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Service Life of Concrete Structures for the Longest Suspension Bridge in South America

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Abstract

It is widely recognized that service life can be economically extended with more robust and durable initial design and construction than in the future by rehabilitation of a deteriorated asset. In an effort to reduce life-cycle costs, new major concrete structures are designed for service lives of 100 years or more; longer than the 75 years typically assumed in structural design codes. To confidently achieve the required service life, engineers must go beyond current structural design codes and assess deterioration mechanisms and mitigation measures specific to each structure and its environment. Similar to modern structural design codes, a rational, reliability-based approach can be used. This paper presents a state-of-the-art durability design methodology that is used on the concrete components of the Chacao Bridge, required to achieve a 100-year service life.

Keywords: Service life design; durability; concrete; chloride-induced corrosion; bridges.

1 Introduction

The Chacao Bridge project consists of a permanent link between the island of Chiloé with mainland Chile crossing the Chacao Channel. The bridge would replace the current ferry service and therefore facilitate traveling between the mainland and Chiloé.

The Dirección de Vialidad Ministerio de Obras Publicas (MOP) of Chile has tendered the tasks of designing and building the Chacao Bridge to the design-build consortium CPC comprising Hyundai, OAS, Systra and Aas-Jacobsen. Systra developed the service life assessment for the CPC consortium. COWI is the design consultant for MOP.

Figure 1 shows a rendering of the Chacao Bridge. The structure will be a multi-span suspension bridge with three suspended span, with a superstructure consisting of steel box girders and orthotropic deck. There will be three reinforced concrete towers. The approach bridge will consist of composite concrete slabs and steel girders. The total bridge length is 2754 m.

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