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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. Josef Macháček, DrSc.

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Topicality of the doctoral thesis theme

Commentary: The thesis focuses on the connection design of RHS members. The popularity of RHS members in the steel structures constantly grows, with this, the requirements for the design of RHS connections also increase. The current design procedures are outdated and often only applicable to a limited number of connections, so the chosen topic is beneficial.

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

Fulfilment of the doctoral thesis objectives

Commentary: The general goal of presented thesis is improvement of design procedures for eccentrically welded RHS T-type connections.

To achieve general goal, experiments were carried out. The results of experiments are summarized in chapter 4. Advanced numerical model was created validated based on experimental data. Subsequently, advanced numerical model was used for verification and development of the analytical model.

In general, it can be stated that the objectives of the doctoral thesis have been fulfilled.

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

Research methods and procedures

Commentary: The thesis employs experimental and numerical methods. The experimental research was aimed at determining the actual behaviour of T-type connections. Two specimens were connected axially, while 4 specimens show eccentricity. The behaviour under compressive force loading and bending moment loading was investigated.

Advanced numerical model was validated based on experimental data. Subsequently, advanced numerical model was used for verification and development of the analytical model.

The analytical model was verified with the results of available analytical models of other authors and also with the results of the advanced numerical model.

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

Results of the doctoral thesis – dissertant's concrete achievements

Commentary: The results of the thesis correspond with the fulfilled objectives. An important output of the thesis is the proposed analytical method for eccentrically connected RHS members. Experimental data are also valuable and can be used for future research.

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

Importance for practice and for development within a branch of science

Commentary: Results of the thesis and the proposed analytical procedure allow to analyzeT-type RHS connections more accurately, safely and reliably. Proposed analytical procedure covers also design of eccentrically connected joints, which until now have been solved by structural engineers more or less intuitively on the basis of their own engineering estimations.

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

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

Commentary: The formal preparation of the dissertation is at an appropriate level. The division of chapters is logical and the work is overall clear.

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

Statement on compliance with citation ethics

Unfortunately, it is necessary to confirm the conclusions of the iThenticate anti-plagiarism system check. Some parts of the second chapter summarizing state-of-the-art are a paraphrase of the A.P. Voth Thesis and the monograph Hollow Sections in Structural Applications. Citation ethic was unfortunately violated. It can be stated that the violation of citation ethics occurred only in a small part of the work and, moreover, in a chapter that does not bring any new knowledge. Subsequent chapters bringing new knowledge and experimental results are undoubtedly original and beneficial for further research.

Remarks

The experimental samples were welded using 4.0 mm E4303 type electrodes as stated in chapter 4.1. Does the welding method (residual stresses) affect the behavior of the joint?

On the begining of chapter 4 is mentioned that 7 full-scale connection experiments were conducted but just 6 samples are listed in tables 4.1 and 4.2.

What is the reason for so different stress-strain diagram of K1 and K3 versus K2 sample? All three samples were fabricated from one member, the maximum strains should be similar. The same question for N1 vs. N2.

Table 5.1 shows just one material property used in numerical simulation. Was that material property used for all elements? Stress-strain curves received from material property tests (Figure 4.4) seams to be different.

Figure 5.3 shows a deliberate gap at the juncture of the brace's cutting section and the chord's surface. Were any contact elements used in that gap to ensure the transfer of compressive forces and prevent the penetration of the brace into the chord's flange in the event of weld compression?

Final assessment of the doctoral thesis
The thesis provides many new insights. Experimental data are very valuable, as well as the results of numerical simulations. Developed analytical model enables accurate design of RHS T-type joints. The objectives of the dissertation have been met.

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

Date: 16.11.2023

Opponent's signature: .....