

Structural assessment and retrofitting of damaged reinforced concrete water bridge

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1 Abstract

Ageing of Reinforced Concrete (RC) structures is an important problem nowadays, in particular for countries like Italy in which the main infrastructures were built 55 years ago. Carbonation and chloride penetration represent the main causes of reinforcements corrosion because they reduce the passivation of reinforcing steel in concrete.

In this paper the structural assessment of an existing RC water bridge and the following retrofitting design is presented. Built in the years between 1953 and 1961 in Sardinia (Italy), it is a 180 m long bridge with 18 spans of 10 m. It is characterized by a U-shape cross section (5.7 m width, 3.8 m height).

The structure was damaged by water and environmental action that produced concrete degradation and reinforcements corrosion. Existing material characterization and structures conditions assessment will be discussed along with the retrofitting project. The latter is characterized by a structural jacketing of the bridge piers with new concrete and reinforcements. The bridge cross-section will be also retrofitted with a complete external jacket casted with self-compacting concrete (SCC). Particular attention has been devoted to the new joints that connect the 40m long bridge sections. Indeed, they should guarantee water tightness even with the important longitudinal displacements due to structural load.

Keywords: water bridges, concrete, durability, inspection and maintenance, retrofitting, sloshing.

1 Introduction

Ageing of Reinforced Concrete (RC) structures has become a paramount problem nowadays, particularly in countries, like Italy, where the main infrastructures were built more than 55 years ago. The infrastructure functionality closely depends on a good inspection activity and timely maintenance. Recently, many researches have been developed on the bridge management system optimization [1-2].

Carbonation and chloride penetration represents the main causes of reinforcements corrosion because they reduce the passivation of reinforcing steel in concrete [3-4]. Visual inspections can represent an effective tool for structural condition assessment [1-2], [5-6] and integrated with non destructive testing [7] can produce important information for structural health monitoring.

Bridge retrofitting is an important and current engineering problem in many part of the world:

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