

# Thermal Imaging in a Heatwave

Tom Bragg, June 2020



## Find ways of keeping homes cooler by thermal imaging during heatwaves

Insulation for keeping a building warm in winter will also keep it cool in a heatwave (and vice versa), But depending on how the sun heats the building, extra protection may be needed to avoid that causing overheating.

### 1) Look for the hotter surfaces on the building's exterior

They'll vary with the time of day and the sun's angle.

Can the rooms inside of these hot surfaces be kept cooler by better insulation or ventilation?

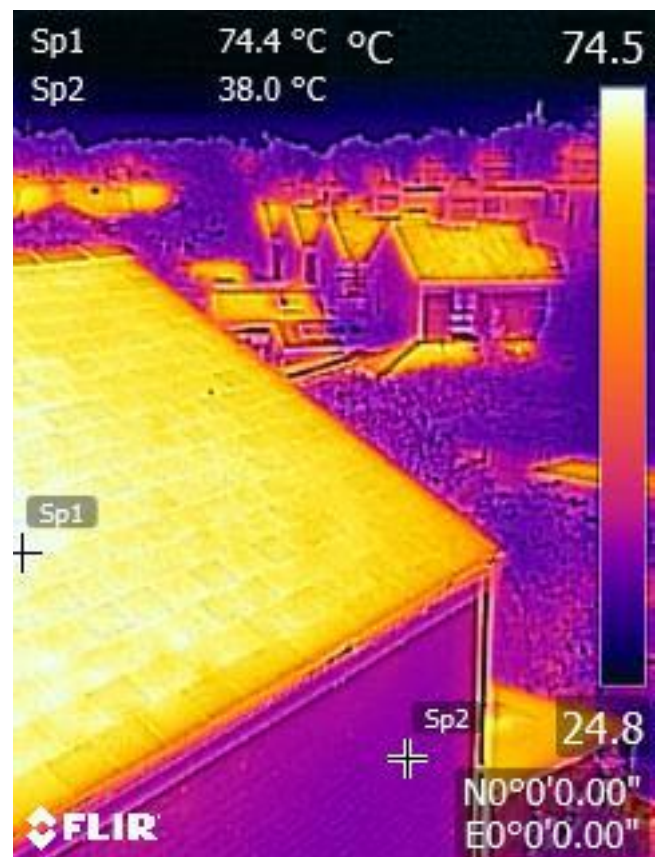
During a heatwave, roofs and walls get HOT, especially if they're facing the sun. This thermal image shows a slate roof in Cambridge (UK) with a surface temperature [Sp1] of 74.4°C. You need good insulation under a roof like this to avoid it heating up the house below. If the insulation is in the loft floor, rather than the roof (like mine), it will have a really hot loft space, probably radiating and conducting heat down into the house.

When heat's flowing downwards like this, convection is unimportant and radiation becomes more significant. So that reflect thermal radiation will be relatively more effective. Follow their installation instructions regarding air-gaps.

It may be possible to cool a hot loft space by ventilation. We've put vents (with insect-proof mesh) under the eaves and into an unused chimney near the top of the loft space to create convective ventilation, drawing in cooler air from under the eaves.

In this image the wall below, at 38°C [Sp2], is less hot because it's not angled towards the sun like the roof and it's white-painted surface reduces absorption of solar energy (see below). Also being an uninsulated solid brick wall, more of the sun's heat wall may be conducted inside, lowering the surface temperature (compared to the insulated roof). Or the thermal mass of the brick may still be heating up after the cooler night.

When thermal imaging in heatwaves, be prepared for transient heat flows like this, when the sun hits a wall or stops heating it. Heat flows are rarely steady-state and surface temperatures of walls, etc, measured by thermal imaging will often be affected by their previous temperatures.



## 2) Compare temperatures in the room inside

Where a wall is hot outside, is its surface temperature in the room inside significantly hotter than of other surfaces in that room? If so, heat flowing in through that wall is heating up the room.

## 3) Can you benefit from shading?

The thermal image of the front of these terraced houses shows the advantage of **shading**: the coolest spot 33.4 °C [Sp1] is under the tree, by the left home's front door.

The roof slates [Sp2] at 68.2° are the hottest, in the full glare of the sun.

Both houses have uninsulated solid brick walls, the left one is plain brick at 48.3°C [Sp3], whereas the white-painted right house is at 40.8°C [SP4], probably because its white surface reflects more and absorbs less of the sun's heat.



This image shows the benefit of two DIY fabric awnings, made as [described in this article](#).

The brick wall in the sun [Sp1] is at 51.3°C, while the nearby window frame, shaded by the top awning, is at 33.3°C [Sp2]. The window frame shaded by the lower awning [Sp3] is at 35.9°C.

We can sit at the table, shaded by the lower awning, which is much more comfortable than in the full sun, during hot weather.

The hottest part of this image is the roof of the extension, sloping towards the camera, which is about 70°C. It has 2 Velux rooflights which are open a little. It would be better to shut them with the surrounding roof tiles so hot. These Velux windows are fitted with [external anti-heat blinds](#) useful for reducing solar heating of the room below.



#### 4) Make use of cooler spaces.

Which rooms are cooler and more comfortable. This may vary with the time of day. Can you keep them cool?

Inside the house, look for cool areas: the insulated suspended wooden floor [Sp1] is at 23.7°C. In fact the sub-floor below these floorboards and insulation was at 16°C on this day - a useful cold area. During a heatwave we open a hatch in the floor under the stairs, along with windows and skylights at the top of the house, to draw cool air from the subfloor up into the house. It's hard to persuade this cool air to rise, so I'm going to try a fan, fitted in a board, to place over the hatch opening.

More resources here:

[Cool Homes in a Heatwave](#)

