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Study on stress distribution around holes in metal plates and transition to fracture JOHN GAFFNEY, BIYU HU, SANICHIRO YOSHIDA, Southeastern Louisiana University — With strength analysis of metal connectors used for buildings in mind, stress distribution around holes in tensile-loaded thin metal plates has been investigated. An optical interferometer sensitive to in-plane displacement of the specimen is set up in front of the tensile machine. Interferometric fringe patterns as a whole image of the specimen are formed on a real-time basis at a preset interval in the order of few seconds. A previously observed bright band-like fringe patterns representing stress concentration in similar specimens without holes are observed around the hole at a late stage of deformation. This band-like pattern is found to run at about 45 deg to the tensile axis through the hole. Sometimes two patterns appear simultaneously around the same hole, forming an "X" like shape. The appearance of the pattern greatly depends on the thickness of the specimen, the locations of the holes and the type of the metal. To a certain extent, the transition to fracture can be predicted from the shape of the pattern. Comparison with finite element analysis indicates that this pattern appears in the region where the von-Mises yield criterion is satisfied.

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