

Innovative strengthening of steel truss nodes by Ultra-High Performance Concrete

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Abstract

The paper presents one innovative idea for strengthening of steel truss nodes by UHPFRC. The nodes are totally encased in the UHPFRC with no additional conventional reinforcement. The connection between steel and UHPFRC is realized by epoxy resin only without any shear connectors. For proving the efficiency of this strengthening method five specimens are going to be tested in laboratory: one reference bare steel node, and four encased. The parameters that are going to be varied during the tests are the concrete cover and encasement length of the elements entering the node. The very promising results from the preliminary FEM of the nodes are presented herein as well as the description of the experiments envisaged.

Keywords: steel truss bridges; nodes; strengthening; encasing; UHPFRC; laboratory tests.

1 Introduction

In the old steel truss bridges one particular point of interest are the nodes. While for strengthening the elements of the truss design engineers can rely on more conventional methods, usually, for the nodes unique solutions have to be adopted. The problems found are related with:

1. Too thin or corroded gusset plates, where local buckling or shear tearing might govern the design;

2. Not many possibilities to add bolts or rivets in order to strengthen the connection of the truss elements, which are entering the node, because of the small space available between the existing connectors and the optimised geometry of the gusset plates.

One integral solution to the above problems, which could be implemented in a variety of steel truss nodes, is strengthening by totally encasing the node in ultra-high performance fibres reinforced concrete (UHPFRC). The authors