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Analytical solution for welded joints of perpendicular plates subjected to torsional moment

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Even with the advent of computer processes, the study of welded joints using classical mechanics and calculus is still employed by welding engineers to establish the dimension of bead welds and set load thresholds that can be applied for connecting structural elements. In the existing analytical models, one normally considers an acceptable kinematics hypothesis for a problem and obtains the formulation that permits calculation of stress for the given case. If necessary, one then analyzes the stress state established at the point of interest. This paper develops a mechanical and calculus-based formulation for the design and verification of weld lines on joints of perpendicular plates subjected to shear stresses due to torque. Our results are compared with the traditional procedure that applies shear stresses to the welded joint that are equal to the normal stresses induced by the bending of the plate. We carried out an additional study using mathematical modeling and the finite element method to evaluate the distribution of shear stress on the cross section of the line weld, which is considered in this case to be a deformable solid.

Biography

Alexandre de Macêdo Wahrhaftig received a degree in Civil Engineering in 1991 and a Master's degree in Rehabilitation of Historic Heritage from the University of Las Palmas de Gran Canaria, Spain in 1995. He received a PhD in Civil Engineering (Structures) from the Polytechnic School of USP, São Paulo in 2008. He has occupied leadership positions on the execution of works and technical services. In the research area, he is mainly engaged in static, dynamic, and experimental analysis of structures and has published scientific papers and books in his name. He was awarded twice by the UFBa for his achievements in the field of innovation, and in 2013, he was honored by the Brazilian Association of Civil Engineers.

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