

## Cooper Hamburg Wheel Tracker temperature uniformity testing.

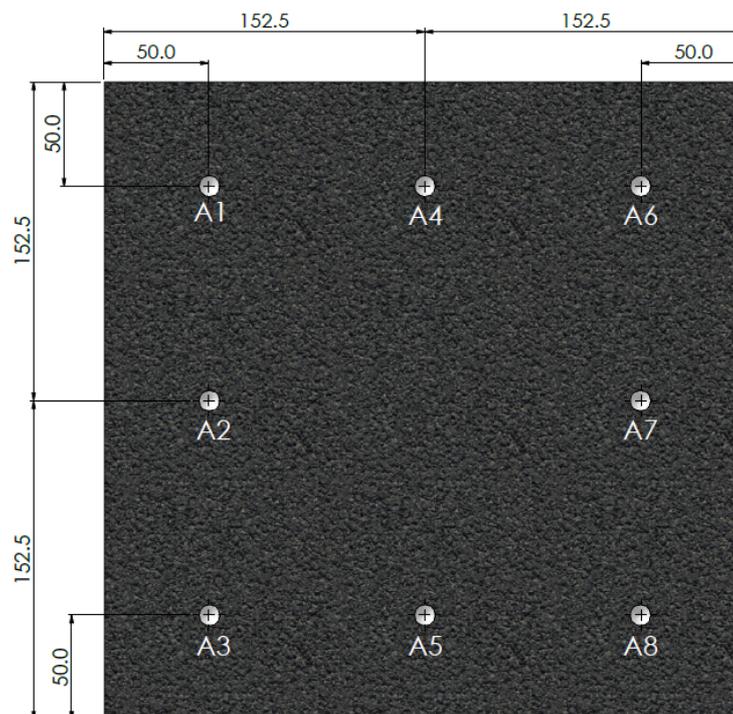
The standard EN 12697-22-2020 – specifies that the test specimens must be controlled to  $60^{\circ}\text{C}\pm 1^{\circ}\text{C}$  both in dry air and water. Experiments were conducted in dry air to determine the temperature uniformity within the two specimens when tested in our Cooper Hamburg Wheel Tracker model WTIM-A.

To conduct these experiments 8 x  $\varnothing 3.2\text{mm}$  x 25mm deep holes were drilled in each asphalt specimen in the locations presented in Figure A. These holes were filled with thermal compound creating an airtight seal for the temperature probes to measure the sample temperature directly rather than the air temperature. The temperature experiments were conducted at  $60^{\circ}\text{C}$  as specified by the standard. 25mm hole depth was chosen as the standard states the vertical deformation of no less than 20mm, so 25mm would be sufficient to reduce the length of probe over the top of the specimen surface.

The specimens were tested at ambient temperature, then heated up to  $60^{\circ}\text{C}$  and allowed an hour to stabilise results. Experiments were conducted to measure the effects of different airflows, heater powers and air baffles against the temperature distribution and heat up time to produce a design with a quick heat up time and best temperature distribution.

**Positions A4 & A5** are measuring the temperature at the **wheel path**. These points cannot be recorded during the actual wheel tracking test as the wheel is in contact with the specimen. It was especially important to obtain data in this location as the temperature in those points will directly affect the test results.

Figure A.  
temperature  
asphalt



Locations of  
probes in  
specimen.

## Test Results

The standard states that once up to temperature, the sample should be conditioned for:

- a minimum of 4 h for specimens with a nominal thickness equal to or less than 60 mm
- a minimum of 6 h for specimens with a nominal thickness larger than 60 mm
- a maximum of 24 hours

As shown in the results in Figure B and Figure C the temperature within the specimen was controlled to  $60.0^{\circ}\text{C} \pm 0.7^{\circ}\text{C}$  achieving and exceeding the temperature requirement for both specimens within a 6-hour period.

Figure B.

Position	Column	Description	Mean ( $^{\circ}\text{C}$ )	Fluctuation ( $\pm^{\circ}\text{C}$ )
A1	E	Left Outer Back	60.7	0.03
A2	F	Left Outer Middle	60.1	0.03
A3	G	Left Outer Front	59.8	0.02
A4	H	Left Middle Back	60.0	0.04
A5	I	Left Middle Front	60.0	0.04
A6	J	Left Inner Back	59.8	0.03
A7	K	Left Inner Middle	59.7	0.02
A8	L	Left Inner Front	60.3	0.02
B1	M	Right Inner Back	59.2	0.02
B2	N	Right Inner Middle	59.4	0.03
B3	O	Right Inner Front	60.5	0.03
B4	P	Right Middle Back	60.0	0.06
B5	Q	Right Middle Front	60.0	0.05
B6	R	Right Outer Back	60.3	0.04
B7	S	Right Outer Middle	59.8	0.03
B8	T	Right Outer Front	59.2	0.02
<b>Max Fluctuation:</b>				<b>0.06</b>

Temperature

measurement results at  $60^{\circ}\text{C}$

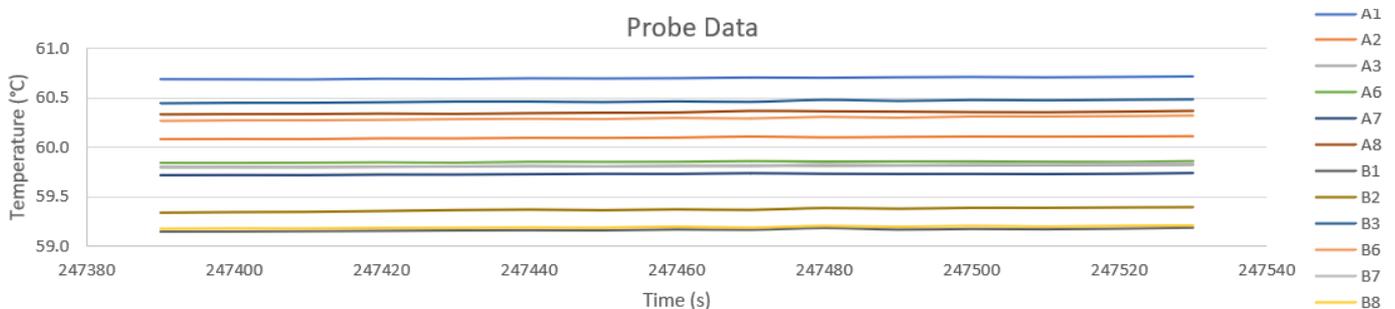


Figure C. Temperature graph showing all the probes at  $60^{\circ}\text{C}$