



Santander Bay's Footbridge

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Summary

This footbridge is formed by a balcony beam, 70.7 m long, fixed to two abutments at its ends. The full length of the footbridge including both white wall accesses is 267.5 m. The flying beam is constructed of a steel–concrete composite semicircular section of 1.45 m depth. The transition between the beam and the white walls is achieved by a concrete projecting wall of 15 m length, whose depth varies parabolically from 1.45 m at the ends of the beam to 5.5 m at the foundation. The girder of the balcony beam is made up of a steel–concrete composite semicircular section. It has a constant depth of 1.45 m. The abutments are made up of concrete cup-shaped sections. Both lateral accesses are longitudinally inclined with a maximum slope of 6% and elegantly support the transitional elements between themselves and the beautiful composite flying girder.

Keywords: footbridge; composite section; balcony beam; semicircular; design; vibration.

1. Introduction

This paper describes the design and development of the footbridge over Santander's Bay Ring Motorway between the towns of Parbayón and Cacicedo. Its double curvature [1], in both plan and elevation lending it the unconventional form of a horseshoe. Basically, the footbridge is formed by a steel–concrete composite semicircular balcony beam of 1.45 m depth whose circular axis is 70.7 m long. It is embedded into two concrete supports that are of variable height. Thus, the lighter flying part is supported by the abutments, which are large concrete pieces that provide stability against overturning (*Fig. 1*). The transverse cross section of the girder is made up of a steel–concrete composite semicircular balcony beam whose inside radius is 1.61 m, and a concrete slab of 0.25 m depth is laid on it. This footbridge, besides providing a pedestrian communication axis between both places, is a dynamic architectural element in its surroundings.

2. Foundations

Geologically, the footbridge is located in a highly developed karst area, with significant vertical and horizontal variations in the lithological profile. Essentially, the rocky substrate where the structure's foundations are laid consists of a surface layer of filling made up of humus mixed with carbonate gravel in a sand-clayey terrain and decalcification clays, with limestone and karst dolomites from the Aptiense. The support foundation is deep and consists of a pile cap whose exterior edge is 1.725 m from the axis of the higher section and whose interior edge is 1.275 m from the axis of the lower section (*Fig. 2*). Accordingly, the pile cap's width is 6.5 m at the base and 3.45 m at the wall area. This pile cap is supported by 40 micropiles, each 15 m long and diameter of 0.22 m.