DOUBLE ANGLE FRAMING CONNECTIONS SUBJECTED TO SHEAR AND TENSION

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(ABSTRACT)

The double angle connection (sometimes referred to as a cleat connection) is one of the most commonly used simple shear connections, and many investigations have been conducted on this type of connection. However, most of these investigations have focused on either the strength or the moment-rotation relationship under shear loading. Several investigations have recently been performed on the behavior of double angle connections subjected to shear plus axial tensile loads. In these investigations, analytical models and design formulas have been proposed to model the complex behavior of these connections when subjected to the combined loading. However, a complete design model has not been developed.

To fulfill the need for a design procedure, double angle connections were studied for three different loading cases. The first case was used to establish the load-displacement relationship under axial tensile loads. The second case was to establish the moment-rotation relationship under shear loads. Finally, the third case was to find the effects of combined axial tensile loads and shear loads on the behavior of double angle connections.

For these purposes, 3D-nonlinear finite element models were developed to simulate the connection behavior under the three loading cases. The commercial software package, ABAQUS, was used for the study. The complex phenomena of contact problems and the pretension forces in the bolts were simulated. A simplified angle model and an equivalent spring model were developed from the 3D results.

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