

## Application Note – To test and monitor possible damage by excessive heat to the roof of Parliament House in Canberra, Australia.

### Customer Requirements

The building authority for the construction of Parliament House in Canberra was unable from standard performance data to estimate the temperature likely to be experienced by the membrane on the roof. The roof consists of 'Dagwood sandwich' of many layers: concrete deck, a three-layer bituminous membrane covered by a protection board, a 100mm percolation course of sand, and 400mm of moist soil supporting growing turf.

Since excessive heat would cause the 7mm thick bituminous membrane to 'slump' or slowly flow down the sloping roof, leaving insufficient material to do its job it was necessary to call in the CSIRO Division of Building Research.

### Equipment

DT500

Channel Expansion Module (CEM)

Modem

### Sensors

Copper Thermocouples

Constantin Thermocouples

Solid state linear temperature sensor

Thermocouple terminal box

Voltage Thermocouples

### Datataker Solution

36 copper vs. constantin thermocouples were installed on a prototype roof section on the site in Canberra and monitored for 110 days over summer. The research team located in Melbourne chose the *dataTaker* DT500 data logger to collect the information. Requiring a large built-in memory, ease of programming and ease of connection to a modem, made *dataTaker*'s DT500 the ideal choice.

All thermocouples used were made from one batch of wire, five samples were returned to the lab and calibrated separately. The reference temperature for the thermocouple was obtained by measuring the voltage across an LM355 solid state linear temperature sensor, located inside the thermocouple terminal box. The LM335 had in turn been calibrated against a quartz oscillator type digital thermometer. This procedure yields results that are reproducible to better than half a degree.

The voltages registered on all thermocouples and LM335 were measured every 15 seconds, and the temperatures calculated. These readings were then averaged at half-hourly intervals and averages logged in the memory *dataTaker* data logger, which was located in a weatherproof enclosure close to the test patch.

Every three days the stored data was transferred to a lab computer in the in Melbourne via modem. Half-hourly average temperatures were stored for later analysis. The client was delighted achieving, within the measurement procedure they applied, an absolute accuracy of better than 1.0°C, and a differential accuracy for any one thermocouple of better than 0.1°C.

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