DETERMINING STIFFNESS OF WELDED T-JOINTS IN RECTANGULAR HOLLOW SECTIONS

M. Broniewicz, J. Szlendak,

Rectangular hollow sections combine excellent strength properties with easy jointing possibilities. These sections are widely used for the construction of lattice frameworks in building design, bridges, towers, masts, etc. In the seventies many research programs were carried out to investigate strength of isolated T-, X-, K-, N- and KT- joints. Further theoretical investigations mostly based on yield line theory were carried out on axially loaded joints (Redwood, R. G., Mouty, J., Mang, F., Wardenier, J.) and moment connections (Brodka, J. and Szlendak, J.). The many configurations of joints in hollow sections and the various modes in which the joints can fail, lead to many joint strength criteria, so complicated that for the design recommendations simplified criteria are used. The range of validity of the design formulae is generally limited in such a way that the deformation criteria do not become decisive under service load conditions. As the criterion of failure the ultimate load capacity is used.

However, the estimation of the joint stiffness was the subject of study only few research programs. Joints of frames made of rectangular hollow sections are mainly flexible, because preferable production technology, that is direct welding tube to tube, causes considerable load on the slender wall of a chord. Moment-rotation curves are non-linear and sections have yielded already under small loading. The joint stiffness has not been expressed in formulae up to now. The design formulae are limited in the range of validity or take indirectly into account of a deformation limit. For example the basic criterion for chord face plastification for T-joints is the deformation limit of $0.01b_o$, where b_o is the chord width. Recently in the Technical University of Bialystok a research programme has started in which all information regarding the joint stiffness are collected and analysed. In the theoretical part of the programme have been analysed about 180 results of the T-joint tests. The moment-rotation curves obtained from these tests were a tool to create the regression model of the joint stiffness for a large population of results. This model will be solve for individual parameters and will be create nomograms to easy reading stiffness for various configurations of joints.