

Precast Concrete Deck Panel Systems for Highway Bridges: History and New Emerging Innovations

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Public inconvenience and loss of income during bridge construction and rehabilitation have prompted exploration of rapid construction methods. In 2001, the Federal Highway Administration (FHWA) launched the Accelerated Bridge Construction (ABC) initiative (Accelerated Bridge Construction Manual, FHWA 2011). ABC is bridge construction that uses innovative planning, design, materials, and construction methods in a safe and cost-effective manner to reduce the construction time associated with maintenance of traffic when building new bridges or replacing and rehabilitating existing bridges.

Cast-in-place (CIP) bridge deck slab represents a significant part of construction of stringer-type bridge superstructures. Much of the construction time is consumed in deck forming, placement of steel bars, and placement and curing of CIP deck concrete. Also, studies conducted by bridge owners, such as Oregon DOT (Johnson 2012), have shown that CIP deck is considered one of the major elements of highway bridges that require continuous maintenance, i.e. patching, sealing, and overlays. CIP decks pose low durability performance due to shrinkage cracking, high permeability and exposure to deicing chemicals and exposure.

As a result, precast concrete deck panel systems have been increasingly used to replace CIP decks. Precast concrete deck panel systems have many advantages such as high construction speed, high quality plant production under tight tolerances, low permeability, and much reduced volume changes cracking due to shrinkage and temperature effects during initial curing. High quality precast concrete decks, are often two-way prestressed. They have relatively low life-cycle cost even though they may have higher initial cost in some US markets.

The keynote presentation will provide details of the basic components of the system, and its history and use in North America. The presentation will also cover new emerging innovations recently developed by researchers including those developed in the NCHRP 12-96 project sponsored by the National Cooperative Highway Research Program of the Transportation Research Board.