IZMIT Bay Suspension Bridge – Advanced Post tensioning system

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Abstract

This paper introduces the advanced post-tensioning system adopted in the anchorage for IZMIT Bay Suspension bridge (now named "Osman Gasi Bridge") in Turkey. The system is based on unbonded tendon instead of the conventional grout solution. The reliable long-term durability is provided by the dehumidification system and the condition inside a tube is continuously monitored. In addition, "strand-by-strand" method gives the possibility to replace strands in the feature. The method has been verified by a mock-up test. Major steps of strand replacement are also described in this paper together with some notable key issues.

Keywords: IZMIT Bay Bridge, Anchorage, PT strand, Dehumidification system, Replacement

1 Introduction

The Izmit Bay Bridge (now named "Osman Gazi Bridge" in honor of Osman I (1259 - 1326) who founded the Ottoman Empire in 1299) located in northwest Turkey, consisting of the North Approach Viaduct, the Suspension Bridge and the South Approach Viaduct, will carry the planned Gebze-Orhangazi-Bursa-Izmir motorway across the Sea of Marmara at the Bay of Izmit between the Diliskelesi peninsula on the north and the Hersek peninsula on the south. The bridge construction has started in January 2013 and opened for the traffic at the end of June 2016. The bridge is located in high seismic zone in which magnitude 7.4 Izmit earthquake took place in 1999. North Anatolia fault is close to the bridge site, around 2 km away from the south anchorage area, and the south anchorage is in the secondary fault zone.

The bridge is arranged as a three span continuous suspension bridge having a total length of 566+1550+566=2682 m. The deck is a hexagonal closed steel box girder with a width of 30.1 m and a depth of 4.75 m and is carrying three lanes of highway traffic in each direction. The walkway for maintenance cars with a width of 2.9 m is at both sides of the steel deck as similar to 1st and 2nd Bosporus bridges.

The north anchorage is designed as a gravity type consisting of the main block, the triangle leg, the side span pier and the transition pier. The main block is approximately 33 m long, 22 m deep and 50 m wide. Two legs, which have the function of holding the cable at the correct angle while providing a convenient structural arrangement of the anchorage, depart from the main block and terminate with a front pad each. The tensile force resulted in the main cables tends to pull the main block upward and toward the main span, while acting in compression on the front pads. The forces coming through the transition pier work against the upward force on the main block.

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