Challenges and innovation in large-scale infrastructure projects – the WHSD project

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Abstract

The Western High Speed Diameter – Central section – is a major infrastructure project comprising marine viaduct bridges, cable stayed bridges and a double-deck truss girder bridge. This paper demonstrates how an aesthetic design was obtained to match a spectacular scenery set by the city of Saint Petersburg, Russia. It is discussed how the choice of spectacular solutions influenced the structural design and construction. The engineering innovations to complete the project, which had significant urban constraints, included state-of-the-art bridge deck launching and lowering sequences and attracted some of the world's leading specialists within their field.

Keywords: Cable stayed bridges, marine viaducts, construction engineering, large-scale project execution, urban constraints, aesthetic design.

1 Introduction

1.1 General introduction

The central part of the Western High Speed Diameter (WHSD) project in Saint Petersburg, Russia, is a newly constructed 2 x 4 lane highway west of city with a total length of 11.7 km, mainly bridge structures. The project comprises large-scale bridge structures such as a major double-deck truss, two iconic cable stayed bridges, and several large-scale marine viaducts and a tunnel. The project opened to traffic in late 2016.

1.2 Scenery

Saint Petersburg holds approximately 5 million citizens and is a major regional hub in the western part of Russia with a significant industrial power. Founded by Peter the Great in 1703, it is formerly the capital of Russia, and in terms of cultural heritage, Saint Petersburg is regarded as one of the significant cities in this part of the world with considerable treasures, collections of art and palaces.

As the city had developed through recent years, it was becoming increasingly urbanized, and a massive infrastructure investment was needed to ease severe traffic congestion problems in the historic city centre.

The project had significant urban constraints and challenges, which attracted some of the world's leading engineering specialists within their area to provide state-of-the art planning and structural engineering. Additionally, the bridges included several exceptional features to match the city's many unique landmarks.

1.3 Purpose

This paper will introduce the bridge structures and discuss the innovative aspects in construction and design developed for the project. Furthermore, it is demonstrated how an aesthetic design was obtained in this large-scale infrastructure project

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