

Hidden defects risk assessment at the Humber Bridge

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Abstract

The Humber Bridge opened in 1981. It is a suspension bridge carrying the A15 dual carriageway. Its 1410 m main span is the longest in the UK. It is owned and operated by the Humber Bridge Board. Following unplanned works to bearings arising from a hidden defect in 2020, Roughan & O'Donovan was commissioned in 2021 to undertake a hidden defects study following the guidance of CIRIA C764. Potential hidden defects for component groups and their possible causes were identified. The criticality and vulnerability of each hidden defect was assessed. A risk ranking table was then used to rank each hidden defect. Resulting mitigation measures included instigating a programme of non-destructive testing to welds, periodic survey of fixed points on the towers and anchorages and expansion joint works. Such a systematic, risk based approach is felt particularly applicable to the management of aging transportation infrastructure under high traffic and environmental demands.

Keywords: bridges; defects; Humber Bridge; suspension bridge; steel; bridge management.

1 Introduction

1.1 The Humber Bridge

The Humber Bridge is an iconic landmark crossing the Humber Estuary, connecting Yorkshire and Lincolnshire in the UK (Figure 1). Opened by Queen Elizabeth II in 1981 it was the world's longest single span suspension bridge until 1997 and remains the longest in the UK at 1410 m. It has asymmetrical side spans of 280 m and 530 m (Figure 2). A Grade I listed structure, as designated by Historic England, the bridge plays a vital role in helping the Humber region reach its potential. It is owned, operated and maintained by the Humber Bridge Board (HBB), who collect tolls to finance the crossing. The bridge

carries the A15 trunk road, north and south, utilising four lanes with two additional walkways and passes over a main line railway, the A63 trunk road and two other minor roads. On average there are 33,000 crossings per day. Between June 2022 and June 2023 an estimated 120,864 pedestrians and 74,563 cyclists used the walkways.



Figure 1. The Humber Bridge, viewed from Hessle.