

Prefabricated Composite Bridges

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Martin Nilsson, born 1970, presented his PhD thesis 2003 within the area of cracking of young concrete. He has since been working with concrete structures and education.

Summary

The savings in construction time is one reason why composite bridges have become a popular solution in many countries. Further time savings can be achieved by prefabricating not only the steel but also the concrete deck and the substructure. Taking these savings into account also from a road user perspective makes this concept even more interesting. In this paper different solutions, presented at an international workshop in Stockholm, are discussed. This includes a prefabricated deck solution with dry joints, used for three one span bridges in northern Sweden. Finally a European R&D project, aiming at developing the concept for multi span bridges, is presented.

Keywords: Prefabricated bridges, precast deck elements, composite bridges, ELEM.

1. Introduction

Even if there are a lot of advantages with prefabrication, yet in-situ cast concrete is the normal procedure. In some countries prefabrication seems to be gaining momentum [1, 2], but it is far from a common procedure everywhere. This paper is written in order to spread the knowledge about prefabricated bridges in general and precast deck elements in particular.

2. Different solutions for prefabricated decks

Different studies [3, 4, 5] have been made to compare the costs of bridges constructed in place with the costs of prefabricated bridges. Prefabricated prestressed concrete beam bridges are well known as a cost competitive solution. Yet, bridges with prefabricated concrete deck elements or completely prefabricated bridge systems have a very little share of the market, even if such solutions might give the lowest life-cycle cost. In March 2009, an international workshop was arranged in Stockholm, Sweden. This workshop attracted participants from nine countries, and some of the presented solutions for prefabricated composite bridges are indicated below.

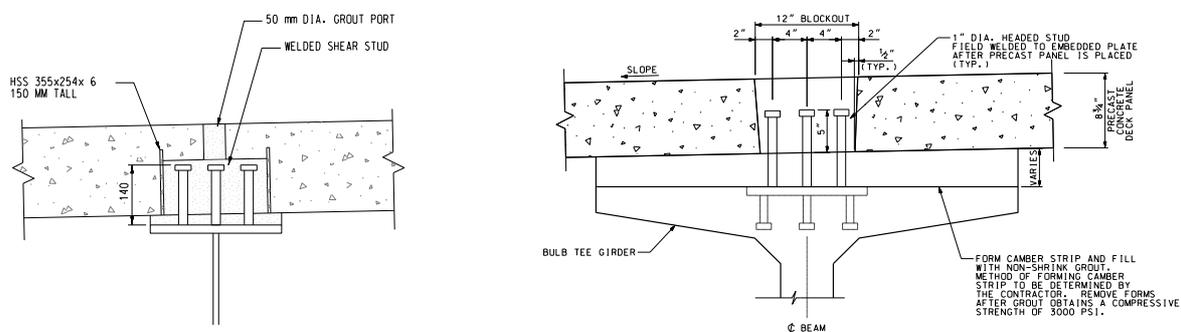


Fig. 1 Two different American solutions for composite connections. [1]



Fig. 2 Swedish prefabricated deck elements with dry joints.



Fig. 3 French bridge where the studs are welded through holes after the elements are erected



Fig. 4 Complete bridge prefabrication of 4500 South Bridge, Utah, USA. [1]



Fig. 5 Prefabricated VFT-girder, Germany. [2]

3. European Research Project - ELEM

Studies made in USA, Sweden, UK etc. all show advantages of prefabrication in the field of bridge construction. In order to improve the competitiveness of prefabricated composite bridges, a European research and development project, ELEM RFSR-CT-2008-00039, was started in 2008. Four countries are represented in the research group, Sweden, Germany, Finland and Poland. The success of the project relies on the cooperation between universities, engineering consultants and steel producers.

The project has started with a knowledge extension, and the next step is to improve the details in element bridges, try the solutions in laboratories, design a multispan bridge with prefabricated elements and perform field monitoring on such a bridge. These are the coming events in the research and development project, which will continue until the mid of 2011.

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