Characterization of RHS-IPE beam-column joints

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ABSTRACT

One of the main priorities of research when referring to structural steel structures in the recent years has been the characterization of the structural joints. This is due to the great importance of a good knowledge of their resistance and the fact that they behave differently depending on the stiffness of the joint. It is very important to implement the right stiffness of the joint to carry out a good structural analysis. Nevertheless sometimes, it is not so easy to know the actual stiffness of a joint.

The component method is the most important and widely recognized theoretical approach for the evaluation of the stiffness and resistance properties of a wide range of joint configurations. It has been adopted for the steel structures by the Eurocode-3 as its main tool for the description of the behaviour of joints between H or I sections. The component method is a powerful tool to determine the performance of the connections in terms of strength and stiffness. It is the framework for many researches based on connections. The difficulty in studying all together the elements and parameters that condition the connections is the reason of focusing on a part or component.

The structural hollow sections are many times a very good proposal for the columns in building structures. However, despite the clear advantages of tubular profiles, joints that involve structural hollow sections (RHS or CHS) have been traditionally excluded from the application of the component method. It is obvious that the possibility of apply the component method to this kind of joints would be a significant advance allowing as well the consideration of semi rigid joints. A global saving would be reached adding to the possibility of using well characterized partially rigid joints, the saving material that may involve the use of tubular columns.

The present project we are working on, intends to apply the component method to joints involving square (SHS) or rectangular hollow sections (RHS) as tubular columns, due to their multiple economic and material saving advantages. For the beam members a pair of IPE sections will be used due to its excellent behaviour when bending is just in the vertical plane that is the common situation in buildings. The research is presented in a comprehensive way, initiating the process with the characterization of the components that are identified in a RHS column as a part of a symmetrically loaded double-sided beam-to-column joint.

Keywords: Structural joints, Component method, Tubular structures, FE analysis.