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Residual bearing capacity of welded hollow spherical joints after corrosion damage

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Abstract

Welded hollow spherical joints (WHSJs) are widely used in space lattice structures. WHSJs are inevitably corroded due to long-term exposure to corrosive atmosphere and this damage will threaten the space structure safety seriously. Previous studies have mainly focused on bridges and cables; however, research on space lattice structures and WHSJs is rare and urgently required for structural design and lifetime safety evaluation. Therefore, several numerical models of corroded WHSJs were proposed to investigate the mechanical behavior; the effects of several parameters on the tensile and compressive capacity of joints were studied by nonlinear analysis; the prediction equations of residual bearing capacity were established. Results showed that corrosion distribution, corrosion degree and the characteristic of WHSJs had significant influence on the residual tensile and compressive capacity. Moreover, the results could also lay a foundation for the reasonable evaluation, repair and reinforcement of the space structure connected by welded hollow spherical joints after corrosion damage.