

The beneficial influence of the roller-straightening process on the bearing capacity of steel columns

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ABSTRACT

The roller-straightening process is a steel production technique which consists of passing a steel element through a series of rolls that bend the member, what leads progressively to a reduction of the initial geometrical imperfections along its weak axis. In addition, this post-treatment process induces a continuous yielding of the steel member and thus may present a second interest which is the reduction of the compression residual stresses at flange tips. This modification of the residual stress pattern could lead on an increase of the carrying capacity of steel columns.

Indeed, the capacity of columns in compression is evaluated through the European buckling curves reported in EN1993-1-1 in which the compression resistances are highly affected by the initial bow imperfections and residual stresses resulting from the rolling process.

However, whilst all long products seem to be systematically straightened nowadays, EN1993-1-1 does not consider the potential beneficial effect of the roller-straightening process. In other words, it means that the current recommendations of EN1993-1-1 neglect the potential benefit of this process on the buckling capacity.

In this context, a collaboration for a research study has been initiated between ArcelorMittal and the University of Liège to numerically estimate the residual stress patterns after the roller-straightening process of three relevant heavy H-shape profiles and evaluate whether these new distributions could lead to a significant increase of the column bearing capacity.

keywords: *Roller-straightening, Flexural buckling, Residual stresses, Stability*