

Historical background of safety factors and their effect on structural reliability

Background

The methods of the Eurocode for structural design follows a semi probabilistic approach: Characteristic values of load and resistance phenomena are modified by partial safety factors. This ensures an adequate reliability in structural design. However, this approach is relatively new (since the late 1970s). Prior to the partial safety factor concept, the global safety factor concept was utilized. And prior to the global safety factor concept, engineers had to rely on experience or trial and error. The partial safety factors we use today are a result of this historical evolution of the safety concept. The values of the partial safety factors were constantly adapted throughout history. Some of these adaptations are well founded, some of them seem to be arbitrary.

This thesis investigates how much “black art” and how much science is within the choice of the partial safety factors. Moreover, the effect of the different choices of partial safety factors on the reliability of structures will be quantified. We restrict the thesis on the historical evolution within Germany and focus on the partial safety factors for bending, tension and compression of steel bridges for trains.

Methodology

First, a literature review of the historical evolution of partial safety factors for bending, tension and compression of steel structures within Germany needs to be conducted.

Second, the different values of the partial safety factors are applied to a representative portfolio of design situations. From this the historical evolution of the structural reliability can be investigated.

The scope of these two steps might be too large for one Bachelor thesis. Therefore, we may split the two steps in two separate Bachelor theses.

Good mathematical, static and programming skills will certainly prove helpful in this project.

Objectives

The student conducting the proposed BSc thesis will learn how to

- perform a literature review.
- setup a portfolio of representative design situations.
- perform structural reliability analysis.

Starting date:

Flexible

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