

Human Errors and Corresponding Risks in Reinforced Concrete Bridges

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Abstract

Concerning the bridges failures that have been arising over the years, experts have pointed out as the principal cause of failure the human errors that usually take place in the design, construction and operation stages. The main goal of this paper is the identification of the design and construction errors that represent a higher risk for reinforced concrete bridges. Therefore, a human error survey was developed together with design and construction experts on this subject, to collect and assess these errors by using risk-based indicators (probability of occurrence and consequences). The corresponding survey results, given by design and construction experts, are analysed by using a decision-making tool, named Analytic Hierarchy Process (AHP), which will allow the identification of the errors with higher consequences and a higher probability of occurrence. Based on this survey, a qualitative risk-based evaluation of the errors is also performed.

Keywords: Human error, Reinforced Concrete Bridges, Risk Analysis, Analytic Hierarchy Process (AHP), Bridge Failure

1 Introduction

To increase the reliability of our bridges it is first required, the identification of the main source of the issues that is leading to their failure. Relying on a bridge failure database developed by [1] which contain several worldwide bridge failure cases with their main causes of failure, since 1966 to 2017, we can state that design and construction error has a key role to play in this matter, representing 31% of the failures. Although, the operation errors are responsible for most of the failures, with a percentage of 51% (Figure 1.1).

The design and construction errors is a wide subject and when it comes to being defined specifically we can find ourselves very confused about its boundaries and how can we identify them in the complex conception process of a bridge. These errors can represent different risks when compared with each other, thus it is important to identify those that represents a higher risk.



Figure 1.1 Principal causes of failure for reinforced concrete bridges (Syrkov. A, 2017)