THESIS REVIEWER'S REPORT

I. IDENTIFICATION DATA

Thesis title:	**Enhancing Early-Stage Design Process of Concrete Structure Using Parametric Modelling and Multiobjective Optimization**
Author's name:	**Durdona Qurbonovas**
Type of thesis :	master
Faculty/Institute:	Faculty of Civil Engineering (FCE)
Department:	Concrete and masonry structures
Thesis reviewer:	Ing. Jaroslav Brož, PhD
Reviewer's department:	Dlubal Software s.r.o., Anglicka 28, Prague 2, Czech Republic

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment **extraordinarily challenging**

How demanding was the assigned project?

The topic of the master thesis is actual and demanding on the interdisciplinary level. Nowadays, parametric modelling and optimization is on the rise. This theme is not fully adopted in Czech Republic nor in the University courses. To my knowledge, there is not any course where students can adopt needed skills. There are only online courses, videos, and materials mostly in English language.
Therefore, I consider this diploma thesis extraordinary challenging because student have to find suitable sources, learn software, search plugins and put all things together.

Fulfilment of assignment **fulfilled**

How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.

All assigned tasks from the thesis have been fulfilled. Moreover, one chapter about Digital fabrication was added.
Chapters 1 – 3 and 5 & 6 are dedicated to the introduction to the methodologies such as parametric modelling, visual programming, and optimization. Chapter 4 describes Structural analysis and creation of the model. Chapter 7 comes with an optimization process; chapter 8 contains cross-sectional analysis of the optimized column. Concluding chapter illustrates the usage of digital fabrication.

Methodology **outstanding**

Comment on the correctness of the approach and/or the solution methods.

The graduate student chose an appropriate solution procedure. She first became familiar with the concept of parametric modeling and software tools Rhinoceros 3D and Grasshopper which are used for parametric modeling. Then she learnt Karamba 3D plugin and ran finite element calculation within Grasshopper. Once she did structural analysis then she started with environmental analysis. Finally, she learnt optimization methods and applied them in Wallancei. Once the column has been optimized then the student evaluates its cross-section with IDEA StatiCa tool. At the end, she used tool for digital fabrication to design formwork.

Technical level **A - excellent.**

Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?

The submitted diploma thesis deals with a topic that is not only in the academic but as well as in the application area. Large, multinational companies (e.g., AECOM, Buro Happold, SWECO, Bollinger+Grohmann) are intensively engaged in the use of visual programming and optimization in their projects. The diploma thesis therefore deals with the solution of the actual problem which professional communities are facing.
The reviewer appreciates the use of the Kramba3D tool for Finite element analysis, Ladybug tool for environmental analysis and the effort to solve the issue with a focus on environmental friendliness of the indoor. During her work, the graduate has acquired knowledge that is in demand in the above-mentioned companies and moves the field forward.

Formal and language level, scope of thesis	**C - good.**
Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?	
The thesis is logically structured. The thesis is formulated in a simple plain English language. It helps readers to understand the difficult topic of the thesis so that s/he can easily follow it. There is not any barrier to understanding. Reviewer appreciates the usage of the professional LaTex typography system. However, the reviewer regrets that there are offenses against typographical conventions in the thesis – page mirror overflow, typos – even in the title of the thesis.	

Selection of sources, citation correctness	**A - excellent.**
Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?	
In her thesis, the graduate student used relevant sources for his thesis - their list is given in the bibliography. The sources used by the graduate are relevant to the topic of the thesis. In the thesis, it is clearly distinguishable which parts are taken from literature or quoted, and which are own conclusions – ideas of the graduate. Therefore, there was no violation of citation ethics in the work, and the citations are in accordance with the practice of scientific works.	

Additional commentary and evaluation (optional)
Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.
The work confirms the author's high level of knowledge in the field of visual programming in the Grasshopper environment plugins associated with it. It is not trivial to create such advanced visual scripts in Grasshopper and custom components that were necessary for solving the thesis.

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

Summarize your opinion on the thesis and explain your final grading. Pose questions that should be answered during the presentation and defense of the student's work.

Reviewer's evaluation is impacted with scope of the thesis. Graduate student has had to learn theoretical parts related to optimization and environmental analysis. She needed to get familiar with the Grasshopper plugin and visual programing as such. She also designed the whole house from an architectural point of view which is quite unique and brings interdisciplinarity to the game.
She also proved to have a knowledge of design and check of the concrete column. This is also evidence of the knowledge of structural design.
Reviewer was impressed by the fact that thesis also contains the last chapter – Digital fabrication. It is very useful to demonstrate that models created in optimized parametric design are constructable without any issue.

Proposed questions to be answered during the defense of the thesis.

1. Would it be possible to also use 3D print as one of the methods for digital fabrication instead of the formwork?
2. What are the possible extensions of the thesis – e.g., in the PhD. studies?
3. Would it be possible to use also other plugins for the script than Karamba 3D, Ladybug and OpenNest?

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The grade that I award for the thesis is **A - excellent.**

Date: **4.6.2023**

Signature: