

## Design and Fabrication of the Hot Plate for High-Temperature Guarded Hot Plate Apparatus

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A hot plate for guarded hot plate apparatus for high temperature measurement of steady-state thermal transmission properties are designed and fabricated. For the aim of the thermal measurements up to 1000 °C, tungsten is chosen as hot plate material because its stability at high temperature and small thermal expansion. The hot plate is to measure specimens of square shape with 300 mm × 300 mm dimension located on the both sides of the plate. The measuring area is 150 mm × 150 mm, around which an air gap of 2 mm width separates the hot plate from the guard plate. Inconel-sheathed heaters of 2.3 mm outer diameter are installed in the grooves patterned on the plates, and used to control and to quantify the thermal energy across the specimens. The heaters are sandwiched between the two tungsten plates that are bolted together. The design parameter is adjusted so that the temperature uniformity on the hot plate is within 0.01 °C and on the guard plate within 0.05 °C. A finite element analysis method is employed to design optimal heater patterns for the uniform temperature distribution of the hot plate, guard plate and cold plates. The temperature uniformity on the both sides of specimens and gap imbalance across the hot and guard plates are measured by 16 type N thermocouples with 2 mm diameter installed on the plates.