Experimental bending tests on filler beam section with SFRC

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Abstract

Filler beam decks are a traditional steel concrete composite deck for railway and roadway bridges which has been in use since decades without major changes in its configuration. The use of steel-fibre reinforced concrete (SFRC) as complement to the traditional reinforcement is investigated to reach a more optimized, environmental-neutral and resilient structural form.

In this frame a large experimental campaign has been initiated, whereas in this paper the monotonic bending beam tests will be discussed. In term of resistance the major difference is the superior ductility of SFRC which permits to fully exploit the resistance of the steel profile. On the other side, the presence of the steel fibres highly enhances the tensile properties of the concrete matrix contributing to a significantly higher bending stiffness.

Keywords: filler beam decks, steel-fibre reinforced concrete, high-strength steel, composite bridge.

1 Introduction

Fibre reinforced concrete (FRC) is established as the solution of choice in several industrial or tunnelling applications. The trend is towards an increased use in structural applications [4], where it can play a significant role both at serviceability limit state (e.g. increasing concrete tensile properties permit to decrease crack formation and width) as well as ultimate limit state (e.g. for flat slabs they can be a substitute of traditional reinforcement). They may bring also other important benefits in specific fields (e.g. reduced concrete spalling in case of fire exposure).

Fibre reinforcement may be realized out of a variety of materials. Amongst them steel fibres is the solution of choice for standard structural applications thanks to their high strength (commonly available products over 1500 MPa yield strength) and moderate unitary cost.

The structural behaviour of fibre reinforced concrete has been intensively researched over the last decades and the knowledge is now mature enough to be transferred into design codes ([10]). In this sense it can be expected that practitioners will increasingly use this product in the future.

Several research studies were already performed (e.g.[3], [4], [5], [6], [7], [8]) but the use of SFRC in

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