

## The Lusail Feature Arch

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### Abstract

“Engineering the Future” - Lusail City is a self-contained and comprehensively planned new city currently under construction in Qatar. The Lusail Feature Arch was designed to enhance the Marina Interchange and create a gateway to Lusail City, with an arch spanning 184m and rising 75m above the A1/A6 interchange. The concept and aesthetics were developed in conjunction with international bridge architects, Dissing+Weitling, and comprise a triangular section tapering with height and incorporating an anti-clockwise twist emanating from the springing, creating a shape which is continually changing in profile as it gains height. This paper describes the derivation of the design criteria of this very slender structure. The arch was susceptible to wind induced excitations, and the paper discusses the effects determined through wind tunnel testing which was undertaken to establish the aerodynamic performance of this unique structure.

**Keywords:** Design criteria; analysis; modelling; steel; aesthetics; wind engineering; aerodynamics.

### 1 Introduction

Lusail Real Estate Development Company on behalf of QATAR DIAR initiated the design of a landmark to enhance the Marina Interchange and create a gateway into Lusail City, a flagship development which embodies Qatar’s National Vision for 2030.

An extension to Doha city, Lusail is the largest development within the State of Qatar, designed to accommodate a population of approximately 200,000, who are expected to reside, work and socialise across the city’s 19 districts.

CH2M and sub-consultant Dissing+Weitling were commissioned to create a feature arch to enhance the interchange. The interchange consists of a multi span post tensioned concrete viaduct which carries the A6 interchange over the at-grade local roads and the A1 expressway which sits beneath the local road network in a subterranean box culvert underbridge, refer to Figure 1.

The client stipulated that the arch and interchange bridge design criteria must be consistent. To satisfy the Doha Expressway design criteria for highway structures, all structures were to be designed with a design life of 120 years and in accordance with the relevant British Standards, including the Design Manual for Roads and Bridges and the Highways England Technical Memoranda. Seismic and temperature requirements were to be in accordance with AASHTO LRFD 2007 4<sup>th</sup> Edition.



Figure 1. Marina interchange, Lusail