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Finite Element Modeling for Clamping Stresses Developed in Hot-Driven Steel Structural Riveted Connections

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Abstract : A three-dimensional finite element model is developed to capture the stress field generated in connected plates during the installation of hot-driven rivets. Clamping stress is generated when a steel rivet heated to approximately 1000 °C comes in contact with the material to be fastened at ambient temperature. As the rivet cools, thermal contraction subjects the rivet into tensile stress, while the material being fastened is subjected to compressive stress. Model characteristics and assumptions, as well as steel properties variation with respect to temperature are discussed. The thermal stresses developed around the rivet hole are assessed and reported. Results from the analysis are utilized to detect possible regions for fatigue crack propagation under cyclic loads.

Keywords : clamping stress, fatigue, finite elements, rivet, riveted railroad bridges
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