

Prefabricated Bridge Technologies Increase Mobility, Safety, and Quality



U.S. Department of Transportation
Federal Highway Administration

Office of International Programs

The Office of International Programs works to access, promote, and disseminate global best practices and technical innovations to ensure a safe and efficient United States highway transportation system.

ORIGINS

Transportation agencies across the United States are challenged with keeping the nation's four million miles of roads and over 610,000 bridges in good condition while balancing efficiency, equity, and environmental concerns.¹

Since 2002, FHWA has been promoting Accelerated Bridge Construction (ABC) using Prefabricated Bridge Elements and Systems (PBES) through the FHWA's Every Day Counts, Strategic Highway Research Program 2, and Highway for Life initiatives.

A 2004 International Scan Program tour to Japan and Europe accelerated learning on PBES. ABC technologies are now widely used in the United States.

WHAT IS PBES?

PBES accelerates bridge construction by fabricating bridge elements and systems off-site or near the site. The bridge elements are then moved in place by using self-propelled modular transporter (SPMT) technology, slid laterally into place using hydraulic jacks, or erected using cranes. The goals of PBES are to reduce construction time, minimize traffic congestion, improve durability of bridge structures, increase safety of the traveling public and workers, and reduce environmental impacts of the bridge construction process.

MOVEMENT OF SUPERSTRUCTURE SYSTEMS - SPMTs

SPMTs are high capacity, highly maneuverable transport trailers. SPMTs can be moved and rotated in all three-dimensional axes and have been used for many prefabricated bridge installations throughout the United States.

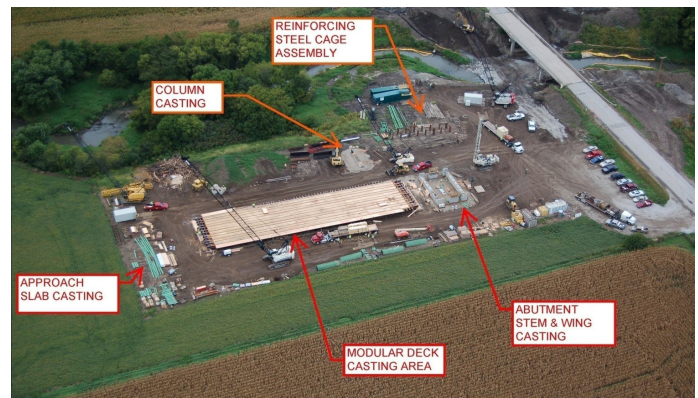


FIGURE 1. KEG CREEK BRIDGE REPLACEMENT, COUNCIL BLUFFS, IOWA. PREFABRICATED BRIDGE ELEMENTS WERE FABRICATED OFF-SITE. **SOURCE:** IOWA DEPARTMENT OF TRANSPORTATION



FIGURE 2. KEG CREEK BRIDGE REPLACEMENT, COUNCIL BLUFFS, IOWA. PREFABRICATED BRIDGE ELEMENTS WERE TRANSPORTED AND ERECTED IN PLACE USING CRANES IN ABC. **SOURCE:** IOWA DEPARTMENT OF TRANSPORTATION

¹ Report Card for America's Infrastructure. 2021. Overview of Bridges. <https://infrastructurereportcard.org/wp-content/uploads/2020/12/Bridges-2021.pdf>.

Prefabricated Bridge Technologies Increase Mobility, Safety, and Quality

SLIDE-IN-BRIDGE CONSTRUCTION (SIBC) OF SUPERSTRUCTURE

Lateral Slide or SIBC causes minimal disruption to traffic. The new bridge superstructure is built on temporary support adjacent to the existing structure. During weekend closure of the bridge, the existing bridge is demolished, and the new bridge is slid into place using rollers or Teflon pads, and hydraulic jacks.

PBES MODULAR SUPERSTRUCTURE SYSTEMS

Pre-topped modules of deck and girder units do not require the installation of a cast-in-place deck after erection and offer benefits over prefabricated deck systems since the deck is connected to the beam or girder during fabrication. Construction of modular superstructure systems can be accomplished in less than two days.

PREFABRICATED DECK ELEMENTS

The process of installing a bridge deck is one of the most labor-intensive operations in bridge construction. Prefabrication of deck systems offers an opportunity to significantly reduce construction time. Prefabricated deck elements eliminate activities that are associated with conventional deck construction, such as on-site installation of deck forms, installation of overhang brackets and formwork, reinforcing steel placement, paving equipment set up, concrete placement, and concrete curing.

ADVANCEMENT OF ACCELERATED BRIDGE CONSTRUCTION USING PBES

Exchange programs of bridge innovative technologies globally and nationally have resulted in advancement of ABC using PBES. In the United States, most States have implemented ABC and institutionalized it into their practice of bridge design and construction. New products and materials, such as Ultra High Performance Concrete, have emerged to accommodate the need for durable connections of prefabricated elements.



FIGURE 3. PREFABRICATED BRIDGE, PECOS STREET. BRIDGE OVER I-70 AND PECOS, DENVER, COLORADO. BRIDGE ELEMENTS WERE BUILT NEAR THE SITE, LIFTED WITH HYDRAULIC JACKS, AND MOVED INTO PLACE USING SPMT. THE BRIDGE WEIGHED 2,400 TONS AND TOOK 50 HOURS TO MOVE A DISTANCE OF 800 FEET. **SOURCE:** FHWA



FIGURE 4. BRIDGE SLIDE, NORFOLK SOUTHERN RAILROAD OVER I-240, MEMPHIS, TENNESSEE. THE BRIDGE ELEMENTS WERE BUILT ADJACENT TO THE EXISTING BRIDGE. **SOURCE:** FHWA