

## **FEM for Stress Reduction by Optimal Auxiliary Holes in a Uniaxially Loaded Plate**

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**Abstract :** Optimization and reduction of stress concentration around holes in a uniaxially loaded plate is one of the important design criteria in many of the engineering applications. These stress risers will lead to failure of the component at the region of high stress concentration which has to be avoided by means of providing auxiliary holes on either side of the parent hole. By literature survey it is known that till date, there is no analytical solution documented to reduce the stress concentration by providing auxiliary holes expect for fever geometries. In the present work, plate with a hole subjected to uniaxial load is analyzed with the numerical method to determine the optimum sizes and locations for the auxillary holes for different center hole diameter to plate width ratios. The introduction of auxiliary holes at a optimum location and radii with its effect on stress concentration is also represented graphically. The finite element analysis package ANSYS 8.0 is used to carry out analysis and optimization is performed to determine the location and radii for optimum values of auxiliary holes to reduce stress concentration. All the results for different diameter to plate width ratio are presented graphically. It is found from the work that introduction of auxiliary holes on either side of central circular hole will reduce stress concentration factor by a factor of 19 to 21 percentage.

**Keywords :** finite element method, optimization, stress concentration factor, auxiliary holes

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