Practical Use of UHPC As a Main Material for Superstructure of Pedestrian Bridges

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Abstract

The main topic of paper is practical use of UHPFRC as main material for superstructure of pedestrian bridges. Three practical examples of real pedestrian bridges are presented – first is segmental single span bridge (completely made by UHPFRC segments), the second is cable stayed pedestrian bridge also with superstructure made by UHPFRC segments and the last one is low raised arch with external prestressing tendons. Information about design (material and structural analysis, details solutions and construction stages) are described and presented.

Keywords: UHPFRC; pedestrian bridge; structural analysis; precast segments; cables; construction.

1 Introduction

UHPFRC or UHPC is a new promising high-quality cementitious material. Its mechanical properties (compressive strength 120-180 MPa, flexural tensile strength approximately 20-40 MPa) and workability make it possible to design new constructions of specific parameters and shapes. At the same time, a very high durability many times higher than ordinary concrete is essential for practical use. Methodologies were also developed under the leadership of the CTU in Prague to further expand the possibilities of designing and applying UHPC and UHPFRC in the Czech Republic.

2 Segmental bridge in Pribor, Moravia

2.1 Basic Information

This relatively modern cement composite material was used in this case to build a footbridge designed as a simple supported girder with length of the span 35 meters and total structure length 36 meters from UHPFRC C 110/130 with dispersed steel reinforcement. The general view of the bridge is shown in Fig. 1. The bridge is placed on the reinforced concrete substructure (abutments) by means of four cylindrical steel bearings with a diameter of 200 mm. The surface of the structure is directly walkable (without additional waterproofing and covering surfaces) with water drainage realised by cross section slope of 1.0%. The bridge is equipped with a railing system - 1.1 meters high, formed by optically subtle circular posts with a diameter of 22 mm. These posts are longitudinally connected by a solid lacquered acacia handrail. Inside the handle is integrated footbridge lighting, including the necessary accessories.

2.2 Structure arrangement of the bridge

The superstructure with a depth of 800 mm is divided in the longitudinal direction into five segments with a length of 7.2 meters and a cross-section according to Fig. 2. The slenderness ratio of the structure is therefore 1:44.

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