Recommendations for proof load testing of reinforced concrete slab bridges

Eva Lantsoght

Politécnico, Universidad San Francisco de Quito, Quito, Ecuador

Concrete Structures, Delft University of Technology, Delft, the Netherlands

Cor van der Veen, Dick Hordijk

Concrete Structures, Delft University of Technology, Delft, the Netherlands

Ane de Boer

Rijkswaterstaat, Ministry of Infrastructure and the Environment, Utrecht, the Netherlands

Contact: E.O.L.Lantsoght@tudelft.nl

Abstract

Proof loading of existing bridges is an option to study the capacity when crucial information about the structure is lacking. To define the loading criteria for proof load testing, a review of the literature has been made, finite element models of existing viaducts have been made, and on these viaducts, proof loading tests have been carried out. These bridges were heavily instrumented, to learn as much as possible about the structural behaviour during proof loading. Additional laboratory experiments have been used to develop controlled loading protocols, and to identify which stop criteria can be used for which case. As a result of the analysis and experiments, recommendations are given for proof loading of bridges with respect to the required maximum load and the stop criteria. These recommendations have resulted in a guideline for proof loading of existing reinforced concrete slab bridges for The Netherlands.

Keywords: guidelines; proof load testing; slab bridges; reinforced concrete; field testing; stop criteria; flexure; shear.

1 Introduction

As the bridge stock in The Netherlands and Europe is ageing, various methods to analyse existing bridges are being studied. These methods can be categorized based on the Levels of Approximation from the *fib* Model Code (1), and are called Levels of Assessment (2). A common bridge type in the Netherlands from the 1960s – 1980s is the reinforced concrete solid slab bridge. This bridge type often rates too low, especially in shear. The developed methods start from the lowest Level of Assessment with a simple spreadsheet-based calculation, the Quick Scan (3, 4). At the second level, linear finite element methods are used (5), and at a higher level, reliability-based methods (6) and non-linear finite element models (7) can be