span between bearings is typical in all ten spans, and is 144'0". The steel superstructure is a redundant system with four deck plate girders spaced on 4-ft. centers that are composite with a reinforced concrete deck. The girders are 9'4" deep and use ASTM A709 Grade 50W weathering steel.

The substructure consists of hammerhead piers with circular columns founded on steel H-piles. Each pier column is 7'6" in diameter with an average column height of 45'. The geology of the site is karstic with variable weathering of limestone and dolomite. The rock is variable and contains voids that are filled with soil. Due to the variability of the rock and soil, dynamic testing of piles were used to verify pile capacities. Piles were driven to lengths of up to 200' in some locations. The use of steel piles were shown to be very effective in developing required bearing capacity and in having splicing capability to accommodate the variable rock profile.

Overall, this state-of-the-art railroad bridge design incorporated strength, function, economy, safety, constructability and aesthetics. Specific innovative features that were included are:

• Use of Grade 50W weathering steel for initial economy, long term low maintenance and aesthetics;

• Use of bolted stiffener and bracing connections for improved fatigue resistance;

• Use of four girder system for redundant fatigue and fracture considerations;

• Use of solid plate diaphragms with access holes for ease of fabrication;

• Use of dual inspection walkways within outside girder panels for ease of access and inspection;

• Use of uniform girder span layout for economy of repetition;

• Use of economical span lengths for plate girder design, balancing superstructure and substructure costs;

• Use of circular reinforced concrete pier columns for strength, hydraulics and economy.

The existing bridge is an historic structure, and will be kept and maintained by the city of Bridgeport as a pedestrian bridge providing access to an island in the Tennessee River at this location. The bridge was originally constructed in the early 1850s and has portions of the original masonry piers and abutments still in use. The original bridge had timber trusses and has been modified several times over the years. During the Civil War, the bridge was the focal point of several conflicts between Union and Confederate forces vying for its strategic importance in transportation and communication. The bridge superstructure was destroyed and rebuilt twice during this period. Five of the deck truss spans were reconstructed last in 1910, and the other four spans in 1930. These existing spans are all steel pin-connected deck trusses. General bridge deterioration and related high maintenance costs have lead to the need for replacement. The new plate girder bridge built along side the old historic truss bridge illustrates the state-of-the-art in modern railroad bridge design as contrasted by the slender clean lines of the new and the deep busy appearance of the old.

Numerous other environmental issues had to be mitigated in order to obtain a permit for the new bridge including avoiding two archaeology sites adjacent to the new alignment on the island, wetland impacts on the island and threatened and endangered species impacts in the river.

Final design was completed in February 1997, and the construction contract was awarded in April 1997. Construction began in May 1997 and was completed in November 1998.

The CSX Bridge over the Tennessee River is an economical and aesthetically pleasing design with low maintenance weathering steel girders and slender circular pier columns. It combines the required strength, function and serviceability with a clean slender appearance that blends well with the natural river environment and wooded riverbanks.

Project Team

Owner
CSX Transportation

Designer
HDR Engineering, Inc.

Steel Fabricator
Carolina Steel Corporation

Steel Detailer
Carolina Steel Corporation

Steel Erector
Scott Bridge Company, Inc.

General Contractor
Scott Bridge Company, Inc.