Reduced Partial Factors for Assessment in UK Assessment Standards

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Abstract

Design standards are based upon a range of input variables for resistance, action and modelling. The distribution type and parameters for each determine the partial factors appropriate to achieve a defined reliability level over a specified reference period. For assessment a reduced reliability level may be accepted due to the greater cost of providing reliability through strengthening when compared to the cost of providing it at design. This would allow the use of lower partial factors, although they are still limited by the need to provide a minimum level for human safety. Adoption of this approach for assessment would have significant benefits for an ageing UK infrastructure by reducing the need to carry out costly strengthening and retrofitting schemes whilst still ensuring appropriate structural reliability levels are maintained. This paper presents a study investigating appropriate reduced partial factors to be applied through UK assessment standards, the sensitivity of these values to input distribution model assumptions, and how they could be implemented in industry.

Keywords: bridge, assessment, reliability

1 Introduction

1.1 Background

Assessment codes usually utilize the same partial factors as design codes, which have been specified to achieve a desired reliability. However, for assessment a reduced reliability is acceptable justified by the greater cost of providing reliability through strengthening and retrofitting when compared to the cost of providing it at design. Subsequently, lower partial factors can also be utilized. However, the reduction in reliability is still limited by the need to provide a minimum level for human safety.

In the United Kingdom existing highways structures are assessed using the Design Manual for Roads and Bridges (DMRB) [1]. This standard defines the partial factors to use for actions and resistances, which are identical to those used previously for design to British Standards prior to the implementation of Eurocodes. Highways England

commissioned a study to investigate how partial factor reduction could be implemented in the United Kingdom. This paper presents the detail of this study, focusing on the calculation of appropriate partial factor reductions, their sensitivity to input assumptions, and how the approach can be implemented through the Highways England assessment codes in the DMRB.

1.2 Objectives

The study firstly defined the appropriate reliability levels to use, as there are a number of different recommendations for different reference periods in available literature. Using these reliability levels, partial factor reductions were then calculated for a number of variables.

Different assumed input variable distribution models were used to determine how this affects the partial factor reductions calculated, and therefore the sensitivity of the method to the assumed distributions. This was a key objective as