# Closed-form Solutions of the Homogeneous Isotropic Elastic Half Space Subjected to a Circular Plane Heat Source

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## Abstract

This paper presents analytical solutions of the steady state displacements and temperature increments of a half space subjected to a circular plane heat source on the basis of the fundamental solutions of the half space due to a point heat source. The half space is modeled as a homogeneous isotropic linear elastic medium. The software Mathematica is used to complete symbolic calculations, and the closed-form solutions are presented. The governing equations of the mathematical model are based on the theory of thermoelasticity. The thermal stresses of the half space obey Newton's second law and Hooke's law. Besides, the energy conservation and heat conduction law are introduced to formulate the governing equations of thermal flow. The solutions can be used to test numerical models and the detailed numerical simulations of the thermoelastic processes near the buried heat sources.

Keyword：Circular Plane Heat Source, Half Space, Integral Transform, Closed-form Solution