

**I. IDENTIFICATION DATA**

<b>Thesis title:</b>	Evaluation of ancient bricklayer's skills using numerical estimations of themasonry strength of the walls of Churches from the Broumov group
<b>Author's name:</b>	Shantanu S Kulkarni
<b>Type of thesis :</b>	master
<b>Faculty/Institute:</b>	Faculty of Civil Engineering (FCE)
<b>Department:</b>	Department of Mechanics
<b>Thesis reviewer:</b>	Radek Zigler, Ph.D.
<b>Reviewer's department:</b>	Department of Architectural Engineering

**II. EVALUATION OF INDIVIDUAL CRITERIA**

<b>Assignment</b> <i>How demanding was the assigned project?</i>	<b>challenging</b>
The thesis assignment is focused on nonlinear structural analysis of a masonry wall segment. It can be assessed as challenging.	
<b>Fulfilment of assignment</b> <i>How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.</i>	<b>fulfilled</b>
The submitted master thesis is done according to the assignment.	
<b>Methodology</b> <i>Comment on the correctness of the approach and/or the solution methods.</i>	<b>correct</b>
The methods used by the author in his work are correct and in accordance with the usual practice for the historic structures' assessment.	
<b>Technical level</b> <i>Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?</i>	<b>B - very good.</b>
The technical level of the submitted bachelor thesis is very good. The proposed solutions demonstrate that the author can apply the knowledge gained by study.	
<b>Formal and language level, scope of thesis</b> <i>Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?</i>	<b>B - very good.</b>
From formal point of view, the thesis level can be assessed as very good. Some minor mistakes and typing errors, as well as some mistakes in terminology do not reduce the overall quality of presented thesis.	
<b>Selection of sources, citation correctness</b> <i>Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?</i>	<b>C - good.</b>
The citation ethics has not been breached and all the sources are more or less correctly cited (the online sources should include the date of citation, since these can change in time, some information is missing direct citation – i.e Tab. 3.1 and others). Selection of sources is somewhat limited, more in-depth information could have been obtained from broader state-of-the-art review.	

## Additional commentary and evaluation (optional)

*Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.*

The primary goals of the thesis were achieved. Moreover, the presented thesis contains interesting information on stone and mixed masonry behavior (this is of outmost importance for historic structures' stabilization and rehabilitation). Very interesting seems to be the evaluation of masonry using MQI as it presents easy, fast and, to an extent, reliable way of establishing basic material properties. However, according to the results, there are some difference between the MQI (and NTC 2018/2019) based values of compressive and shear strengths (Tab. 7.1 – 7.3) and the calculated ones. A brief discussion on this and some general recommendations would be extremely interesting.

## III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

*Summarize your opinion on the thesis and explain your final grading. Pose questions that should be answered during the presentation and defense of the student's work.*

Overall, the presented thesis is well written and in accordance with the assignment. Nevertheless, I have some remarks and comments that could be discussed during the defense:

1. While describing the possible numerical approaches to modeling masonry (in general), the author mentions detailed micro and macro modelling. It is not quite clear, what does the author mean exactly by "detailed micro modelling", since Fig. 3.10 show the mortar joints as interfaces, Fig. 3.11 as continuum elements. What model did the author use? Are there any other approaches that could be adopted (mezzo modelling)?
2. While simulating the compressive, tensile and shear tests, the author used loading by force (page 34-35) while obtaining a post-peak behavior in his simulation. Usually, a force controlled loading is necessary for post-peak behavior analysis. Could author comment on this?
3. A "3D Non-Linear Cementitious 2" model was used for masonry units and mortar modelling. This material model requires, among others, fracture energy  $G_f$  as one of the input parameters. Could the author briefly explain, how the  $G_f$  could be experimentally evaluated?
4. The author mentions, in Conclusion, that another material model, more suitable for masonry units and mortar modelling could be used in future works. What model would the author choose and what would be the advantages of this material model?

The grade that I award for the thesis is **B - very good**.

Date: **22.7.2020**

Signature: