Development, Evaluation, and Implementation of a Precast Paving Notch System

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ABSTRACT

Bridge approach pavement settlement and the resulting formation of “bumps” at the end of bridges is a recurring problem on a number of Iowa bridges. One of the contributing factors in this settlement is failure of the bridge paving notch. A paving notch (also known as a corbel or a paving support) consists of a horizontal shelf constructed on the rear of a bridge abutment and is used to support the adjacent roadway pavement. Over time, these paving notches have been observed to deteriorate/fail due to a number of conditions, including horizontal abutment movement due to seasonal temperature changes, loss of backfill materials by erosion, inadequate construction practices, foundation soil settlement, heavy traffic loads, salt brine that leaks through the expansion joint, and an open expansion joint that tends to fill with dirt and debris and “push” the approach pavement off the paving notch.

The conventional repair procedure for this problem typically consists of removing the deteriorated paving notch concrete while preserving as much of the existing reinforcing steel as possible, constructing wood forms, and placing a cast-in-place (CIP) concrete paving notch followed by replacing the approach slab pavement. The conventional replacement method, however, requires that the bridge be taken out of service for an extended period of time, which disrupts the traveling public. The notable number of bridges that exhibit the failing paving notch problem and, more importantly, their location on highly traveled roadways necessitate the development of a standardized, much more quickly installed replacement method. With a standardized system, situations where the deterioration is unknown until approach pavement removal could be addressed with minimal traffic disruptions.

The developed precast paving notch system was intended for use in either new construction or as rapid replacement that can be installed in single-lane widths to allow for staged construction under traffic with a single overnight bridge closure. The system consists of a rectangular precast concrete element that is connected to the rear of the abutment using high-strength threaded steel rods and an epoxy adhesive that is similar to that used in segmental bridge construction.

The Iowa State University (ISU) Bridge Engineering Center (BEC) performed full-scale laboratory testing of the proposed paving notch replacement system. The objective of the testing program was to...
verify the structural capacity of the proposed precast paving notch system and to investigate the feasibility of the proposed solution. Following testing, the design of the paving notch system was finalized and utilized at a site near Knoxville, IA.

This paper will summarize the laboratory testing, including results and protocols, and will describe the first field application of the system.

Key words: bridge—paving notch—rapid—replacement