



Segmented footbridge made of UHPFRC

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Abstract

The paper deals with the design and production of a segmented prestressed bridge made of Ultra High Performance Fiber Reinforced Concrete (UHPFRC). The footbridge is installed in the town of Příbor in Czech Republic. The UHPFRC or UHPC material in the Czech Republic gradually finds its way to interesting and unique design applications. The paper presents the design and production of a segmented bridge of the first type in the Czech Republic, designed as a simple beam of 35 meters total length of 36 meters, which is created by the closure of five double-chamber segments 2,5 m wide and 0,8 m height. The UHPFRC class C110 / 130 was chosen as a structural material with a dispersed steel reinforcement developed by Klokner Institute CTU in Prague.

Keywords: UHPC, UHPFRC, segmented structure, footbridge, prestress.

1. Introduction

UHPFRC or UHPC is a relatively new promising high-grade cementitious material, see articles [1], [2], [3], [4], [5], [6]. Its mechanical properties (compressive strength 120-180 MPa, flexural tension of approx. 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 of multiple times over conventional concrete is essential. In addition, the methodologies [7], [8], [9] have been developed under the guidance of the Klokner Institute CTU for a wider dissemination of the design and application capabilities of UHPC and UHPFRC in the Czech Republic. This relatively modern cement composite was used in this particular case to construct a footbridge designed as a simple beam of 35 meters length overall of 36 meters of UHPFRC C110/130 with scattered steel reinforcement. The visualization of the appearance is shown in Figures 1 and 2. The footbridge is supported by a pair of

200 mm diameter cylindrical roller bearings on a reinforced concrete bottom structure. The surface of the structure is walkable directly (without additional waterproofing and outer surfaces) with a drainage slope of 1.0% to the side edge. The bridge is equipped with a railings of 1.1 meters high with optically subtle cylindrical posts of 22 mm in diameter. These posts are longitudinally joined by a massive varnished acacia handle. Inside this handrail is integrated footbridge lighting.

The construction of a height of 800 mm is longitudinally divided into five segments with a length of 7.2 meters and a profile according to Figure 3. The total cross section width is 2.5 meters. The volume of the footbridge is lightened by twenty dimensional polystyrene blocks that limit the consumption of a relatively expensive (compared to standard concrete) UHPFRC construction material. It is a hidden girder structure of a beam formed by a system of inter-acting longitudinal and transverse ribs.