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学术论文

主管壁加厚方钢管T型节点滞回性能研究

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摘要：

为了研究主管壁局部加厚对方钢管T型节点滞回性能的影响，对一个主管壁局部加厚的方钢管T型节点试件和一个主管壁未加厚的方钢管T型节点试件进行试验测试和有限元模拟。试验中，通过控制支管的竖向位移对方钢管T型节点试件施加低周往复循环荷载，研究试件的变形和破坏模式，并进行相关抗震性能指标（延性系数和能量耗散）分析。试验结果表明：主管壁局部加厚能够明显改善节点的滞回性能，同时能够使节点由带有明显延性特征的断裂破坏转变为主管壁厚改变处的延性屈服破坏。利用有限元软件ANSYS对试验试件进行有限元模拟，结果与试验结果吻合较好。最后利用有限元软件分析了主管壁加厚方钢管T型节点加厚参数（主管的加厚长度*l*和加厚厚度Δ*t*） 对节点滞回性能的影响。分析结果表明：为了改善节点滞回性能，加厚长度不超过支管截面边长的3倍，加厚厚度不超过主管壁厚的0.8倍。

关键词： 方钢管T型节点 主管壁加厚 拟静力试验 数值模拟 滞回性能

Study on hysteretic behavior of square tubular T-joints with increased chord thickness

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Abstract:

In order to study the hysteretic performance of square tubular T-joints with increased chord thickness, experiments and numerical simulation were carried out on a full- scale square tubular T-joint with normal chord thickness and one with thickened chord. Low-cycle loading was applied to the specimens using displacement control method. The deformation and the failure mode were studied. The corresponding indices of seismic behavior, such as the ductility ratio and energy dissipation ratio, were also analyzed. It can be concluded that the hysteretic performance of the square tubular T-joints is improved greatly by increasing the chord thickness. The failure mode is changed from fracture at weld toe with obvious characteristics of ductile behavior to yielding at the chord intersection. After the testing, finite element analysis was carried out. The FEA results agreed with the test results reasonably well. Finally, effects of strengthening parameters on the hysteretic performance were studied based on finite element analysis. The strengthening parameters include the thickened chord length and chord thickness. It can be suggested that the reinforced length should not exceed 3 times of the brace section height. The increased thickness also should not exceed 0.8 times of the chord thickness for improving the hysteretic performance efficiently.

Keywords: square tubular T-joints chord thickening quasi-static test finite element simulation hysteretic performance

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