SHEAR BUCKLING IN STEEL MEMBERS SUBJECTED TO FIRE

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The ultimate resistance capacity of steel structural members may be influenced by shear buckling, an important and common phenomenon for the analysis of beams with slender cross-sections [1,2]. In fire situation, the buckling phenomena in these steel members are amplified by the reduction of the mechanical properties caused by the high temperatures [3, 4].

Recently, there has been an increase of the use of plate girders with slender webs, arising from the search of more economically competitive solutions. These slender webs are largely affected by shear buckling.

Thus, it is intended in this PhD to develop a numerical and experimental study about the shear buckling phenomenon in steel beams subjected to fire. The main goal is to validate the existing analytical models adapted to elevated temperatures, or to develop new design approaches, if needed, to be applied by structural engineers.

The presentation will focus on already performed numerical analysis and on the PhD main goals and tasks. It will be presented some numerical models to be used on this study, which are defined by comparisons with experimental results at normal temperature that can be found on the literature [5]. After the normal temperature preliminary study, elevated temperatures (500 ºC) were applied to the same numerical models. The influences of different geometrical imperfections and residual stresses on the ultimate load are analyzed at both normal and fire conditions.

Additionally, comparisons between the finite element numerical results and the simplified rules within Eurocode 3 Parts 1-2 and 1-5 [6, 7] will also be made.
The program SAFIR (developed at the University of Liege in Belgium) [8] was used to obtain the numerical results with geometric and material non-linear analysis.

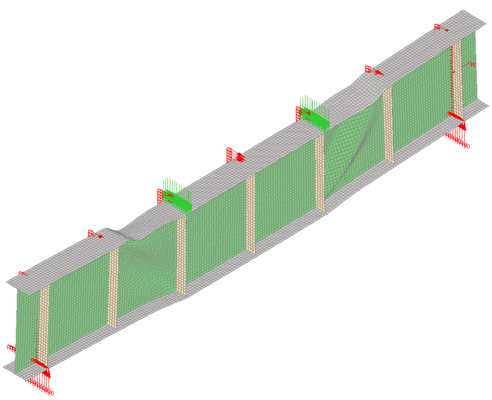

Figure 1 – Numerical model

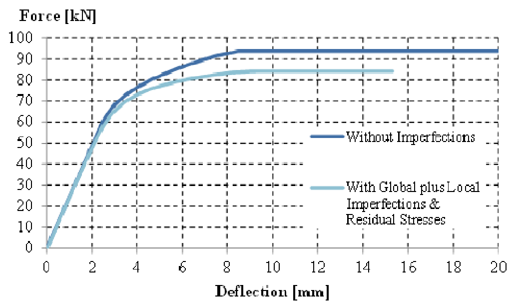

Figure 2 – Relation between imposed force and displacement

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