Full-strength contour finding problems

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Abstract

The paper addresses partially unknown boundary problems (full-strength contours finding problems) of plane elasticity theory and plate bending. Tangential normal stresses and tangential normal moments whose values depend on external loads and hole shapes play an important role in the plasticity zone formation in the plates with the holes and also in the plate destruction in the neighborhood to the plate's hole boundary.Proceeding from the above -mentioned, the following tasks were assigned: in conditions of provided external loads the shapes of the holes in plates should be chosen so that on the boundaries tangential normal stresses (tangential normal moments) module's maximal value will be the same and minimal in the same body in all other possible holes tangential normal stresses (tangential normal moments) maximal value of module.

It's proven that for infinite domains tangential normal stresses (tangential normal moments) the minimum of maximal value will be obtained on such contours, where this value maintains the constant value. These contours are named full-strength contours.The solvability of these problems provides controlling stress optimal distribution selecting the appropriate hole boundary.

Using the methods of complex analysis [1], the unknown full-strength contour and stressed state of the body are determined. Numerical analysis are performed and the corresponding graphs are constructed by Mathcad .

References

1.Muskhelishvili, N.: Some Basic Problems of the Mathematical Theory of Elasticity. Fundamental Equations, Plane Theory of Elasticity, Torsion and Bending, XXXI. Noordhoff International Publishing, Leyden, (1975).