CZECH TECHNICAL UNIVERSITY IN PRAGUE
Faculty of Civil Engineering
Department of Science and Research
Thákurova 7, 166 29 Praha 6

e–mail: obhajoby@fsv.cvut.cz   tel.: 2 2435 8736

Opponent's review of the Doctoral Thesis

Candidate   Ing. Abhishek Ghimire

Title of the doctoral thesis   Numerical calculation of welds in structures from high-strength steel

Study Programme Integrated safety

Tutor   prof. František Wald

Opponent   Ing. Alexej Treťjakov, Ph.D.

e-mail   alexej.tretjakov@mottmac.com

Topicality of the doctoral thesis theme
Commentary: The candidate in the presented work compares existing methods of lap fillet welds resistance estimation, performs experimental work and offers a regular inclined shell element model in the finite element method with new strength criterion as an improvement of previous proposals. The proposed method and experimental data show considerable improvement for transverse welds made with high-strength steel compared to EN1993-1-8:2020 estimation. The implementation of high-strength steel elements in structures is more often nowadays. Together with the other requirements for building structures today the question of design efficiency is very important.

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

Fulfilment of the doctoral thesis objectives
Commentary: The main objective of the thesis was to investigate the weld resistance of high-strength steel fillet welds using the finite element method and to develop a realistic and economical design model for its assessment.

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

Research methods and procedures
Commentary: To fulfil this objective candidate used various methods and procedures: a theoretical investigation, experimental studies, finite elements modeling and analytical proposals.The chosen procedure and methodology are appropriate for solving the issue.

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

Results of the doctoral thesis – dissertant's concrete achievements
Commentary: The candidate presented the state of the art in the chosen branch, performed sophisticated experiments on resistance and deformation capacity of the transverse fillet lap-welded connections from high-strength steels, developed solid and inclined shell element models of welds following experimental setup, verified models with experimental data, compared the model with the latest analytical model from EN1993-1-8:2020 and investigated the plastic strain limits for connections. Presented work expands experimental, FEA modelling and analytical estimation knowledge for high-strength steel welds.

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

Importance for practice and for development within a branch of science

Commentary: The proposed RISEM method with the strength criterion might be used directly for design purposes or for further implementation in FEA design software to provide a useful tool for HSS welds resistance assessment.

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

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

Commentary: The thesis is well-organized and easy to understand. It maintains a high standard of graphical presentation, with images and graphs seamlessly complementing the textual content.

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

Statement on compliance with citation ethics

Ethical approval for this work was obtained from prof. Ing. Milan Jirásek, DrSc. From the point of view of citation ethics, I have no comments on the submitted work.

Remarks

Page 47 – values in Table 28 are not consistent with Table 32. Is there any difference between approaches?

Page 64 – Why only strains are compared in Table 36? What is the reason for such a difference in stress?

Chapter 4 – from the results in Chapter 4 a correlation between EXP/EC3 estimation, mean deformation capacity and weld B throat could be found. Why this size of the welds was chosen? Did the previous studies deal with bigger welds or other filler materials? Doesn't that mean that EN1993-1-8:2020 shows enough safe and economical design solutions but covers a more complex selection of cases?

Chapter 6 – what was the defined accuracy of the performed FEM analyses (maximum error)?

Chapter 7 – what should be the main purpose of the RISEM method together with numerical design calculation? Is it prepared for the design or for the implementation to the software?

Chapter 8 - A Relatively small number of experiments were used for validation. Were some experiments from the literature with a similar setup tried?

Page 74 - Fig 66, the RISEM results seem to follow to unsafe side for greater weld leg size. What is the reason for this undesirable trend?

Page 77 – values in Table 39 are probably inconsistent with "%"

Page 89 – following the results presented in Table 47, RISEM shows lower results than AM for shorter welds. In your opinion, what could be the reason? Does EN1993-1-8 overestimate shorter longitudinal welds or RISEM underestimate them?

Final assessment of the doctoral thesis

Ing. Abhishek Ghimire demonstrated deep knowledge and a comprehensive understanding of the topic. He set logical and meaningful goals for his work, which were successfully achieved. The candidate utilized both experimental and software tools to reach the objectives of the research. The work has the potential to contribute to further scientific advancement in the respective field, and its results have been internationally published. The submitted thesis fulfils the requirements set for the award of the Ph.D. degree.

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

yes ☒   *no* ☐

Date: 07.02.2024

Opponent's signature: ....