



Review

Simulations and analyses of arched brick structures

Łukasz Bednarz ^a, Artur Górski ^{b,*}, Jerzy Jasieńko ^a, Eugeniusz Rusiński ^b^a Wrocław University of Technology – Institute of Civil Engineering, Plac Grunwaldzki 11, 50-377 Wrocław, Poland^b Wrocław University of Technology – Institute of Machines Design and Operation, Lukasiewicza 7/9, 50-371 Wrocław, Poland

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ABSTRACT

The paper presents problems related to the assessment of historical objects, especially brick arch structures, in view of potential improvement of their strength using various technologies. We have presented the methodology and computer simulations used for assessment of present strain and load bearing capacity of brick arches along with a variety of reinforcement techniques. We also present arch deformation FEM analysis along with results of assessment of actual objects.

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1. Introduction

Modern computation methods used for assessment of deformations and load bearing capacity of objects have wide application for newly designed buildings, but can be as well applied to existing historical structures. This includes historical buildings with brick arches. Maintaining their safety and usability, especially in view of potential partial or even major damage, is a challenging task, often faced by conservators and persons reinforcing buildings [1,3].

Successful performance of these tasks requires a broad knowledge about the various phenomena causing degradation of these structures, knowledge of old building techniques as well as modern solutions for preventing such degradation and for restoring their original load bearing capacity. Use of modern repair and reinforcement techniques for brick structures as well as for their individual elements (e.g. arches, vaults, and domes) allows for significant savings, whilst also making it possible to save culturally important objects. Reinforcement and repair of brick arches and vaults are a difficult problem, which in each case generally requires an individual approach [4].

2. Methodology for assessment of brick arches

Analysis of brick and mortar structures (especially historical arches, vaults and domes) poses many problems in describing and modeling these types of objects. Usually the difficulty is caused by incomplete information about the mechanical properties of materials

* Corresponding author. Tel.: +48 71 3202847; fax: +48 71 3203123.

E-mail addresses: lukasz.bednarz@pwr.wroc.pl (Ł. Bednarz), artur.gorski@pwr.wroc.pl (A. Górski), jerzy.jasienko@pwr.wroc.pl (J. Jasieńko), eugeniusz.rusinski@pwr.wroc.pl (E. Rusiński).