REVIEWER'S FORM
for thesis evaluation

SAHC

1. Identification of the student

Student:	Evi Susanti
Thesis:	Numerical Evaluation of the bearing capacity of the All Saints' Church walls in Broumov, CR
1st Institution:	UPC Barcelona/UNIPD Padova
2nd Institution:	Czech Technical University in Prague
Academic year:	2016/2017

2. Identification of the reviewer

Name:	Michal Šejnoha
Institution:	CTU in Prague, Faculty of Civil Engineering, Department of Mechanics
Position:	Professor

3. Fulfillment of thesis goals

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

Comments:

Based on the thesis proposal it is clear that all goals proposed were successfully fulfilled. What I miss is a clear specification of individual goals at the end of the introductory part or at least the goals of numerical part based on a thorough inspection described in-depth in Chapter 3. Nevertheless, some of the achievements, see Chapter 7, go even beyond the original goals set.

4. Academic/scientific/technical quality

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

Comments:

Moving through individual chapters supports a good theoretical background of the candidate in the field of mechanics. Her knowledge covers both theoretical as well as numerical parts of nonlinear mechanics including plasticity and damage of quasi-brittle material supported by mastering a variety of advanced computational tools based on the Finite Element Method. Both scientific and technical quality is certainly found above average in comparison to general requirements one would expect from a typical Master thesis. What I found particular important is Chapter 7 suggesting reasonable steps for further monitoring and potential rehabilitation measures arising from detailed numerical analyses to preserved this significant historical heritage. This goes beyond typical outcomes of master level research being concerned with practical and real world applications. A strong point is also a combination of experimental and computational work, both analytical and numerical. In this context, however, I have a few questions the candidate might wish to clarify during the thesis defense. In particular:

1. To what extent the candidate participated in the classification of material properties of subsoil discussed in Appendix A and the determination of material properties of constitutive models adopted in Program ATENA.
2. What was the reason for using the SBETA constitutive mode? The program ATENA offers other constitutive models, e.g. 3D nonlinear cementitious, which allow for a direct application in the plane-strain conditions so no adjustments of material stiffness is needed.
3. Section 5.1 introduces several simplifying models to address underground settlement subjected to surface surcharge. Have these approaches been used just to assess the Winkler-Pasternak constants through the program Depth and used later in numerical simulations based on FEM or also to predict settlement to be compared with numerical simulations?

5. Formal arrangement of the thesis and level of language

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

Comments:

The submitted thesis are organized in 7 Chapters, generally well written and in most parts easy to follow. Starting with a broad discussion about the history of architecture with emphases on churches in Broumov the thesis develop in a systematic way from the description of the current conditions of the All Saints Church in Broumov in Chapter 3 to numerical analyses presented in Chapters 4 and 5. These analyses are carefully selected to address the most severe problems the Church is currently facing. While concentrating on structural strength and bearing capacity of foundation, the principal cause of unfavorable conditions linked primarily to moisture transport and ground water table change is also discussed promoting some immediate rehabilitation measures in the last two chapters to slow down further deterioration of the Church. The submitted thesis are therefore comprehensive and meet very high quality standards, at least with respect to Diploma thesis.

The level of English is relatively good although some grammatical errors could not be overlooked. In particular, the use of articles, both definite and indefinite, and the correct use of plural and singular forms deserve attention. This, however, does not lower the quality of the thesis level much.

Some particular comments to be taken into accout if submitting the current research to journal publication:

1. The wording "compressive and tensile shear stress" should be changed to "negative and positive shear stress". There is nothing like compressive or tensile shear stress.
2. On page 52, 4th line from above: I suppose the word "compressive" should be replaced with "tensile".
3. Equation should be numbered.
4. Dimensions should be added to figures showing computational models.

6. Further comments

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Apart from the 3 comments and questions put forward in Section 4 of this evaluation, the candidate may wish to respond to the following more specific questions.

1. It is not clear, how the differential settlement is applied as a load to get the results presented in Fig. 5.12.
2. In some analyses, the actual arrangement of stones has been replaced with a homogeneous material. But I suppose, the material orthotropy has not been taken into account and the material was considered isotropic. A comment on that is welcome.
3. The resulting settlement in Figs. F.3-F.6 is rather different and not very compatible. I wonder, the plane stress conditions were adopted for the subsoil material as well. In my opinion, the subsoil in all cases should be modelled in plane strain conditions, while the walls in plane stress. There should be no problem with compatibility as the same number of degrees of freedom is assumed in the nodes. A comment on that is welcome.

7. Grade: _____ **A** _____

Use the following scale

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

Prague

July 13, 2017

The Reviewer,

Michal Šejnoha