REVIEWER'S FORM
for thesis evaluation

1. Identification of the student

Student:	Pratik Gajjar
Thesis:	Nonlinear numerical evaluation of the wall bearing capacity and the structure stability of the St. Ann Church from the Broumov Group of Churches
1st Institution:	University of Minho
2nd Institution:	Czech Technical University in Prague
Academic year:	2017/2018

2. Identification of the reviewer

Name:	Drahomír Novák
Institution:	Brno University of Technology, Faculty of Civil Engineering, Institute of Structural Mechanics
Position:	Professor, Head of department

3. Fulfillment of thesis goals

excellent ☒	above aver. ☐	average ☐	below aver. ☐	weak ☐

Comments:

The main objectives of the thesis of the finite element analysis and evaluation of current bearing condition of the St. Ann Church from Broumov Group of Churches were accomplished.

The thesis consists of seven sections. After the Introduction, the short description of Broumov region and its history follows in the Sec 2. The thorough observation of the current state of the church is described in detail in the next Section 3, which is followed by the numerical study of bearing capacity of the church walls in the Sec 4. Analyses of materials used in the church structure and modeling of their effective properties are the objectives of this section. In the Sec. 4, the main attention is paid to the numerical modeling of the subsoil-structure interaction and to the impact of the different subsoil settlement to the current state of the structure. After the Conclusions, some recommendations of further studies, observations and repairs are proposed in the last Sec. 7. Moreover, numerical simulation are illustrated and completed by selected results in Appendices at the end of the thesis.

The wall bearing capacity and the structure stability were analysed. The main results of computations are illustrated by figures, where the damage parameter pattern and crack distribution show areas of possible damage and crack evolution. The author presents these locations are in correspondence with the crack pattern observed in situ. The 3D computer simulation proved the significant influence of the unequal and different subsoil settlement to the damage state of the structure.

4. Academic/scientific/technical quality

excellent ☒ above aver. ☐ average ☐ below aver. ☐ weak ☐

Comments:

Academic, scientific and technical quality is evaluated as excellent.

It is appreciated the exploiting and the linking of several computer codes and software (ATHENA 2D, DIANA FEM, Geo5) and results obtained for the needs of numerical analysis of the St. Ann Church. Managing of the software and understanding of material models used in codes match and slightly exceeds requirements for graduates of the SAHC course.

The set up of the "meso-level" model in ATHENA software to obtain effective parameters of masonry for the subsequent 3D analysis of sub-structure interaction is also appreciated together with the modeling of the subsoil behavior.

5. Formal arrangement of the thesis and level of language

excellent ☐ above aver. ☐ average ☒ below aver. ☐ weak ☐

Comments:

Formal arrangement of the thesis and level of language is evaluated **average.**

P. Gajjar's work is very well structured and written in good English. There are several mistakes and typing errors in the text that do not reduce the scientific quality of the thesis. Unfortunately, there are also mistakes influencing the meaning of the problem described. Mainly, in the subsection 5. 1. 4, there are missing figures 5.3, 5.4 and 5.7. Moreover, the description of variables is missing throughout the whole text of this subsection.

Other errors occurring in the text can degrade the overall impression of the thesis. For example, the title of the subsection 5. 2. 1 "The conversation", it should be corrected to "The conversion". In the table 14, units are written with lowercase letters instead of capital letters.

It is recommended to pay attention to correct terminology when writing, e. g, "program" -> "software" or "computer code"; "vertical deformation" -> "vertical displacement"; "spring modulus" -> "spring stiffness"; etc. It is also recommended to write equations with using an Equation editor respecting general rules.

Some tables are aligned to the left; some are aligned to the centre of the page width.

From a stylistic point of view, there are some words and phrases which are repeated very often in the text, e. g., in the Conclusions, the word "from" is repeated 13 times.

Despite of all recommendation and comments the quality of the thesis is good.

6. Further comments

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The master's thesis presented is fully acceptable and it is recommend for defence. The grading is very good (B).

Several comments and questions, which appeared during the thesis reading, should be discussed:

1. Is it possible to present missing figures and the variables description from the subsection 5.4.1

2. From which places are samples 1 and 2 obtained in Sec. 4? Where they are located in the structure?

3. The different subsoil settlement is modelled by prescribed displacements of the bottom (lower parts) of selected walls (Sec. 5.4.3, page 53 - Figure 5. 12). Why did the author select just these walls? Isn't better to model the different settlement by different (reduced) stiffness of spring supports obtained from previous subsoil analysis? The prescribed vertical displacement can bring additional tensile and shear stresses into the FE model.

4. Is it possible to prove the correspondence of the computed crack pattern (Figures 5.15 – 5.19) with damage and cracks observed in situ by some picture? Are they located in the same zones?

7. Grade: B (very good)

Use the following scale

A (excellent)	B (very good)	C (good)	D (satisfactory)	E (sufficient)	F (fail)

BUT, Brno

July 16, 2018

The Reviewer, Drahomír Novák

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(type name of the reviewer)