



Jane Addams Tollway I-90 Bridges over the Kishwaukee River - New standards for Integral Abutment Bridges

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Summary

Integral Abutment Bridges (IAB) are widely adopted in the United States. The Federal Highway Administration (FHWA) and State Departments of Transportation are developing new design criteria based on temperature range, total length, material types, soil and foundation types and skew. The goal is to gain a more detailed knowledge of the behaviour of this type of bridges to support the increasing use of them.

This case study relates to two bridges for the Illinois Tollway that were designed while the Illinois Department of Transportation was in the process of developing new design guidelines for IAB. One of the project goals was to create a prototype to test the new standards and details. The design was developed in coordination with a research group that received a grant to instrument the bridge and collect data to study the behaviour of substructures and superstructures of long integral abutment bridges. The paper discusses the state-of-the-art of IABs in the United States and provides insight on what are the major issues that designers have to focus for future applications.

Keywords: Integral abutment, drilled piles, pile-soil interaction, instrumentation, design criteria.

1. Introduction

Integral abutment bridges are bridges with no expansion joints and simplified bearings that require less maintenance especially in cold climates where penetration of de-icing salt through the joints is the main cause of corrosion and bridge deterioration. The United States have a long history of IABs currently adopted in the majority of the States. Although the FHWA may set the general criteria States are directly responsible for developing and maintaining Design Manuals to establish criteria to guide bridge design.

The results of a 2009 survey [1] show that 41 out of 50 of the United States build, operate and maintain IABs. Of the nine States that currently do not use them three never did, three discontinued them because of serious problems and three discontinued for other reasons. Twenty seven States indicated that they believe that IAB's construction cost is lower compared to conventional bridges and thirty two believe that IAB's maintenance costs are lower compared to conventional bridges. These data indicate that more IAB will be most likely adopted in the United States and also that more data and studies on their long term behaviour will become available. States like Colorado are among the earliest adopter and have the largest inventory of integral abutment bridge including the longest ones in the nation.

This paper presents a case study related to the design of two bridges for the Illinois Tollway Authority: the Jane Addams (I-90) bridges over the Kishwaukee River. The selected bridge types are four-span steel plate girder structures 187 m long on a 30 degree skewed concrete substructure