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A Technique for Strengthening Existing Continuous Non-Composite Steel Girder Bridges Using Post-Installed Shear Connectors and Inelastic Moment Redistribution

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Abstract

Many older bridges are constructed with floor systems consisting of a non-composite concrete deck over steel girders. A potentially economical method for strengthening these bridges is to develop composite action by attaching the existing concrete deck to the steel beams using post-installed shear connectors. The current paper discusses this method based on the findings from a large-scale research study aimed at strengthening existing non-composite continuous steel girder bridges. The results of this research indicate that post-installed shear connectors are a feasible and efficient method of extending the useful service life of a non-composite steel girder bridge. Increases of more than 60-percent in the ultimate strength of the bridge girders tested in this study were attained by strengthening to a composite ratio of only 30-percent. The test program also exhibited excellent fatigue resistance for the post-installed shear connectors.

Keywords: Post-Installed; Shear Connectors; Composite; Steel Bridge; Inelastic Moment Redistribution; Fatigue; Strengthening; Large-Scale.

1 Introduction

Many older bridges were constructed with floor systems consisting of a non-composite concrete slab over steel girders with no shear connectors. Most of these bridges were designed using smaller loads than the standard design loads currently used for new bridges, as specified by the American Association of State Highway and Transportation Officials (AASHTO) [1]. The inadequate strength of these bridges can result in the need to limit truck loads through load posting, or it may require replacement of such a bridge. Alternatively, strengthening measures can be undertaken to increase the load rating of these non-composite steel girder bridges. A potentially economical

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