

# THESIS SUPERVISOR FORM



## 1. Identification of the student:

Student:	Pablo Bañasco Sánchez
Thesis:	Calibration of finite element model of St. Jakub church in Cirkvice by modal testing
1 <sup>st</sup> Institution:	UPC Barcelona
2 <sup>nd</sup> Institution:	Czech Technical University in Prague, Czech Republic
Academic year:	2017/2018

## 2. Identification of the supervisor:

Name:	Doc. Ing. Petr Fajman. Csc.
Institution:	CTU Faculty of Civil Engineering in Prague
Position:	Associative Professor

## 3. General comments

The student deals in the thesis with calibration of data through dynamics response of St. Jacob tower of Church in Cirkvice in the Czech Republic.

The thesis is divided in six chapters.

The first two chapters aim at the general description of problems and literature review. It starts with history and briefly description of the tower with photos.

The chapter three deal with tower geometrical characteristics.

The chapter four describe numerical model and analysis of tower of St. Jacob church. Three-dimensional model from 2D finite elements representing of church was realized in the software SCIA, where he was loaded and computed in dynamics mode. The material properties were obtained from similar structure in Kutna Hora and they compare with values from MQI (masonry quality index) method. The numerical model was validated by the experimental test, the parameters of foundations were varied - connected and independent foundations Nave-Tower with full rigid and flexible foundation in vertical and horizontal direct. The first three engine values were compared with values from experimental measurement and the Young ' s modulus were corrected in model.

**THESIS SUPERVISOR  
FORM**



The chapter five is focused on results. The comparison between MQI and modal testing were done. The results of modal analysis are in range of MQI method. The obtained values from the MQI method for the Young' s modulus have been demonstrated to be low in most of the considered cases of St. Jakub in Cirkvice. The structure is compared with similar churches solved in different country. After that the influence of this harmonic oscillating bell system to the dynamic response of bell-towers were investigated. The phenomenon on mechanical resonance was eliminated.

By the determination of bell load was used the original program for bell cross-section properties and forces included in the national annex of the DIN 4178.

The last chapter is conclusions followed by appendix.

Mr. Sánchez has proven very good ability to collect, analyse and classify a large amount of diverse information. He looked for a solution to the thesis with a very little intervention from his supervisor. The calculations involved analysis by FEM. The student had to acquire advanced knowledge of dynamics modeling and FEM with commercial software SCIA for advanced structural analysis. In general I can report that Mr. Sánchez in his thesis work successfully coped with all tasks assigned to him.

I regard Mr. Sánchez is competent to solve advanced problems related to analysis of monuments and historical constructions. Therefore, I recommend his admission to the state exam and to process the defending act of his thesis.

I recommend grading his thesis by 91 points out of 100, i.e. A on the ECTS scale (excellent).

**4. Grade:** \_\_\_\_\_ **A** \_\_\_\_\_

Use the following scale

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

CTU faculty of Civil Engineering in Prague

July of 15th 2018

The Supervisor,

-----

Petr Fajman