1. Identification of the student

Student:  Ronald Allan M. Mabunga Jr.
Thesis:  Internal microclimate of the space of a sacred building
1st Institution:  Universidade do Minho
2nd Institution:  Czech Technical University in Prague
Academic year:  2023/2024

2. Identification of the reviewer

Name:  Ing. Riccardo Cacciotti, Ph.D.
Institution:  ITAM
Position:  Researcher

3. Fulfillment of thesis goals

Comments: this work aims at characterising the microclimate of the Treasury and Chapel of the Cathedral of the Assumption of Our Lady in Sedlec, Czech Republic. Additionally, it attempts to outline recommendations for improving the protection of historic building materials and artifacts present in those spaces based on specific humidity as a key parameter. More specifically, the thesis sets three main goals: 1) definition of the microclimate behavior and specification of risk moments, 2) comparison of risk factors between the selected space and adjacent area and 3) recommendations for the enhancement of the internal microclimate of the selected space. Although the first two objectives are clearly fulfilled (in particular the second one) given the in-depth discussion of monitoring results outlined in the thesis, the recommendations would have benefited from a more articulate proposal, focusing on tailored prevention and maintenance strategies (e.g. limiting moisture production/ingress, natural ventilation) rather than predominantly on a switching control system.

4. Academic/scientific/technical quality
Comments: the thesis presents good scientific quality and adequate technical knowledge related to the monitoring of environmental parameters of the church spaces. The methodological framework employed is clear and comprehensively presented. The monitoring results provide useful results for characterising the trends of the internal microclimate over the monitored period. The analysis of results is carried out in a very competent way, providing solid observations essential for drafting adequate recommendations. Nevertheless, although the work is sufficiently exhaustive, some minor lack of information prevents the reader from grasping the full context of the case study. For example, details are not provided concerning the target conditions set for the appliances in the controlled environment of the treasury as well as information explaining their maintenance/operation. Also the current conservation state of the spaces investigated is not clear: having an overview of existing damages, if any, could provide extremely relevant data for defining the impact of microclimate, especially when interrelated to the microclimate monitoring results. In addition, it would have been perhaps useful also to outline clues concerning the main sources of moisture in the building (e.g. visitors, damp, leakage etc.) and further characterize the external climate including external RH and rain intensity over the monitoring period. Finally, a very interesting protection strategy is outlined providing clues about the possible optimization of the microclimate conditions in order to satisfy conservation requirements. Controlling the microclimate is central to the proposal while preventing water ingress (if any), excessive moisture production as well as managing natural ventilation is not adequately addressed. In particular, maintenance and regular inspection, always crucial to the effective protection of cultural heritage assets, would have required more discussion.

5. Formal arrangement of the thesis and level of language

<table>
<thead>
<tr>
<th></th>
<th>excellent □</th>
<th>above aver. □</th>
<th>average □</th>
<th>below aver. □</th>
<th>weak □</th>
</tr>
</thead>
</table>

Comments: The thesis presents a clear structure and it is composed of well-defined sections. The title and abstract are understandable and well thought, however a mention of the specific building studied (as well as in the introduction/objectives) would have helped better setting the context from the very beginning. The introductory section concentrating on the scope of the research in general, including research questions and goals is very good. The contents are comprehensive and well presented. A more balanced subdivision of the work between the theoretical and practical sections would have been beneficial to further highlight the importance of the findings of the study. In this perspective, the theoretical part could have been a bit more concise, with a short yet exhaustive state of the art, while the practical part could have been slightly more articulate especially when dealing with the description of the protection strategy. At times, information are a bit sparse throughout the text: for example, the description of the materials and artifacts contained in the spaces should be presented at the beginning of the practical section, when the church is described. Minor typos and language errors are present.
6. Further comments

Overall, the thesis fulfills its research goals and it is of good scientific quality. The student exhibits to have achieved a very good knowledge in addressing appropriately typical problems related to historic structures applying adequate microclimate monitoring and diagnostic procedures. The formal organization of the thesis is of good quality, lacking slightly on the organization of contents. The final evaluation is between good and very good, tending slightly toward the former grade.

Some suggestions for questions:

-Citing from page 37: “Additionally, the correlation between probe 4 and the exterior temperature reveals a stronger influence of external conditions on the chapel’s interior temperature. Conversely, the correlation between the probes within the Treasury and the exterior temperature indicates that the installed appliances in the Treasury effectively influence the internal microclimate”.

How so? If the appliances present in the Treasury are a humidifier/dehumidifier how can this influence temperature and support your observation?

-Which are target RH conditions in the Treasury to which the appliances are set? Is the dehumidifier always in operation?

-How could maintenance help optimize the microclimate in the Treasury and Chapel? What about natural ventilation as a mitigating measure?

-Has the building/space been inspected by the student? Any survey carried out?

7. Grade: ______ C _______________

Use the following scale

<table>
<thead>
<tr>
<th>A (excellent)</th>
<th>B (very good)</th>
<th>C (good)</th>
<th>D (satisfactory)</th>
<th>E (sufficient)</th>
<th>F (fail)</th>
</tr>
</thead>
</table>

Prague
July 19, 2024
The Reviewer,