



State of the art of typologies of piers and abutments of existing Chilean road bridges, considering the risk of scour

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Abstract

Chilean bridges have partially or totally failed due to the scour/undermining of their abutments and piers in the last decade. For this reason, in the last 5 years, the Ministry of Public Works, in reference to its current regulations (*Manual de Carreteras* Code), in association with Chilean universities, has begun a study on the scour/undermining behavior of bridges in Chile. Within the current maintenance and asset management programs implemented on vulnerability and extreme events, in order to provide an adequate intervention decision, it is necessary to have an adequate cadaster and knowledge of the existing structures, with special focus on the older ones,.

In this framework, this paper presents the evolution of the design of scour control elements in existing Chilean bridges of the 20th century (study of over 300 cases), allowing them to be compared with current design criteria. To this end, detailed design solutions for piers, abutments and bridge foundations from the 1920s to 2000s are presented, analyzing their vulnerability regarding current design conditions.

Keywords: Bridges; Scour; Local Scour; Danger; Risk; Damage; Infrastructure; abutments; piers; Foundation; Structures; Roads.

1 Introduction

During the last century, Chile has globally become a country that demands high design and construction standards of its structures as a result of the constant refinement of regulations for buildings and construction works in general, as well as of the frequent natural disasters sustained in the area, such as earthquakes, tsunamis and landslides.

Chile has a roadway system in which resilient structures, such as bridges, have been included as an “of the essence” requirement to play the role of connecting the different parts of the country, thus

enabling free transit, commerce and dynamism. According to the Roads Department of the Ministry of Public Works, Chile had a total of 7,768 bridges in 2018.

Improvements implemented as a result of the evolution of regulations (specifically the *Manual de Carreteras* of Chile), render road-linking structures, such as previously designed bridges, obsolete in terms of complying with the current protection standards against partial or total foundation scour and, therefore, these do not behave as expected in the light of this deterioration, which many times results in settlements that cause structure fissures