

I. IDENTIFICATION DATA

Thesis name:	Stability Analysis of St. Barbara Church in Otovice
Author's name:	Ivana Božulič
Type of thesis :	master
Faculty/Institute:	Faculty of Civil Engineering (FCE)
Department:	Department of Mechanics
Thesis reviewer:	Radek Zigler
Reviewer's department:	Department of Building Structures

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	challenging
<i>Evaluation of thesis difficulty of assignment.</i>	
The thesis assignment is focused on nonlinear structural analysis of a small baroque church. It can be assessed as challenging, since it required, apart from sound theoretical background, also making in-situ survey of the structure, inspection of damage and assessment of material properties based on non-destructive testing.	

Satisfaction of assignment	fulfilled
<i>Assess that handed thesis meets assignment. Present points of assignment that fell short or were extended. Try to assess importance, impact or cause of each shortcoming.</i>	
The submitted master thesis is done according to the assignment.	

Method of conception	correct
<i>Assess that student has chosen correct approach or solution methods.</i>	
The methods used by the author in her work are correct and in accordance with the usual practice for the historic structures' damage and residual safety assessment.	

Technical level	A - excellent.
<i>Assess level of thesis specialty, use of knowledge gained by study and by expert literature, use of sources and data gained by experience.</i>	
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.	

Formal and language level, scope of thesis	B - very good.
<i>Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.</i>	
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.	

Selection of sources, citation correctness	B - very good.
<i>Present your opinion to student's activity when obtaining and using study materials for thesis creation. Characterize selection of sources. Assess that student used all relevant sources. Verify that all used elements are correctly distinguished from own results and thoughts. Assess that citation ethics has not been breached and that all bibliographic citations are complete and in accordance with citation convention and standards.</i>	
Sources cited by the author focus mainly on numerical evaluation and analysis of structures and are relevant to the thesis topic. However, some key sources were omitted. Namely the basic codes for assessment of existing structures (ISO 2394:2015 "General principles on reliability for structures" and ISO 13822:2010 "Bases for design of structures - Assessment of existing structures").	
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, the journal articles should include at least the journal title and volume etc.).	

Additional commentary and evaluation

Present your opinion to achieved primary goals of thesis, e.g. level of theoretical results, level and functionality of technical or software conception, publication performance, experimental dexterity etc.

The primary goals of the thesis were achieved. Moreover, the presented thesis contains some parts that should be noted as very interesting. Namely the soil-structure interaction that is very well elaborated and its results are than correctly applied to the 3D model of the whole structure.

On the other hand, some parts of the thesis could have been more elaborated. Namely the damage inspection and its results could have been clearer (there are no crack patterns, moisture zones and surface degradation and other important factors that could have made the presented thesis even more valuable). Also, the analysis of the main causes of the structural and material damage could have been more thorough. But this would probably exceed the thesis assignment.

III. OVERALL EVALUATION, QUESTIONS FOR DEFENSE, CLASSIFICATION SUGGESTION

Summarize thesis aspects that swayed your final evaluation. Please present apt questions which student should answer during defense.

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. The author states (p. 25) that the load-bearing walls are made of three-leaf masonry. As the thickness of the walls (and other structures) is not mentioned anywhere in the thesis (neither in text or in figures) this could be questioned. Also, the sentence on p. 40 "Masonry walls in existing buildings are usually three-leaf walls, with rubble infill." is not universally valid (apart from the wall thickness it greatly depends on the period and location the structure was constructed – it may very well be true for Italian baroque structures, but it may not be true for Czech baroque structures). How was this information obtained (author states that no boreholes were made)?
2. To obtain material properties (masonry units and mortar), non-destructive testing by Schmidt Hammer was performed. This can be feasible for masonry units (although some calibration is necessary, as not all the Schmidt Hammer types are suitable for all materials /different impact energy used/), but I have some doubts about using it for the mortar (limitation in the impact area required for testing). In fact, there are no results presented in Tab. 5.1 for mortar (if I understand the table description correctly – (A) = mudstone, (B) = sandstone and (C) = bricks.). Are there any methods (either non-destructive or with minimal damage to the structure) available?
3. Results presented in Tab. 5.1 and in Tab. 5.2 seem to differ (mudstone – 48 MPa in Tab. 5.2 seems wrong). Also, the measured compressive strength of bricks (31-49.5 MPa) seems rather exaggerated. Could the author comment on the material properties and could the uncertainties of in-situ testing be discussed?
4. Detailed micro modelling of wall segments was used to obtain the masonry properties (compressive and tensile strengths, modulus of elasticity). Are there any other methods for obtaining the homogenized properties of heterogeneous materials (ie. masonry)?

I evaluate handed thesis with classification grade **A - excellent**.

Date: **15.7.2019**

Signature: