Recent Developments in the Design and Construction of Integral Bridges

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Summary

This paper presents a summary of the latest developments in the field of Integral Abutment Bridges (IABs). It examines the current design specifications and the current practice in the design and construction of IABs including foundations, superstructure, construction stages, abutment backfill, and the limitations on IABs. The study also investigates the correlation between the analysis results from a detailed three-dimensional (3D) Finite Element (FE) model and a simplified two-dimensional (2D) model for an IAB under thermal load. Field measurements from a steel girder IAB were used to validate the 3D FE model. Using the validated models, the analysis was carried out to study the performance of a typical IAB under thermal loading. The study shows that currently there are still vast differences in the design and construction of IAB's. The study also shows significant variations in displacement and rotation between interior and exterior locations in relatively wide IABs that can't be captured by 2D analysis.

Key Words: Integral Abutment, H-Piles, Prestressed Concrete Piles, Concrete Filled Steel Pipes

1. Introduction

Expansion joints and end bearings in conventional (jointed) bridges are expensive and require special handling during construction. They also require periodic inspection and maintenance and may need to be replaced several times throughout the bridge life. This is especially true for areas with considerable snow amounts where deicing chemicals are used throughout the cold season and where snowplows could repeatedly hit and damage the joints. Furthermore, water and deicing chemicals would penetrate through the expansion joints to cause extensive deterioration to the bearings and other components of the superstructure and the substructure. Leakage at joints accounts for most of the deterioration at superstructure and at the substructure. Consequently, expansion joints and bearings in bridges have provided considerable construction and maintenance challenges for most transportation agencies. For the above reasons, integral abutment (jointless) bridges are becoming increasingly popular in the USA and around the world and are considered as a more economical alternative to conventional bridges. More IABs are built every year in the United States and around the world. 85% of the new bridges built in the State of Tennessee are integral abutment bridges [1]. In the United Kingdom, the British Highways Agency Design Manual for Roads and Bridges recommends that all new bridges less than 60 m in length and skews not exceeding 30° shall be designed as IABs. New

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