MEC-E6007 - Mechanical Testing of Materials: Lab session 1.

1. Background

Environmental change and global sustainability are posing new challengers for engineers in the transportation industry to develop the next generation of products. For instance, in the maritime sector sustainability requires the effective use of high strength steels in the large welded structures. In combination with new structural topologies the weight of cruise ships can be reduced considerably [1,2]. The challenge of higher strength materials is their sensitivity to the manufacturing process and manufacturing induced defects. Therefore e.g. the cutting and welding processes need to be optimized to utilize the full strength potential of the high strength steel materials [2–5]. A fundamental aspect is to understand how the material's strength properties change during the manufacturing process and discover the underlying microstructural characteristics that explain these changes.

2. Task

In this exercise, you will study how welding has influenced the mechanical properties of the welded connection extracted from a real-world structure; see Figure 1. The welding method is submerged arc welding (SAW), and the materials are S690 and S355 grade. Determine the base material type on each side of the weld, and determine possibly locations of weakness within the welded joint. The recommended hardness measurement force is HV1, but you may use different forces if you provide argumentation to support your choice.

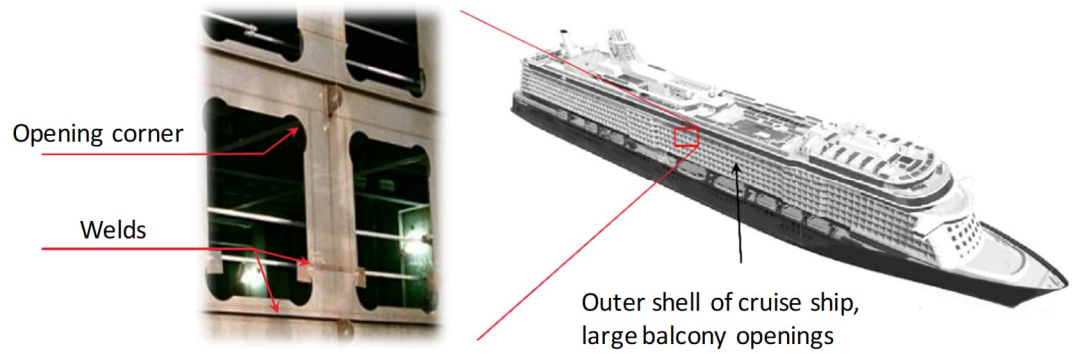

Figure 1. Illustration of cruise ship structure and a picture of the outer shell containing balcony openings.

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