Stress concentration and optimal design of pinned connections

A pinned connection or lug joint is a common connection type used both in civil engineering and mechanical engineering. In civil engineering, this connection is used for assembling truss members, and in mechanical engineering, this connection type is widely used in machine elements. The standard design is with a circular pin. The stress concentration factor size depends on the tolerances between pin and assembled parts and also by the three-dimensional design. Relatively different maximum stress values are seen depending on the modelling being done in two dimension (with assumptions) or in full three dimension. The focus in the present article is on the two-dimensional design and minimizing the maximum stress. It is shown that not only the contact geometry is important for reducing the stress, the external design is equally important. By finite element analysis including contact modelling, it is shown that reduction in the stress concentration factor of up to 18% is possible.

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