

## I. IDENTIFICATION DATA

<b>Thesis name:</b>	<b>Calibration of finite elements model of St. Jakub in Cirkvice by modal testing</b>
<b>Author's name:</b>	<b>Pablo Bañasco Sánchez</b>
<b>Type of thesis :</b>	Master
<b>Faculty/Institute:</b>	Faculty of Civil Engineering
<b>Department:</b>	Department of Mechanics
<b>Thesis reviewer:</b>	Ing. Jiří Kott, Ph.D.
<b>Reviewer's department:</b>	VALBEK, spol. s r. o.

## II. EVALUATION OF INDIVIDUAL CRITERIA

<b>Assignment</b>	<b>Extremely demanding</b>
<i>Evaluation of thesis difficulty of assignment.</i>	
To create a functional FE model of tower of Romanesque church, which allows in the future evaluating the possibility of reinstalling the original bells, is demanding on the amount of knowledge from different disciplines. It also takes a lot of time to get acquainted with the history and construction way of the church.	

<b>Satisfaction of assignment</b>	<b>Fulfilled</b>
<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>	
All the goals of the thesis were fulfilled. It is important to mention, the geometry of the church was measured to have data for the structural modeling. In the chapter "1. Introduction" the sentence "The age of construction of the church and the characters involved on it are not clearly defined" corresponds with the problem, that the sources (literature) are written in Czech language, what makes a barrier for a non-Czech speaker. The church is very important Romanesque monument and its history is quite good known, especially the year of consecration. The church was widely restored after the year 1989. That means a big amount of researches, projects documentation were done in past years.	

<b>Method of conception</b>	<b>Correct</b>
<i>Assess that student has chosen correct approach or solution methods.</i>	
It is correct to start the analysis of historical building with non-destructive methods and numerical analysis. Thanks to these analyses is possible to definite the limits/wake parts of construction and the aims for future analyses, semi-destructive or destructive methods. In this thesis are determined especially following areas for future investigations: soil properties and foundation behavior. In the chapter "4.2 Material mechanical properties" it will be useful to try to determinate the masonry properties using the Eurocode 6: Design of masonry structures.	

<b>Technical level</b>	<b>A - excellent</b>
<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 student had shown good knowledge of modeling historical buildings, especially due FEM calibration through the modal testing. Note: The maximum angle of oscillation of bell depends on the weight of the bell (see DIN 4178). The angles of oscillation 70° and 80° chosen in the thesis are usually the maximum angles.	

<b>Formal and language level, scope of thesis</b>	<b>B – very good</b>
<i>Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.</i>	
The extent of the thesis corresponds to the requirements and the chosen topic. The thesis is thoroughly and clearly arranged. All symbols used in the equations should be explained in the thesis. E.g. not all symbols in Eq. 2.4.1 and 2.4.2 are explained. Page 48 – "Meanwhile, the maximum HORIZONTAL force occurs always at 0° and it is almost twice of the swinging system	

weight (fig. 5.2.8). Correct is VERTICAL.

PAGE 48 – Figure 5.3.9 – The numbers are the same in the charts. Correct is the chart “Swinging system 2”.

**Selection of sources, citation correctness**

**C - good**

*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.*

It is important to mention, that the student had and tried to use literature in different languages – English, Czech, German, etc.

There are more sources used and also mentioned in the text than are written in the part 7. References.

Page 16 – *SCIA Engineer manual*,

Page 32 – Figure 4.3.1.1 *Experimental modal testing results provided by Doc. Ing. Petr Fajman, CSc.*

Page 32 - ...the values chosen in this dissertation are based on laboratory testing developed on CTU PhD dissertation, it presents a table where are given density values for different quarries near Cirkvice and Kutná Hora (*Kott, 2012*)...

Page 42 – Furthermore, it is included in the next table the result of this dissertation and *that belonging to St. Jakub in Kutná Hora* (fig. 5.2.1).

All used elements are correctly distinguished from own results and thoughts.

**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.*

Last but not least, it is necessary to mention, that the thesis is of practical significance.

**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.*

The student has developed a calibrated FE model. He has applied the masonry quality index method to obtain values for mechanical parameters of the masonry elements.

He had shown that there is more than one final solution for the key parameters determinants of the dynamic behavior of the tower.

Question 1: Why were the bells put down on the vault of the second floor of the tower in the year 1968?

Question 2: Is it possible to reinstall the origin bells in the tower?

I evaluate handed thesis with classification grade **VERY GOOD (B)**.

Date: **16.7.2018**.

Signature:

Ing. Jiří Kott, Ph.D.