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. Svitlana Kalmykova

Title of the doctoral thesis Rectangular Hollow T-shaped Joint with Eccentricity

Study Programme 3607V009 Building and Structural Engineering

Tutor prof. Ing. František WALD, CSc.

Opponent doc. Ing.Milan ŠMAK Ph.D.

e-mail milan.smak@vut.cz

Topicality of the doctoral thesis theme

Commentary: The theme of the doctoral thesis – welded joints of rectangular hollow sections – is relevant. Accurate description of the behavior of connections between structural elements under loads significantly influences the reliability of the design of load-bearing structures. Design rules in the normative document EN 1993-1-8 do not adequately account for the eccentric connection of members in the joint. Research conducted as part of the dissertation provides valuable insights for the design of these types of RHS section joints.

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

Fulfilment of the doctoral thesis objectives

Commentary: The objectives of the doctoral thesis are specified in Chapter 3. The aim of the thesis was to determine the resistance of welded T-joints of rectangular hollow sections with offsets, where one branch is laterally shifted from the chord centreline. Six partial research tasks were outlined: evaluation of existing design procedures; experimental verification of the behavior of analyzed joints; finite element method (FEM) numerical solution and its validation with experiments and sensitivity studies; and development of an analytical model.

The obtained results and insights are presented in Chapters 4, 5, and 6. It can be stated that the objectives of the work have been fulfilled.

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

Research methods and procedures

Commentary: The research conducted within the dissertation involved the use of both experimental and numerical methods. Based on the conducted experiments, an analytical model of the welded joint was constructed.

Experimental research is presented in Chapter 4. Six loading tests on T-joints were conducted during this research; the tests differred with the eccentricity in the joint, loading method (compressive force or bending moment), and material (S235 or S355 steel).

Numerical research is presented in Chapter 5. Models for FEM analysis were developed using ABAQUS software. Geometric and material nonlinearities were incorporated into the models. Sensitivity studies were part of the numerical research.

The analytical model is described in Chapter 6. The constructed analytical model was validated against the results of numerical models and available data from the literature.

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

Results of the doctoral thesis – dissertant's concrete achievements

Commentary: As a part of the doctoral thesis, both experimental and numerical research were conducted. The insights gained from the actual behavior of joints with eccentric member connections formed the basis for the joint's analytical model. The results can serve for further research into the behavior of joints with eccentric member connections and for verifying refined design procedures.

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

Importance for practice and for development within a branch of science

Commentary: The results achieved based on the research and particularly the constructed analytical model can serve as a complementary approach for designing joints when applying the rules of EN 1993-1-8, or for verification the suitability of the proposed solution.

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

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

Commentary: The doctoral thesis meets the required standards. It is clearly divided into 7 chapters and is graphically well-presented.

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

Statement on compliance with citation ethics

Citation ethics and plagiarism were checked in accordance with the rules and customs of ČVUT Prague and will be evaluated accordingly during the thesis presentation.

The key parts of the work are chapters with descriptions and results of experimental research, numerical FEM research, and analytical resistance of T-joints. The chapters contain original research and insights by Ing. Svitlana Kalmykova.

Remarks

1. Welds have a significant impact on the behavior of joints. Specify whether and how the different actual dimensions of the welds were considered for each test specimen.

2. During the presentation, indicate how the influence of different steel grades (S235, S355) was observed in the load-displacement diagram during experimental tests (for example, specimens 1.01 vs 1.02).

3. Figure 4.7 shows a different relationship of the force-displacement in specimens with and without offset. What was the difference in in-plane moment loading (specimens 1.03 vs 2.04)?

4. What material characteristics were used during the validation of numerical models and comparison of the analytical model with models from other authors? Do the characteristics emerge from the statistical evaluation of the experimental data or the mean values of fy, fu, E were used?

Final assessment of the doctoral thesis

The topic of the doctoral thesis is relevant, it aims to improve the design of selected RHS joint structures. The methods and procedures for solving it were appropriately chosen, and the work provides a wealth of valuable insights. The objectives of the thesis have been achieved. Ing. Svitlana Kalmykova's doctoral thesis can be considered successful.

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

Date: 13.02.2024

Opponent's signature: .. ..