Development of an orthotropic composite slab system for road bridges

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Abstract

Increases in traffic loads led to extensive fatigue damages to existing orthotropic steel roadway slabs. Reinforced concrete slabs are less susceptible to fatigue but considerably heavier. With the so-called ortho-composite-slab a light and robust construction is developed as an alternative to existing construction methods for bridge decks. The experimental test program planned within the framework of the AiF-FOSTA research project P 1265 [1] is used to determine the load-bearing and fatigue behavior of ortho-composite-slabs with composite dowel strips. The following article presents the construction and the experimental test program.

Keywords: bridge deck system; orthotropic composite slabs; composite dowel strips; experimental tests.

1 Introduction

Orthotropic steel roadway slabs in bridge construction are characterized by a high load-bearing capacity with low dead weight. Notch sharpness in details and strongly increased traffic loads led to extensive fatigue damage to existing steel roadway slabs [2]. With the so-called ortho-composite-slab (OC-slab), which consists of a longitudinally stiffened deck plate, a relatively thin reinforced concrete layer and dowel strips as shear connectors, a light and robust construction is being developed as an alternative. Similar roadway slab types from Leonhardt [3] and Robinson [4] were first used in the 1940s and 1950s. Due to the success of the orthotropic roadway slab at that time, the lightweight composite construction became less and less important. The OC-slab takes up the basic idea again. However, the concrete should be considered as statically contributing. In the earlier versions, it was mostly arranged in a constructive way [5], [6].

2 Superstructures in large bridge constructions

Bridge superstructures are available in a wide variety of designs. There is the pure steel construction method in the form of the orthotropic roadway slab, the solid construction method and composite structures made of steel and concrete.