

# REVIEW OF DISERTATION THESIS

Reviewer: doc. Ing. Jiří Brožovský, Ph.D.

Author: Özgür Yurdakul

Supervisor: Ing. Ladislav Řoutil, Ph.D. Title: Probabilistic Nonlinear Computer Simulation for Realistic Prediction of Structural Response

## Introduction

The review was requested by the head of the Subject Advisory Board of the programme "Transport Means and Infrastructure" of the Faculty of Transport Engineering of the University of Pardubice at October 16, 2019.

## Topicality of work

The topic of the work – realistic numerical modelling of real reinforced concretes structural member – is still very important and not-yet definitively resolved problem. Furthermore, the author's work is oriented on a problem of numerical modelling of substandard-quality elements. These do exists and they are common in real structures but their behaviour (which is often different from laboratory-grade elements) and even their existence is usually not taken into account.

## Aims and their fulfillment

The aims are listed in the part 1.4. This text is relatively long and includes detailed information about methodology but the reviewer is not sure what is the main aim. The reviewer thoughts that is can be defined as development of methodology for analysis of elements substandard RC structures. Can the student comment it?

## Approach to solution and results, thesis author contribution

The selected approach is logical and sophisticated. There are used both non-linear models material models and random quantities.

The commercial software (ATENA) is used. The text is influenced by this fact. The part 2 (Modelling parameters) seems to follow selected parts of software manual a bit too closely. It is understandable as description of used models and approaches is essential for understanding of obtained results. But the reviewer is not too comfortable with this approaches (it should be stated clearly what parts of text are obtained from manual and what are added by the author itself). Also some subtitles, albeit correct, are somewhat unusual and their organisation is little confusing ("Parabola", "Popovics" vs "Post-Peak Response").

The experimental and numerical works are author's own contribution. Of course the experiments are always limited by available equipment and resources. Anyway, amount of

accomplished work is unusual and proposed results and data are valuable for further works in this area.

In reviewer's point of view the main contribution of the author include development and verification of methodology of substandard RC elements with use of modern computational tools.

## Formal aspects of work

The text is organised in a logical way and includes all necessary parts. Most of pictures and graphs are well-readable. There are some minor typing errors but in a text on such size they are inevitable. Anyway, some theory is also included in selected chapters (for example in the 4.4.2). It probably would be better to concentrate all theoretical information in one chapter.

## Questions and comments

There are some typing errors and unusual terms, like "linear curve". Also, as if was stated before, some parts of text follow the ATENA documentation too closely.

The text "This chapter deals with.." should not be used in scientific texts.

- The statement at page 47 about is too complicated for reviewer: "In general, the yield criteria can be implemented to determine whether the material fails or undergoes plastic behaviour."
- The pictures page 50 are not well readable - what line is the Kupfer and what line is the Willam one?
- There is a statement about mesh size at page 53. But there is no illustration nor explanation to prove the claim (...good connection...).
- The model from chapter 4.3.1 (page 79) uses symmetry of the modelled beam. But it is correct in case when random quantities are used? Can the non-symmetric damage development be excluded? Please explain this.
- Conclusion summarises the work done but the reviewer cannot find any description of further works. So is it a fully-solved and finished area? If not, can the author comment possible direction of future works on this subject?

## Conclusions

The author have proved it's ability to execute and to finish scientific work.

**All requirements for the Ph.D. work have fulfilled.**

After reviewing his thesis the reviewer **recommends** this Ph.D. work for defence.

In Ostrava at November 25, 2019

  
Jiří Brožovský