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COMPOSITE DOWELS: THE WAY TO THE NEW FORMS OF STEEL-CONCRETE COMPOSITE STRUCTURES

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SUMMARY

The introduction of composite dowels in Europe at the beginning of the last decade led to the creation of new forms of composite bridges in which a T-profile is used instead of an I-beam. Both the construction and design methods are new. The paper presents the bridges using this new type of shear connection. The variety of forms and dynamic development of a new type of construction is presented. The development history and the latest shear connection design guidelines are summarized. Reference was made to the basic design principle for composite beams with the associated concrete slab: the omission of part of the transverse force transmitted by the concrete slab. To understand design basis for new forms is to deeply understand that they are beyond current version of Eurocode 4: "3 + 2 ≠ 4 and Eurocode 3 + Eurocode 2 ≠ Eurocode 4". The above in a good way reflects the sense of what new forms are and why their design is complicated.

Keywords: *Composite dowels, Composite bridges, Composite beams, Shear connection, Bridge Engineering, Hybrid beams.*

1. INTRODUCTION

Composite dowels opened new possibilities for engineers designing composite structures. Thanks to this shear connection, it became possible to effectively and economically connect steel T-sections with concrete in bridge structures subjected to cyclic loads. This type of shear connection has recently been used to build innovative composite structures across Europe. Thanks to such connectors, composite beams can be effectively and economically constructed without using the top steel flange, i.e., by directly connecting the steel beam web and the concrete slab or web. This shear connection is currently being proceeded to obtain European Technical Specification (consistent with rules of Eurocode 4), and appropriate rules have been proposed by project team SC4.T1 [52].

1.1. The idea

The idea of composite dowels appeared because SSF Ingenieure was looking for a new shear connection to eliminate upper steel flange in prefabricated composite girders used in VFT system (the system using prefabricated composite beams for bridges). This way I-section was substituted with T-section. This led to a whole variety of forms (Fig. 13).

1.2. The bridges

In this paragraph, for simple introduction, the pictures of chosen examples being constructed last years in Poland are presented. They are much more advanced and different to first bridges being constructed (Fig. 13) and they show, how development is progressing and in which direction. On the other hand, they are quite new forms of composite structures.

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