

The Extraordinary Noise-reduced Modular Expansion Joints of the Queensferry Bridge

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Abstract

The recent construction of the spectacular Queensferry Crossing across the Firth of Forth in Scotland required the use of some extraordinary components, such as the modular expansion joints which accommodate the long deck's exceptionally large longitudinal movements of up to 2300 mm. To minimise noise from vehicles as they cross the joints, they are equipped with noise-reducing surface plates at the driving interface, and flexible noise-absorbing membranes to tackle noise emanating from the underside of the joints. The largest joints, each with a length of over 17 m, a width of over 5 m and a weight of 55,000 kg, are among the largest-movement modular expansion joints ever manufactured, and the largest that feature noise-reducing surface plates. The design, supply and installation of the joints is described.

Keywords: Queensferry; Bridge; modular; expansion joint; noise-reduced.

1 Introduction

The construction of extraordinary bridges generally requires the use of exceptional key components. For example, very long superstructures require expansion joints that can accommodate correspondingly large movements and rotations. The associated challenges are described with reference to the recently installed expansion joints of the new Queensferry Crossing in Scotland.

2 The Queensferry Crossing

The Queensferry Crossing (Figure 1), recently constructed across the Firth of Forth near Edinburgh, Scotland, was built to carry most of the traffic that was previously carried by the adjacent Forth Road Bridge, which has been in service since 1964. It was constructed, on behalf of Transport Scotland, by Forth Crossing Bridge Constructors (FCBC) – a consortium of Hochtief from Germany,

Dragados from Spain, American Bridge from USA and Morrison Construction, originally from Scotland. The final design was undertaken by a joint venture comprising Grontmij, Gifford, Ramboll and Leonhardt Andrä and Partner, based on a specimen design by a Jacobs Arup joint venture.



Figure 1. The Queensferry Crossing during construction, with the world's largest freestanding balanced cantilever