

Expert opinion of master thesis

Opponent:	doc. Ing. Petr Mohyla, Ph.D.
Tutor of master thesis:	prof. Ing. Eva Schmidová, Ph.D.
Topic of master thesis:	Structural and Mechanical Heterogeneties of Fine-Grain Steel Welded Joints Used in Construction of Rail Vehicles
Student:	Fatih Bozkurt

1. The topic of thesis

Presented work aims to evaluate influence of welding on microstructural and mechanical properties of two construction steels – S355N and Domex700MC. Both of that steels are suitable for light weight construction parts of railway vehicles.

2. Results

Theoretical part of the work contains a survey of welding process, strengthening mechanisms, types of fractures and fracture behavior testing. This part of the work is clear and provides valuable information.

Experimental part of the work is focused on welded joints of two steels with improved yield strength S355N and Domex700MC with different mechanism of strengthening. The microstructure changes were analyzed using scanning electron microscopy (SEM). Hardness measurements were performed in weld metal, fusion zone, heat affected zone and base material as well. To determine the dynamic fracture yield strength, there was used instrumented Charpy V notch test. Fractography evaluation was performed to distinguish the influence of primary heterogeneity of tested steels. Substantial degradation process was found in welded joints of Domex700MC. In conclusions author recommends (very correctly) lowering heat input and controlling the cooling rate during welding.

3. Originality of the work

Presented work includes original solutions, student uses modern experimental methods. Professional level and time-consuming of the work is high. In presented master thesis there is used a large quantity of literary sources, which are properly cited. Achieved results are valuable and useful in practice.

4. Formal requirements of the work

Formally, the work has a high level. It is transparent and has a logical structure. There is only a minimal amount of inaccurate technical terms, for example Figure 2.2: *welding pool* instead of *weld metal*, *partially transformed zone* instead of *intercritical zone*, *recrystallized zone* instead of *fine grained zone*.

5. Questions and comments

Page 19: European standard EN 288-2:1995 is already replaced by international standard EN ISO 15609-1:2004.

Which type of covered electrodes are almost used with reverse polarity?

Which type of strengthening occurs in steel S355N and Domex700MC?

Which position of welding was used in the experiment?

6. Overall evaluation of the work

Assignment of the thesis was fulfilled. The work is clear and provides valuable results using modern experimental techniques. The overall level of work testifies to the excellent leadership of the head of the thesis. I recommend master thesis of Fatih Bozkurt to defend and appreciate the degree **Excellent**.

Ostrava, 29.5.2015

doc. Ing. Petr Mohyla, Ph.D.

