

**I. IDENTIFICATION DATA**

<b>Thesis name:</b>	<b>Stochastic Micro-modelling of Historic Masonry</b>
<b>Author's name:</b>	<b>John Adamek</b>
<b>Type of thesis :</b>	<b>master</b>
<b>Faculty/institute:</b>	<b>Faculty of Civil Engineering (FCE)</b>
<b>Department:</b>	<b>Department of Mechanics</b>
<b>Thesis reviewer:</b>	<b>David T. Biggs</b>
<b>Reviewer's department:</b>	<b>Biggs Consulting Engineering</b>

**II. EVALUATION OF INDIVIDUAL CRITERIA**

<b>Assignment</b> <i>Evaluation of thesis difficulty of assignment.</i>	<b>extraordinarily challenging</b>
For the time allotted, this represents a significant amount of work. I think it is exceptionally challenging . I am not an expert in structural mechanics. However, I recognize the effort. The introduction was very useful.	

<b>Satisfaction of assignment</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>	<b>fulfilled</b>
The assignment was to demonstrate a methodology for use with the walls of St Ann's Church. It is particularly useful because it demonstrates a methodology that is not commonly used. To that end, the thesis was successful.	

<b>Method of conception</b> <i>Assess that student has chosen correct approach or solution methods.</i>	<b>correct</b>
The background was well presented. It illustrates that the correct methodology was used.	

<b>Technical level</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>	<b>B - very good.</b>
The specialty of the thesis appears to be in developing a practical application for the modelling theory. The knowledge was gained through the literature. However, the literature never fully explains the practical application. That is achieved through trial with the software. The student has demonstrated a high level of expertise.	

<b>Formal and language level, scope of thesis</b> <i>Assess correctness of usage of formal notation. Assess typographical and language arrangement of thesis.</i>	<b>A - excellent.</b>
The presentation of the thesis is well done. The English is very well written.	

<b>Selection of sources, citation correctness</b> <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>	<b>A - excellent.</b>
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The literature search seems very inclusive. Again, I state my own limitations with mechanics. If there are others that should have been used, I am not familiar with them.

My perception is a thorough literature review has led to a well done thesis.

I do not have access to the references so I did not review that they were properly cited.

#### Additional commentary and evaluation

Present your opinion on 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 goals appear to be met. The work applies to the practical application to a real building.

I have relatively few comments:

1. Section 3.3.1.2 Coring lists results by Kuklik. The results seem to give core results of the stone within the wall. This is a bit confusing. Coring is generally used to produce the compressive strength of the wall conglomerate, not the individual stones. This should be explained.  
Were there any cores of the wall as a whole, not individual materials?
2. On p. 8, Italian code is mentioned. It's not mentioned again or referenced until p.53. It should be referenced on p.8. It should also be explained what is in the Italian code that's relevant.
3. On p. 10, correct the typo from: "The walls are assumed to be 1.2 m thick, with the external and internal walls leafs assumed to be 0.5 m wide and the infill being 0.2 m. An image of St. Ann's Church can be seen in Figure 10."
4. The text below is from p. 13: Explain the 50% and 68% values. Are these quantities of stones, not area? How were they used to obtain the 8.3% and 3.8% values? This needs correction or clarification.  
Correlate these to Fig 16 also.

"Based on the analysis completed, 80% of the area on average is stone, with the remaining 20% taken up by mortar. Utilizing a cumulative density function, it was seen that approximately 50% of stone elements are less than 0.001 m<sup>2</sup>, and approximately 68% of stones are less than 0.002 m<sup>2</sup>. The summarized results of the statistical analysis are illustrated in Figure 15 and 16, with the full set of calculations found in Appendix A."

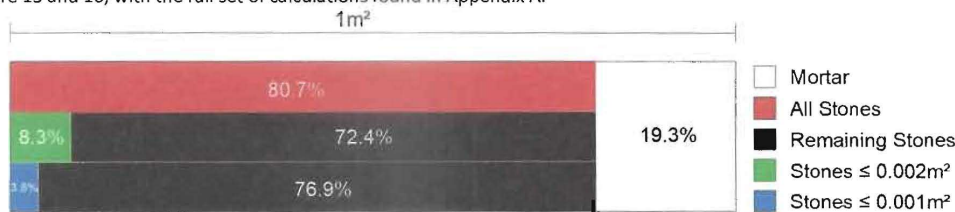


Figure 15 - Statistical Analysis of Masonry Wall Sections.

5. On Table 1, p. 15: Why were Wall Sections evaluated individually even though the grouped walls have the same materials? For example, all tests on Ignimbrite could be combined to one average value, one COV, and one std deviation. The average compressive strength would not change.
6. 3.3.2.1 SEM on p. 17 is used to obtain Cementation Index to classify mortar as hydraulic lime. What other technique could be used to validate this conclusion?
7. 4.4 Comparisons on p. 53: The results were compared to literature and other methods for historic structures. Did the Kuklik cores not give comparison values? What other literature and methods were used for comparison?
8. For Conclusion, p.53: I would have preferred for the thesis to make a statement relative to the methodology demonstrated as to the practicality of using the procedures for assessing historic structures on a regular basis. Is this methodology better than other options should as core tests of walls, ndt (ultrasonics) and material tests?

**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.*

I felt the clarity of explaining the macro-modelling, meso-modelling, and micro-modelling differences and the progression through the thesis of demonstrating them was very good.

I would encourage the author to prepare a journal paper or a conference paper based upon the thesis. My previous comments could be incorporated.

During the defense, I suggest having the student discuss comments 5, 6, and 8.

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

Date: **16.7.2019**

Signature:

