REVIEWER'S FORM
for thesis evaluation

1. Identification of the student

Student:	Mason Moritz
Thesis:	The influence of carpentry joint stiffness and modelling techniques on internal forces distribution in traditional timber structures
1st Institution:	Universidade do Minho
2nd Institution:	Czech Technical University in Prague
Academic year:	2022/2023

2. Identification of the reviewer

Name:	Doc. Ing. Petr Fajman, CSc.
Institution:	CTU in Prague, Faculty of Civil Engineering
Position:	Associative Professor

3. Fulfillment of thesis goals

excellent ☐ above aver. ☐ average ■ below aver. ☐ weak ☐

Comments: The objective of the thesis is to investigate the effect of modelled joint stiffness (semi rigid x hinge) on the predicted distribution of internal forces in roof trusses. For this purpose, the author analyzed roof trusses of different historic buildings. The differences in the structural configurations used are so great that unification is very difficult. Due to the trusses' static indeterminacy, the attachment to the supporting structure shows the greatest influence on the distribution of internal forces. The influence of the stiffness of the internal joints is much lesser and cannot be significantly refined. The author tested the effects of possible variations in the joints' stiffness, thus the objectives were met.

4. Academic/scientific/technical quality

excellent ☐	above aver. ☐	average ☐	below aver. ■	weak ■

Comments

The works is divided into 7 main chapters and 8 appendices

1-3 introduction, historical context and Literature review

4 - connection typologies and inventory

5 - materials and methods

6 - results

7- conclusion

Two types of element connections in the truss are considered. The semi-rigid joint (springs model) and hinge joint. Three different types of real ruff structures were solved:

Slavonice – structure with purlin and queen post. It is unclear why the solved structure (without purlins) is different from the description of the truss with purlins.

Třebíč – the spar roof – description and model match each.

Doksy – "Liegende stuhl" – It is solved only full ties.

The work contains a number of technical and scientific flaws, such as, missing dimensions of the analyzed trusses, lacking explanation how wind and snow loads are transferred from the empty ties to the full ties. The deficiencies and questions are described in detail in section 6 of this review.

5. Formal arrangement of the thesis and level of language

excellent ☐ above aver. ☐ average ■ below aver. ☐ weak ☐

Comments:

The thesis contains all compulsory parts. However, the orientation in the work and general readability could be improved by, e.g.:

- providing dimensions in all structural drawings of the analyzed trusses (Figs. 7, 10, 13),
- showing the meaning of all symbols used in equations (1) – (13), in the accompanying figures (Figs. 26, 27)

There are some other formal errors, such as inconsistent use of capitals in the table of contents, inconsistent numbering of equations (p. 33 vs. p. 46), some figures are not referenced in the main text (e.g. Fig. 33),. See also section 6 of this review.

The language used is excellent.

6. Further comments

During the defense, the student should respond to and clarify the following comments:

Fig. 1: Is it the author's original work? In any case, the source of the data should be clearly referenced.

Fig. 2, 3: Are these drawings the author's original work? If not, the original source of the figures must be referenced. Fig 2 – that's not a good example for purlin roof

Figs. 7,10,13: Schematics should contain at least basic dimensions - description in text is not sufficient. Otherwise it is not possible to evaluate correctness of the presented results.

(Eq. 1) on p. 33 Normally it is used to classify the stiffness of the joint less than 0.5 is a hinge and more than 25 is rigid - it might be a good idea to put it in a table 4 - otherwise it is meaningless.

Fig.30: Top figures, deformation -What is the variable DMX plotted by the contours – maximum displacement or maximum deflection (displacement in y-direction)? Why does the model with spring joints exhibit larger maximum displacements than the model with hinges? Are the magnification scales of displacement in both figures the same? If they are not, the comparison of deformation is difficult.

Tab. 7: The relative difference of M, V in vertical strut (the last two rows) is irrelevant when comparing finite value with zero.

P. 53: The sentence "The bottom chord sees the highest tension and the difference between the two is minimal, at 4% where the semi-rigid model is slightly more conservative than the hinged model." is not true. From Tab. 7 is semi-rigid N=3,244 (kN), hinge N=3,360 (kN) – it's the other way around.

P. 55: Slavonice - Why is the statics model in Fig 32 (without purlins) different from the construction scheme shown in the description of the same truss in Fig. 7 on page 23 (with purlins) ?

P. 55: Note: Asymmetric snow and wind loading can make more adverse effects than symmetric snow with wind.

P. 60: Doksy - how about the forces from the rafters between full ties? The purlins connect them.

For systems with purlins Doksy (Slavonice ??), it is not defined how the load is transferred from the empty ties to the full ties with purlins.

Unfortunately, I didn't find any photo of the solved trusses in work - why?

In Conclusion: Axial stresses were the most commonly accurate measure, with the hinged model often overconservative by just over 10%. Stresses or Forces ?

7. Grade: D (satisfactory)

Use the following scale

A (excellent)	B (very good)	C (good)	**D (satisfactory)**	E (sufficient)	F (fail)

Prague

July 18, 2023

The Reviewer, ---------------------------

Petr Fajman