8. RESULTS OF INSITU MEASUREMENTS

Table 1 summarises the results for the 13 sets of thermal resistance measurements.

Table 1: Summary of results

Thermal resistance (m^2K/W) – estimated measurement uncertainty 10%	**Ceiling A batten only**	**Ceiling A batten and joist**	**Ceiling B joist only no dwang**	**Ceiling C batten and joist**
Original insulation	1.5	1.3	1.7	2.2
Single layer of Insulation over the top of framing	Initial 1.5 Final 3.5	Initial 2.9 Final 3.4		1.5
Calculated	3.6	3.6		
Single layer of insulation friction-fitted between framing	3.5	3.6		3.7
Calculated	3.6	3.3		
Layer of insulation over framing and second layer between framing	>5	>5	4.8	
Calculated	6.5	6.3	5.2	

For Ceiling A and the situation with insulation only over the the top of the framing, the intial R-value result was surprisingly low, despite taking considerable care with installation. A revisit to the test site revealed that small gaps (5 mm) had opened up at some of the joins between the sections of insulation. The insulation was carefully moved so as to close these gaps, and the R-value was then remeasured and found to be close to what would be expected if there were no ventilation losses occuring.

For Ceiling C, the thermal resistance was also very low for the case of insulation installed over the top of the framing, but because of nature of the framing, it was not possible to apply a better fit to the insulation.

Previous studies have estimated the uncertainty in determining thermal resistance using the HFTs as 10%, including calibration errors and uncertainties associated with installation and in-use conditions. The estimation of the uncertainty was based on an assumption that the average temperature difference is at least 10°C. If the temperature difference is less than 10°C, the method becomes less reliable, and repeat measurements are needed to provide confidence in the results.

For Ceiling A with two layers of the R 3.2 insulation, it was only possible to determine that the thermal resistance was significantly above R 5. This happened because the temperature difference was insufficient to produce a significant heat flow through the heat flux transducer.

For Ceiling B, it was possible to make a reliable measurement because the temperature difference was larger and so the output from the HFT was sufficient to be able to measure it reliably. It also helps that the overall thermal resistance was lower (because the lower layer of insulation was the original material and not the replacement R 3.2 material).

The measured R-values for the ceilings insulated with their original insulation materials are what would be expected given the material types and thicknesses. For the examples with insulation friction-fitted between the framing, the results are well within measurement error of the values calculated on the basis that the edges of the