New Steel-Concrete Adherence Connections for Composite Bridges

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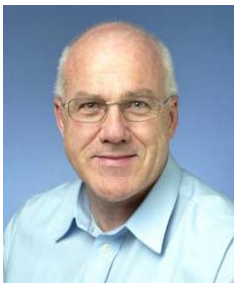

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Summary

Steel-concrete composite bridges with precast slabs are ideal when building new bridge structures or replacing existing bridges, due to the short duration of on-site work. However, the steel-concrete connections generally used in this construction method - groups of stud shear connectors - tend to slow down the erection procedure. New connections by adherence, whose resistance is due to friction between various interfaces, constitute a very promising and innovative solution to this question. The paper presents experimental and analytical research conducted on these connections. Results show that these connections exhibit a high resistance to shear forces and are very rigid, but have a limited ductility. A calculation model is developed which takes into account the kinematics of the connection deformation and the behaviour laws for the various interfaces. A simplified method for determining the resistance of these connections is also proposed.

Keywords: Connection; adherence; friction resistance; composite beam; test; calculation model.

1. Introduction

Steel-concrete composite bridges present many advantages which reduce the duration of on-site work and consequently the costs. In addition, the potentially harmful effects (noise, pollution, traffic jam, deviation) of the construction work [1, 2] is reduced as the steel beams may be welded and the concrete slab precast in the shop, leaving only the erection and assembly work to be performed on site. Currently, however, the steel-concrete connections used in composite bridges – groups of headed studs connected to the slab when concreting the pockets in the slab on site – are not well adapted for use with precast slabs. Indeed, this kind of connection tends to slow down the assembly work because of the numerous small quantities of concrete that need to be poured on-site to fill the pockets. Moreover, cracks may develop in the corners of the pockets, which tend to increase the risk of degradation by corrosion of the slab reinforcement.

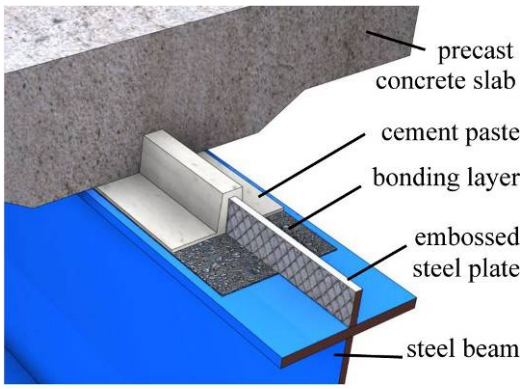

Fig. 1 *General view of a connection by adherence*

Connections, whose resistance is due to friction between various interfaces, constitute a very promising solution to this problem. This connection "by adherence" [3], is illustrated in Fig. 1. An embossed steel plate is first welded longitudinally onto the upper flange of the steel beam (Fig. 2(a)). The upper flange may then be coated

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