

Elastoplastic and Ductile Damage Model Calibration of Steels for Bolt-Sphere Joints Used in China's Space Structure Construction

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Abstract : The bolted spherical node is a common type of joint in space steel structures. The bolt-sphere joint portion almost always controls the bearing capacity of the bolted spherical node. The investigation of the bearing performance and progressive failure in service often requires high-fidelity numerical models. This paper focuses on the constitutive models of bolt steel and sphere steel used in China's space structure construction. The elastoplastic model is determined by a standard tensile test and calibrated Voce saturated hardening rule. The ductile damage is found dominant based on the fractography analysis. Then Rice-Tracey ductile fracture rule is selected and the model parameters are calibrated based on tensile tests of notched specimens. These calibrated material models can benefit research or engineering work in similar fields.

Keywords : bolt-sphere joint, steel, constitutive model, ductile damage, model calibration

Conference Title : ICSCCS 2022 : International Conference on Steel Construction, Components and Safety

Conference Location : London, United Kingdom

Conference Dates : April 21-22, 2022