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Testing of coiled spring pins as shear connectors

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Abstract

A few decades ago, steel-concrete composite bridges were quite rare structures, whereas steel girder bridges with non-composite concrete decks were rather common. For the latter type of structure, composite action can be obtained long after the bridges were constructed by post installation of shear connectors. Most installation procedures involve reconstruction of pavement and concrete deck, which will result in traffic disturbance. There are however some types of shear connectors that can be installed from underneath, connecting the top flanges to the concrete deck, without affecting the upper surface. This means that the bridge can be strengthened during traffic. One type of such a shear connector is the coiled spring pin, which is an interference fit connector. This paper presents the results from push-out tests conducted in order to find the static capacity and the load-slip behaviour of coiled spring pins used as shear connectors.

Keywords: Shear connector; push out test; composite bridge; composite action; coiled spring pin; shear studs; bridge strengthening; rehabilitation;

1 Introduction

During the last decades, traffic density and vehicle weight have been increasing towards higher and higher numbers and the tendency seems to continue [1]. This implies that there will be a continuous demand of strengthening or replacement of bridges with poor traffic load capacity.

Steel girder bridges with concrete decks are today by norm designed as composite structure, with a few exceptions. Some countries, for instance Sweden [2], even require that a shear connection shall be provided if a steel girder bridge is designed with a concrete deck on top. This has however not been the case for such a long time, as late as in the 1980s steel girder bridges in Sweden were often designed with a non-composite concrete deck on top. This implies that there are many existing bridges with a potential additional traffic load capacity, if composite action can be created afterwards. According to the national Transport Administrations Bridge managing systems in Sweden, Finland and Norway, there are more than 2000 bridges of this type, only in these three countries.

Composite action can be achieved by different types of shear connectors. Welded headed shear

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