

An innovative metro viaduct using UHPC

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Abstract

Systra had developed since 1996 a concept of U-shape viaduct, used for more than 300 km of metro viaducts throughout the world. In order to continuously improve the transportation infrastructures, SYSTRA has developed recently, with inputs from Lafarge Holcim, a new structural and architectural concept for metro viaducts, using UHPC.

The deck and the piers are made of a combination of UHPC and ordinary concrete. The lateral beams have openings in order to: clear the view from the metro passengers across the lateral beams, improve the architectural aspect and allow various esthetical expressions, and optimize the UHPC use. Thanks to this new design, the span between piers is about 45m to 50m (instead of formerly 35m for SYSTRA classical U-shape viaducts). Globally the carbon print of the UHPC viaduct is less important than the classical viaducts, due to a better durability of UHPC.

Keywords: UHPC, metro viaduct

1 Introduction

In many countries, metro lines are built on long viaducts. Generally these viaducts carry two tracks, one for each direction. The rolling stock can be rolling on rails or on tires. The power supply can be made through overhead catenary line, or a third rail. The track height above the ground varies usually from 7 to 12m. These structures being built in the heart of the town, their integration in the urban landscape is an important topic.

SYSTRA has already developed since 1996 a patented viaduct type, made from a U shape prestressed concrete deck supported on reinforced concrete piers, which has been used for more than 300 km of metro viaducts in the world [1]. The

purpose of this paper is to present a new viaduct type, also dedicated to metro lines, using Ultra High Performance fiber reinforced Concrete (UHPC).

2 Description of the new viaduct

2.1 General design

It has been decided to take advantage of advanced material like UHPC to design a viaduct that is structurally and aesthetically attractive. It is also designed to integrate all the transportation systems, like the present SYSTRA classical U-shape viaduct. The following equipment is integrated in the design: track, emergency walkway, cable troughs, acoustic protection.