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1915 Çanakkale
Bridge, Tower foundations: Independent Design Verification

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ABSTRACT

An Independent Design Verification (IDV) has been carried out on the 1915 Çanakkale Bridge for the DBFO contractor client DLSY JV. The bridge spans the Dardanelles in Türkiye and has a world leading main span of 2023m. This paper presents the IDV for the foundations of the two main towers for the bridge. The Designer adopted an increasingly used solution wherein reinforced concrete caissons are supported on gravel mats which sit on the soil deposits which are reinforced with open ended driven steel tubes ("inclusion piles") which are toed into stiff deep strata, this approach has been used on the Rion-Antirion bridge in Greece and the Izmit Crossing in Tukey. The IDV included: independent review of the ground investigation information; preparation of Ground Investigation Reports which included the seismic setting of the site and design spectra; and development of finite element models for the two tower foundations including (a) single pile models allowing investigation of the load path between caisson and Miocene bedrock through gravel mat, piles and more recent geological strata; and (b) full 3D FE models of the initial section of the steel towers, the reinforced concrete caisson and its geotechnical foundation for SLS, ULS, ALS (ship impact) and seismic design situations. The verification process included fruitful discussion with the Client and Designer to develop design solutions for the foundations. The bridge has been successfully opened to traffic.

Keywords: design, foundations, piles, seismic

1 INTRODUCTION

The DBFO joint venture DLSY (Daelim, Limak, SK and Yapi Merkezi Joint Venture) won the right to design, build, finance and operate the 1915 Çanakkale Bridge that crosses the Dardanelles Straight that links the Sea of Marmara (and Black Sea beyond) to the Aegean Sea (and Mediterranean Sea beyond) as shown in Figure 1.

DLSY, appointed Cowi and PEC to be the Designers and a JV of Arup and Aas-Jakobsen to be the Independent Design Verifier (IDV). The design brief given to DLSY was, at a high level, relatively simple: a 6 lane carriage way (3 lanes each way) with a main span of 2023m minimum that would not impact on the shipping traffic transiting from the Mediterranean to Black Seas. The bridge span is the longest suspension bridge globally.

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