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# Effects of material nonlinearity on load distribution in multi-bolt composite joints

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## Abstract

In this manuscript, an analytical approach is presented to determine load distribution in single-column multi-bolt composite joints by taking into account the effect of material nonlinearity of the joint members. For this purpose, an integration of traditional spring-mass model in joints and nonlinear Tsai-Hahn formula in polymeric composites were employed to construct a new computational tool for joint design. Load-displacement curve of the joint by considering material nonlinearity revealed of 3.66% and 3.97% more displacement at constant force in comparison to the linear case of three and five bolted joints, respectively. In addition, it was shown that increasing the degree of material nonlinearity of the members increased and decreased the amount of the load transferred by the outer and inner bolts of the joint, respectively. Findings of this research in comparison to

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