



Opponent's review of the Doctoral Thesis

Candidate Ing. arch. Aleš Vaněk, M.Eng.

Title of the doctoral thesis Architectural solution of single-layer membrane integration into gridshell structures

Branch of study Architektura a stavitelství

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Topicality of the doctoral thesis theme

Commentary: Lightweight structures, including the specific application of gridshells in this PhD thesis are a highly contemporary topic. Their lightweight features enable large spans using minimum amount of material, which can contribute to sustainable solutions.

excellent above average average below average poor

Fulfilment of the doctoral thesis objectives

Commentary: The structure of the thesis missed a clear statement of objectives that is based on a contemporary analysis of state-of-the-art. The author has realised a number of membrane and gridshell structures, but it is not clear what objectives are pursued in the realisations.

excellent above average average below average poor

Research methods and procedures

Commentary: In the thesis there are two methods used: (1) a survey of various technologies and principles of lightweight structures and gridshell structures, and (2) realisation of a number of membrane and gridshell structures. Because there are no clearly defined objectives, it is not possible to assess whether the procedures to realise the structures were adequate.

excellent above average average below average poor

Results of the doctoral thesis – dissertant's concrete achievements

Commentary: The realised structures by the dissertant are adequate explorations of membrane and gridshell structures. It is unclear what innovations or new knowledge is gained in the realised structures.

excellent above average average below average poor

Importance for practice and for development within a branch of science

Commentary: The dissertant has demonstrated his ability to design and realize membrane structures and gridshells. For practice within the Czech context this work is important because the number of realizations of these kinds of structures are not that high. It is unclear however, in the context outside Czech republic, to what extent the work is innovative or new.

excellent above average average below average poor

Formal layout of the doctoral thesis and the level of language used

Commentary: The structure of the thesis is not organized in a proper way. The work does not make a clear distinction between own work and review of state-of-the-art. There is no clear research question, no hypothesis, and no objectives that can be assessed. The work should start with a problem statement; then review of state-of-the-art; from the review conclusions should be drawn and the objectives clarified; then the specific choice of gridshell should be argued; then specific problems related to gridshells should be presented plus indication what new knowledge will be gained; the method how problems will be addressed should be described; then the own work is described; followed by results and discussion of the results in the light of the objectives stated earlier on.

At many places in the thesis text (pages 3, 4, 7, 9, 11, 12, 15, 16 (without source), 21, 23, 24, 29, 31, 35, 36, 39, 41, 42, 45, 47, 48, 49, 55, 56, 63, 69, and 77), the dissertant uses lengthy citations from sources rather than using his own words.

The literature references have many issues. The format of a reference should be author, year, title, publisher, place of publisher. Isbn is not necessary. Literature as notes [1], [2], [3], etc. is not ideal format, it inflates the number of references (the list mentions 64 references, but there are only 51 single sources). Internet references should in general be avoided, but in this case 35 internet references from 51 single references is too much. Internet references should include date when they are accessed. Pictures and Pinterest are not literature references. Wikipedia is a good starting point for literature review, but by itself not a proper source.

In cases where the endnote style [1], [2], [3], etc. is used in captions of images, then also the page number where that particular image can be found in the source should be mentioned.

It is recommendable that the thesis is written in English language, but throughout the whole thesis text there are many places where formulation is awkward and unclear. The dissertant should check the text with a native speaker. For example: Page 1, paragraph 5: "...is able to somewhat brute the structure." What means brute here?

Page 1, paragraph 6: "...advantages over other vendors?" A vendor is a company whereas here the proper term is "type" or "category."

Page 2, paragraph 2: "...for the climate of the lightweight belt" What is meant here?

Page 5, paragraph 1: "...during his well-deserved lifelong research" This is an awkward formulation.

Page 5, paragraph 3: "Working in the free circuit which is in the circle substance can be any arrangement according to the specific needs." It is unclear what is meant here.

Page 5, paragraph 3: "...which allows enough light to entrance the building." Entrance should be "enter".

Page 6, paragraph 1: "...which is also located in the area of the Olympic Park in Munich." ILEK mentioned before in the text is in Stuttgart, so you cannot continue the text with "is also located" because the next place is not Stuttgart, but Munich.

Page 8, paragraph 2: "Even tough it held an organic shape, it could still be made into a three dimensional geometric form." Tough should be "though." The statement is unclear.

Page 10, paragraph 3: "...its lightness, flexibility and elegance really supply an architectural work." Probably in place of "supply" there should be "support" or "promote."

<input type="checkbox"/> excellent	<input type="checkbox"/> above average	<input type="checkbox"/> average	<input type="checkbox"/> below average	<input checked="" type="checkbox"/> poor
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Remarks

Chapter 2 is history of lightweight structures. This chapter is too short. It starts with tent structures and then jumps to 20th century structures, mentioning a few origins of tensile structures, air supported/inflated structures, and pressure-stressed structures.

Chapter 3 is cladding materials. The author makes distinction between fabrics, foils, membranes cladded on surface, polycarbonate, and combinations. No reason or sources are offered why this classification is representative for cladding materials. Why are airshells an example of membranes cladded on surface? This looks more like a construction type than a material example.

Chapter 4 is materials of main supporting structure. Chapter 5 is structural principles of main carrying structure. The distinction between materials and structures is interesting, but I suppose they could also be merged into one chapter discussing carrying structures. The argument why this division is made is missing. The division should be supported by reference to other authors who make the same division, or it should be argued why this division is better than the others - again referencing the common understanding by citing other authors.

Chapter 6 is about gridshell structures. Section 6.2 is history, but mentions only the origin of this structural type. It is followed by a series of cases that are not in chronological order. There is no "history" that explains in the series of cases how developments enabled particular types of construction or spans. The own work should not be included in this list (explained in section "Formal layout of the doctoral thesis").

Chapter 7 is membrane protection application. It is unclear why section 7.3 is in this chapter, because it is more a construction type than a membrane protection application. In the chapter, own work and references to other are mixed throughout the text, which does not help in the clarity of the text.

Chapter 8 is detailing. Chapter 9 is documentation of material damage during research. Although this is a good idea to include, it needs much more discussion, since this is where new knowledge is gained or existing knowledge confirmed. This is missing.

Final assessment of the doctoral thesis

The work needs to be thoroughly revised before it can be submitted for doctoral defense. As it stands now, the text has numerous problems that have to be solved first.

Following a successful defence of the doctoral thesis I recommend the granting of the Ph.D. degree

yes no

Date: 28. 10. 2018

Opponent's signature: 