

Resistance of the component “column web panel in shear” – numerical and analytical investigations

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Abstract

The « component method » is nowadays recognised by the European codes as the reference method to design and characterise steel and steel-concrete composite joints. This method, which may be seen as a macroscopic application of the finite element method, consists in dividing the joint into a series of zones through which the forces are transferred, those zones being referred to as “components”. Among them, the so-called “column web panel in shear”, when activated and appropriately designed, can play a key role by providing a reserve of ductility to the joint.

In Eurocode 3, Part 1-8, a simple analytical model is proposed allowing to predict the behaviour of this component in terms of stiffness and resistance. However, some recent researches have demonstrated that, in many cases, the so-predicted resistance tends to be significantly overestimated, which turns out to be rather concerning from a safety point of view.

In this context, the present paper will reflect first results of investigations conducted at Liege University on that problematic. In particular, beam-to-column welded joints have been studied in order to: (i) highlight the above-mentioned problem through comparisons between existing experimental results and Eurocode 3 predictions, (ii) develop a sophisticated finite element model using the software Abaqus©, (iii) validate the so-developed model using existing experimental results and (iv) develop an extensive parametric study in order to highlight the key parameters governing the resistance capacity of the studied component. Based on the conducted investigations, the final goal consists in providing a new analytical formulation which is able to predict more accurately the resistance of the column web panel in shear.