

Thermoelastic Stresses in a Slab

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Communicated by I. N. SNEDDON

ABSTRACT

This paper is concerned with the thermal stress and displacement fields which arise in an infinite flat slab of constant finite thickness when it is subjected to a temperature field which varies through its thickness and along its length. The slab is held stress free on one face and is rigid on the other. The stress-free face is subjected to a general temperature which varies along its length and the rigid face is held at constant temperature. It is further assumed that the temperature obeys the linear heat conduction equation and can be treated as a known input.

The thermoelastic equations are then solved by means of Fourier transforms and complex variable theory. General solutions are expressed in terms of the applied temperature. The complete stress and displacement fields are then numerically evaluated for the case where the applied temperature is a step function of the distance along the face. Results are given as plots of the normalized stresses and displacements for four values of Poisson's ratio.

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