PROBABILISTIC MODEL FOR MASONRY STRENGTH OF EXISTING STRUCTURES

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In the Czech Republic numerous existing structures are made of different types of masonry. Decisions concerning upgrades of these structures should be preferably based on the reliability assessment, taking into account actual material properties. Due to inherent variability of masonry, information on its mechanical properties has to be obtained from tests. Estimation of masonry strength from measurements may be one of key issues in the assessment of existing structures. The standard technique provided in the Eurocode EN 1996-1-1 is used to develop the probabilistic model of masonry strength taking into account uncertainties in basic variables. In a numerical example characteristic and design values of the masonry strength derived using principles of the Eurocode are compared with corresponding fractiles of a proposed probabilistic model. It appears that the characteristic value based on the probabilistic model is lower than that obtained by the standard technique. To the contrary, the partial factor for masonry recommended in EN 1996-1-1 seems to be rather conservative.

Keywords: *probabilistic model, masonry strength, statistical methods, existing structures*

1. Introduction

Existing structures including those registered as cultural heritage are often affected by numerous environmental influences that may yield deterioration and gradual loss of their durability and reliability. Hence upgrades of such structures including design of adequate construction interventions is an important issue for civil engineers. Construction interventions may also become necessary in case of a change in use, concern about faulty building materials or construction methods, discovery of a design/construction error, structural damage following extreme events, complaints from users regarding serviceability etc. [1]. Rehabilitation of these structures is a matter of a great economic significance as more than 50 % of all construction activities apply to existing structures [2]. Decisions about various interventions should be always a part of the complex assessment of a structure, considering relevant input data including information on actual material properties.

In the Czech Republic numerous existing structures are made of different types of masonry. Due to inherent variability of masonry, information on its actual mechanical properties has to be obtained from tests. Estimation of masonry strength from measurements may then be one of key issues of the assessment of an existing structure.

Probabilistic framework for design and assessment of masonry structures has been suggested by Mojsilovic & Faber [3] to allow more consistent representation of the material characteristics, description of uncertainties and more economical designs or decisions about

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