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Opponent's review of the Doctoral Thesis

Candidate Mgr. Batuhan Der

Title of the doctoral thesis Numerical calculation of members and joints at Elevated temperature

Study Programme Integrated safety

Tutor prof. František Wald

Opponent Assoc. prof. Magdaléna Štujberová

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Topicality of the doctoral thesis theme				
Commentary: The issue of fire resistance is highly topical, especially the issue of connections exposed to fire, as there is relatively lack of literature on this topic.				
☐ excellent	☒ above average	☐ average	☐ below average	☐ poor

Fulfilment of the doctoral thesis objectives				
Commentary: The doctoral thesis objectives were fullfiled.				
☐ excellent	☒ above average	☐ average	☐ below average	☐ poor

Research methods and procedures				
Commentary: I consider the chosen methodology of the work - the method of creating and verifying numerical models, conducting experiments, comparing calculations with the results of the experiments and evaluating the influence of individual monitored parameters to be correct.				
☐ excellent	☒ above average	☐ average	☐ below average	☐ poor

Results of the doctoral thesis – dissertant's concrete achievements				
Commentary: It is a pity that the thesis does not clearly state that the doctoral student participated in the preparation of the materials for the IDEA StatiCa Fire Module.				
☐ excellent	☒ above average	☐ average	☐ below average	☐ poor

Importance for practice and for development within a branch of science				
Commentary: The IDEA StatiCa Fire Module, in the development of which the PhD student participated, is a very useful tool for practice and will also help in the development of science in this area.				
☐ excellent	☒ above average	☐ average	☐ below average	☐ poor

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

Commentary: The dissertation is processed clearly and at a high content and graphic level with a minimum of grammatical and stylistic errors.

Nevertheless, I have a few comments about the work, but none of them are serious.

The comments are attached in a separate file.

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

Statement on compliance with citation ethics

I negatively assess partial (although not serious) non-compliance with citation ethics, as stated in the "Dissertation Review Record". The doctoral student should be careful about such things in the future.

Remarks

Final assessment of the doctoral thesis

I appreciate the amount of literature that the doctoral student studied, the relatively large range of parametric studies, and especially the cooperation and creation of documents for the IDEA StatiCa Fire Module.

Submitted work of doctoral student Mgr. Batuhan Der meets the conditions set for the dissertation, therefore I propose to award the Mgr. Batuhan Der academic title "PhD."

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

Date: 8.4.2024

Opponent's signature: .....

Assoc. prof. Magdaléna Štujberová, Dept. of Steel and Timber Structures, FCE SUT Bratislava

Comments to the Mgr. Batuhan Der doctoral Thesis

- p.5 – 3.2: doesn't the emissivity value of 0.35 only apply to certain temperatures (up to 500°C)?
- p.6 – T is the temperature in [K]; θ is the temperature in [°C] (in the whole document)
- p.6 - the relative thermal elongation of steel is $\Delta l/l$
  - the thermal conductivity of steel is λ_a
  - the specific heat of steel is c_a

p.26 – missing equations (10) - (13) in equation numbering
p.27 – instead of $kb,\vartheta fu/\gamma fi$ should be $k_{b,\theta}f_{ub}/\gamma_{fi}$
p.28 – should not be in equation (23) γ_{fi} instead of γ_{M0}?
p.37 – Fig. 3.30 - it is difficult to recognize the constraints in the picture, it is quite unclear
p. 40 – Fig. 4.1 - a dot-dash line is used to draw the axis
p. 41 – in which way was the specimen heated?
p. 45 – Note: it might be interesting to see if and how the temperature affects the redistribution of forces between the bolts for longer connections
p.47 – 5.1.1 – missing literature number “presented in the design code [].”
p. 51 – “The numerical simulation considers the bolt shear failure when the shear plane of bolts reaches the stress value at 25% of the bolt elongation.” What bolt elongation is meant for shear stress? An explanation would be appropriate.
p. 52-54 – What is the difference between samples pa-03 - pa-08? A description would be appropriate.
p. 63 – in the case in Fig. 5.23 there is no creep strain influence?
p. 64 – “In bolted lap joints, there are four different resistances and deformation modes, that need to be considered: bearing of the plate and/or bolt, shear in the plates, tension in the plates, and shear in the bolt shank” – what is the reason for the shear in the plate?
In several places it is stated that the target temperature is applied by the author - in what way? How were the material characteristics at elevated temperatures determined? Has a special material been created for each temperature, or is it possible to enter the temperature in the program and the temperature dependent properties are built into the program?
p.78, 79 – the weld in Fig. 5.48. is end fillet weld, not longitudinal fillet weld
p. 84 – Fig. 5.57 – image title is missing
p.86 - wrong table number
p. 87 – Fig. 5.60a, b - isn't the difference in resistance for 20°C according to CBFEM and Test too big?
p.95 – Fig. 5.67 – is the value for the resistance at 20°C according CBFEM correct?
p.110 – Fig. 5.89, 5.90 – there are no dashed lines in the figures (as mentioned in the text above), it is not quite clear what does it mean 5 %, 10 %, and 15 % differences.
p.117 – “Table 5.17 … using different types of the cross-section” – section types are the same – IPE, only size differs.
p.115, 117, 119 - figures 5.92, 5.93, 5.94 – which results are from analytical model and which shell (respectively LTB)?
p.119 - „The lateral-torsional buckling resistance from the analytical model becomes higher than that from the shell model because the analytical model includes bending resistance depending on the reduction factor in the yield strength of steel“ - The lateral-torsional buckling resistance from the analytical model is also function of the elasticity modulus reduction factor – eq. (43)
p.121 – Note: in Eurocode it is customary that the main axes of inertia are y and z, not x and y
p. 122 - table 5.21 is a bit unclear

Bratislava, 8.4.2024