



Estimation of the effect of stone and structural decay on the load bearing capacity of masonry arch bridges

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Stone masonry arch bridges have high historic value. Even the old medieval bridges are still used in these days and their preservation requires complex analyses. The current research focuses on the structure, geometry, stone material, condition of Hungarian stone masonry arch bridges. Several bridges have been investigated. The geometry of bridges was measured, lithotype and the physical properties of the stone material were determined mostly on site with non-destructive test method such as Schmidt-hammer. At sites where it was possible samples were also taken for laboratory analyses. Rock mechanical parameters were measured according to existing standards. The decay of the stone material and a condition assessment of the structure were also documented in the forms of maps. The studied maps were constructed from limestone, sandstone and volcanic rocks. The different lithotypes show ranges of weathering features such as scaling, flaking, granular disintegration or cracking. The measured data was used to classify the studied bridges and to determine their current load bearing capacity. It was also compared to the supposedly optimal 'original' condition. The comparison between the two different values indicates the loss of load bearing capacity. It is partly related to the deterioration of the structure and material. The load bearing capacity has been calculated with the simple MEXE method, the thrust line analysis (Archie-M) and rigid block method (RING). The results of the three analyses were compared and evaluated. The outcome of the study was the classification of investigated bridges and the quantification of the loss of load bearing capacity, i.e. deterioration. The results can be used to estimate the possible loss of load bearing capacity of different stone bridges in relation to stone and structural decay.