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Opponent's review of the Doctoral Thesis

Candidate Michaela Herzfeldt

Title of the doctoral thesis Mechanical response of concrete structures to effects of ionizing radiation

Study Programme Structural and Transportation Engineering

Tutor prof. Ing. Petr Štemberk

Opponent Dr. Kyoungsoo Park

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Topicality of the doctoral thesis theme				
Commentary: The topic of the thesis is essentical in the integrity of the nuclear power plant, while the investigation on irrdiated concrete structures is very challenging.				
☒ excellent	☐ above average	☐ average	☐ below average	☐ poor

Fulfilment of the doctoral thesis objectives				
Commentary: The thesis objective is clearly stated and fulfilled in the Doctoral thesis.				
☒ excellent	☐ above average	☐ average	☐ below average	☐ poor

Research methods and procedures				
Commentary: 1) The classical fuzzy logic is employed to interconnect irradiated experimental data. Why is the fuzzy logic used? What if one employs another method like neural network? The candidate may consider to review other exiting method to interconnect data. 2) In meso-scale analysis, the coarse aggregate volume fraction is about 35%, which is about the half of the volume fraction of standard conrete, as the candidate indicated in Page 50. Why didn't use an actual volume fraction. Please, provide the validity of the volume fraction in the numerical modeling. 3) In meso-scale analysis, the candidate used circular particles, which may be quite different from actual aggregate in concrete. What is the effect of the shape of aggregates?				
☐ excellent	☒ above average	☐ average	☐ below average	☐ poor

Results of the doctoral thesis – dissertant's concrete achievements
Commentary: 1) In meso-scale analysis, it is great to demonstrate the comparison between computational simulation and experimental test results. 2) The macro-scale analysis provides potential hot-spots and damage in the biological shiedling structure, which is a positive point. On the otherhand, it would great if the candidate provides the

validity of the analysis framework.

☒ excellent	☐ above average	☐ average	☐ below average	☐ poor

Importance for practice and for development within a branch of science

Commentary: The thesis discusses the irradiated damage in both meso- and macro-scale analyses while both scale analysis is essential in understading mechanisms of irrdiated concrete damage. Additionally, it would be wonderful if the candidate can address the connection between the meso-scale analysis and macro-scale analysis, which can be considered as a potential expention of the presnt thesis.

☐ excellent	☒ above average	☐ average	☐ below average	☐ poor

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

Commentary:

1) The layout of the thesis should be confirmed. In general, the thesis consists of Chapters and each capter consists of sections. Additionally, at the end of each capter, Summary section should be provided.

2) Chapters 2, 3 and 4 are the literature review. Thus, they can be combined together.

3) Figure quality should be improved. Some figures are blurry, and thus they are difficult to read.

4) For the formatting, the candidate may want to check the previous PhD thesis by Dr. Yuliia Khmurovska from CTU.

☐ excellent	☐ above average	☒ average	☐ below average	☐ poor

Statement on compliance with citation ethics

Many of figures are captured from previous literature. The reviewer suggests that the candiate draws the figures to avoid potential copy right issues if it is possible.

Remarks

The candiate may want to check the word "ionizing" in the title. This is because most of the thesis focuses on the neutron irradiation.

Final assessment of the doctoral thesis

Although the thesis provides significant contribution on the assessment of irradiated concrete structure, the format of the thesis should be improved.

Following a successful defence of the doctoral thesis I recommend the granting of the Ph.D. degree		
	yes ☒	***no*** ☐

Date: April 28, 2024

Opponent's signature: ..