OPONENTNÍ POSUDEK DIPLOMOVÉ PRÁCE

Jméno a příjmení diplomanta:	Andrei Stadnik
Název diplomové práce:	Vliv reziduálního pnutí na statické chování kolejnice *The influence of the residual stresses on the static behaviour of the rail*
Oponent diplomové práce:	Ing. Filip Kutina (SUDOP PRAHA a.s.)

1. *A brief description of the thesis:*

The thesis deals with the topic of the residual stress field in a rail and it's influence on static behaviour of the rail. Since the topic of the stress field in the rail, concerning a track-bridge interaction issue, is very broad, this thesis limits it's interrest in a flexural behaviour of the rail.

Introductory part of the thesis presents the issue of residual stresses in the rail and explains how they form. It also introduces general characteristics of the analyzed UIC60 rail and brings a theoretical background of concerned standards and methodology of experimental investigation of residual stresses.

Following part describes the bendig tests, specifies a difference of a heat-treated rail and shows results of the flexural testing. Then a residual stress measurement is reported.

Another part is aimed on numerical modelling. It specifies the FEM model used for the simulation of flexural test and residual stresses. The method of validation of the FEM model is also described here.

Final part of the thesis presents diagrams comparing the results of „field tests" and numerical modelling and explains causes and consequences of obtained results.

2. *Meeting tagrets of the thesis:*

The thesis fulfills the given task of verification of the static behaviour of the rail subjected to bending load. Targets of the research are presented with appropriate comments and explanations to obtained results.

3. *Professional and formal quality of the thesis:*

The thesis was elaborated on a high theoretical and practical level. The student used national and international standards and prior published methodologies dealing with the topic of residual stresses in the rail and load testing on the rail.

From the professional point of view it is necessary to appreciate the effort to validate the results obtained from load tests by nonlinear numerical modelling in a universal Abaqus/CAE FEM software.

Partial results and conclusions are commented on numerous diagrams vividly illustrating results of load testing and the comparison with results obtained from numerical models.

The text has a very good stylistic and also a linguistic level is very high. The resources of the reproduced data processed in the thesis are quoted.

4. Comments on the thesis:

In content and in a technical point of view no comments. Formally, it would be useful for easier orientation in the text if the thesis contained a complete list of used abbreviations.

5. Questions to the student (topics for discussion):

1) For rail on the bridge the permissible additional rail stresses due to the combined response track-bridge are limited according to valid standards. Can you explain, why there are different values of limits for compression and tension in the rail?
2) Can you define at least a single advantage of using a heat-treated rail insted of „as fabricated“ on the basis of your research? Why do you think it is produced?
3) In general, how does the functionality of Abaqus FEM model meshed with hex/tet meshing (extensively partitioned) differs from non-partitioned model using only hexahedral mesh?
4) Based on the results of your research, how would you estimate the influence of residual stresses in the rail subjected to axial forces caused by temperature loads and braking/accelerating of a train?

6. Overall evaluation of the thesis:

The thesis was writen on a high professional level. The author has proved to be able to solve complicated technical issues and to evaluate them according to his own oppinion. Conclusions of the research done in the frame of the thesis are useful for the concerned engineering branch, serve for verification of values used in national standards, verifies a sense of using a heat-treated rails and may become a basis for further development.

7. Remarks:

A – výborně / Excellent

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Oponent diplomové práce **Hodnocení**

Datum : 27.1.2017

Legenda k hodnocení: A – výborně, B – Velmi dobře, C – dobře, D – uspokojivě, E – dostatečně, F - nedostatečně