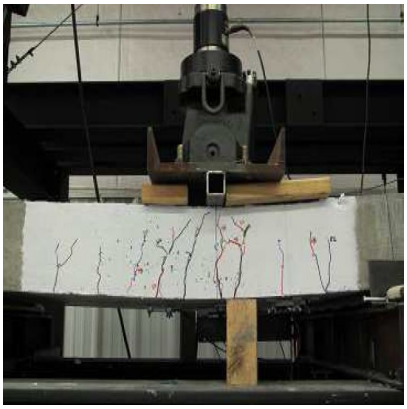

Precast Alternative for Flat Slab Bridges

Description

Meta Fields
Project Completion Year : 2013
Project Starting Year : 2013
Other Documents 0 Other Documents File : 4399
Primary Sponsor Contact Info : South Carolina Department of Transportation Office of Materials and Research 1406 Shop Road Columbia, SC 29201 USA
Key Words : Precast bridge joint, hollow-core bridge, NEXT D bridge, bridge construction, prestressed concrete bridge
Abstract :

The cast-in-place (CIP) concrete slab bridge and the hollow core flat slab bridge are two very common bridge types utilized by the South Carolina Department of Transportation (SCDOT). The CIP bridge is durable but has a long construction time while the hollow-core bridge has a short construction time but produces durability concerns. Trying to balance the speed of construction for hollow-core and the durability of CIP, the SCDOT commissioned this study to provide a recommendation for an alternative bridge type that could: 1) eliminate or minimize longitudinal cracking, 2) have a shorter erection time than the CIP flat slab system, and 3) have no restriction on Annual Daily Truck Traffic (ADTT) and can be used on the National Highway System.

There were two distinct phases in this research. In Phase 1, a thorough online survey and telephone interviews were conducted to investigate the pros and cons of existing short-span bridge systems used by other state departments of transportation. In addition, feedback from contractors and precast element fabricators in the Southeast region was also solicited. Based on this work, a precast bridge system known as the NEXT-D (Northeast Extreme Tee) beam was selected by the SCDOT for further testing and validation. The experimental and analytical validation along with the design of a 6 ft. wide section (NEXT-6) and an 8 ft. wide section (NEXT-8), with span lengths from 22 ft. to 40 ft., was the focus of Phase 2.

The results of the experimental study indicated that U-shaped reinforcing bars and poly-vinyl alcohol (PVA) fiber reinforced ultra-high performance concrete (UHPC) were an effective combination when used for the shear key located between precast NEXT elements. These results were also used to

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calibrate analytical models which were used to better understand and quantify the load demands associated with this beam type. Using this new understanding, a set of new design guidelines for the new NEXT-6 and NEXT-8 bridge systems was developed. For the beam design, the American Association of State Highway and Transportation Officials (AASHTO) live load distribution factors for tee beams are recommended to be used. For the deck design, the AASHTO strip method is recommended with some modification. A simplified four-step procedure was developed to assist bridge engineers in determining the design demands (positive and negative moments) on a one-foot strip of deck for Strength I and Service I limit states.

The results of this study, field experience with existing cast-in-place and precast bridges and sound engineering judgment allow the investigators to believe with a reasonable degree of confidence that the construction of a bridge using the provided recommendations and new system will lead to durable bridges that are cost effective and can be constructed using an accelerated schedule. One of the immediate needs is to now share the results of this study with neighboring states, so that the investment of needed steel forms by precasters can result in similar precast pieces sold to multiple states.

Subject : NEXT Beams; Flat Slab Bridges
Group : Ultra-High Performance Concrete (UHPC)
Category : Completed Projects

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