Challenges of an Iconic Pedestrian Bridge

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Abstract

This paper discusses the challenges involved in the structural design of an iconic pedestrian bridge. The pedestrian bridge is approximately 60 m in span and the cross-section is open elliptical-shaped, formed by spiralling pipes. In the preliminary design stage, different configurations of structural systems are studied to enhance the overall stiffness and strength requirements of the bridge, in close collaboration with architects. Finally, combination of steel double helical ring with steel girders is used as a structural system. Inner helical ring is used as primary structural ring while the outer helical ring is used as secondary ring to support the cladding. A 4 mm-thick aluminium metal skin is used for cladding of the bridge which contributes significant portion of the gravity load and mass for seismic effects in design. The bridge is designed for code-specified gravity, wind and seismic loadings.

Keywords: Pedestrian bridge; helical ring; seismic loading.

1 Introduction

The bridge in this study is a 60 m long pedestrian bridge which is being constructed as an iconic structure near the airport. The cross-section of the bridge is elliptical section made up of helical form, 8 m in depth with varying width, approximately 21 m at the entrance and 24 m at the mid-span. It is a steel bridge with concrete deck, resting on the reinforced concrete piers. The concrete piers have different heights, 25 m and 20 m, respectively, above the ground level, due to clearance requirement of road below the bridge and difference in elevation of ground levels. A 4 mm thick aluminium metal skin is used for cladding of the bridge which contributes significant portion of gravity load and mass considered in seismic design. Pile foundation system is used to support the bridge superstructure.

Figure 1. Isometric view of the bridge

2 Finite element model

Three-dimensional elastic computer model, considering detailed structural skeleton of the bridge, was used to check the overall response and design of the bridge. Due to complexity in geometry of the structural system, special program was developed to generate the nodal coordinates, element connectivity, and element group definitions of finite element model. The model information was imported to SAP2000

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