

ELÄTTRA: High Tensile Steel Applications for Electric RoPax-ferries

Background and project description

The *ELÄTTRA* project is a spin-off project from the *ELECTRIC LIGHT* project (illustrated in Figure 1), where high tensile steel (HTS) applications for the Stena Electra concept Ro-Pax vessel is to be investigated and designed. The *ELECTRIC LIGHT* project conceptualized and designed a battery and electric drive Ro-Pax to traffic the Stena Gothenburg-Frederikshavn route. One of the potential follow-up projects envisioned in the original project was the increased use of high-tensile steels in this type of ship construction. The *ELÄTTRA* project will investigate the potential of different components and sub-structures subjected to a high tensile steel re-design. Its effect on weight, cost, and environmental savings by the measure of CO₂-equivalent. The ro-ro deck structures in particular will be studied in detail as MacGregor is a partner in the project.

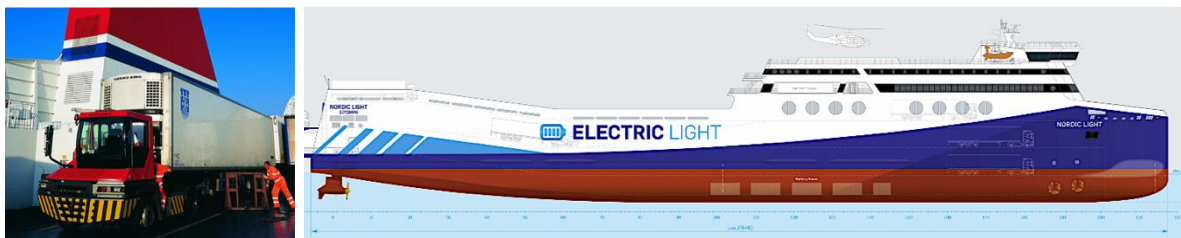


Figure 1. The concept ship design of *STENA ELECTRIC LIGHT*

HTS is only permitted in highly specialized applications on-board ships according to class rules. As an innovation experiment, the project aims at designing to the best of the steel's abilities and retroactively conveying a new practice to lawmakers i.e., flag and class.

Purpose and requirement

We invite students from Mechanical or Civil Engineering to participate in the project in the spring of 2023. Depending on the student's background and interest the thesis can be designed to investigate the following topics, alone or in combinations:

- Strength analysis of selected ship structures
- Fatigue analysis of selected ship structures
- Mapping and analysis of relevant regulations currently conflict with high tensile steel design possibilities.
- Design challenges of high tensile steels for ship structure applications.

Methods and tools: the tools to be used are MATLAB, the FE software ANSYS, the DNV-GL software Nauticus Hull, and GENIE.

Industry partners: this is a joint industry project involving MacGregor, STENA, RISE, and SSAB

Number of students: 4 students are recommended.

Prerequisites: CAD, FEA, MATLAB

The thesis project should incorporate the following tasks:

- Literature studies define the state-of-the-art knowledge of the research subject.
- State-of-the-art: Ro-Ro decks, in particular, have been designed in a plethora of materials over the last 20 years, making an inventory of approaches
- Investigate which areas and structures are best suited for redesign with high-tensile steel
- Detailed strength and fatigue analysis of novel designs selected in the project and by the prior task above
- Suggest regulatory changes based on the above results
- Writing a thesis report and presentation of the work at a public seminar.

Contact persons:

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