The Development of a Novel Over-Ramp System for the Replacement of Movement Joints.

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Summary

The Queen Elizabeth II (QEII) Bridge carries the southbound traffic over the River Thames on the eastern side of the M25 Orbital Motorway around London. The bridge carries over 80,000 vehicles per day, and comprises a cable stayed bridge of 800m with adjoining approach viaducts of around 1km each. The bridge is just over 20 years old and work commenced in 2013 to progressively replace the six multi-element movement joints. Due to its strategic importance and political sensitivity if closed, lane and carriageway closures on the bridge are only practicable for brief night-time periods. To facilitate joint replacement a novel temporary over-ramp system was designed so that no restrictions were imposed on either daytime carriageway availability or traffic speed during the entire works. This paper describes the collaborative development of the ramping system from constraints and concept, through detailed design and testing, to installation and use.

Keywords: Steel; Temporary Structures; Expansion Joints; Maintenance; Renewal; Traffic Management; Health and Safety; Vehicular Barriers; Vibration.

1. Introduction

In May 2009, the Highways Agency awarded Connect Plus, a consortium comprising Balfour Beatty, Skanska, Atkins and Egis, a 30-year Design Build Finance operate (DBFO) contract to manage the M25 Orbital Motorway around London and its key arterial link roads. The M25 is one of the busiest motorways in Europe, carrying in excess of 200,000 vehicles per day on some sections.

Fig. 1: The QEII Bridge

The QEII Bridge together with the Dartford Tunnels forms the crossing of the River Thames on the eastern side of the M25. The QEII Bridge carries the southbound traffic of over 80,000 vehicles per day, and comprises a cable stayed main bridge of 800m with adjoining approach viaducts of around 1km each (see fig. 1). The crossing is one of the most critical pieces of infrastructure in the transport network and any reduction in available capacity would result in severe delays and consequent economic loss for both the country and the DBFO operator.

The QEII Bridge is now over 20 years old and the original movement joints had been suffering from various component failures and progressive fatigue damage over the last few years. A regime of regular monitoring and repair had been implemented to minimise the risk of unplanned failures and prevent serious traffic disruption. Replacement of the movement joints was duly programmed as an early item in the DBFO term.

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