The Third Bosporus Bridge - Its longitudinal and transversal behaviour

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Abstract

The Third Bosporus Bridge is a highly rigid suspended bridge with a main span length of 1’408 m and a total length of 2’260 m located at the north of Istanbul near the Black Sea.

The cable system is a combination between stiffening cables (stay system) and classical suspension. The towers are 320 m high. The steel deck, on the main span, is 5.50 m high and 58.50 m wide with 4 road lanes in each direction, 2 railway tracks and 2 sidewalks.

Of course, for such huge spans, the wind loads and seismic hazard are very important, but with the addition of two railway tracks, the effects of the large and combined loads have to be examined in detail.

For railway traffic, it was very important to check that the vertical displacements were limited. But this hybrid suspension induces non negligible longitudinal displacements leading to a large distension of several stay cables. Then, if classically, the support scheme is important in the vertical and transversal directions, for this bridge, the longitudinal direction had also to be examined in detail.

Different solutions have been studied for the transversal and longitudinal supports. Pendular bearings have been chosen for the longitudinal direction. The paper will explain the interest of the different support schemes.

Keywords: Cable Bridge, design, longitudinal behaviour, transversal behaviour.

1 Introduction

The third Bosporus bridge, called Yavuz Sultan Selim Bridge, is a suspension bridge with a main span length of 1’408 m and a total length of 2’260 m located at the north of Istanbul near the Black Sea. As the Brooklyn Bridge, the main span is partially suspended at the towers by stiffening cables and at the main cables with vertical hangers. The classical vertical suspension with hangers is concentrated at the central part of the main span, over a length of 792 m, inclusive 2x 250 m of transition zone with two suspension systems: stiffening cables system and hangers system (Figure 1).

The towers are composed of two inclined concrete shafts (77’000 tons); their tops culminate at 320 m. The deck, located 75 m above the sea, is 5.50 m high and 58 m wide with 4 road lanes in each direction, 2 railway tracks and 2 sidewalks. In the central span, the deck is in steel with an orthotropic plate with a total steel weight of

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