



Thermal Imaging Survey Report

Department of Plant Sciences

Martin Howes

Wednesday 9th March 2016

A collaboration between Living Labs initiative of Estate management, CU Environmental Consulting Society (CUECS) and the Department of Plant Sciences. Training was kindly provided by Cambridge Carbon Footprint.

The survey was conducted on the evening of Wednesday 9th March with student volunteers and CUECS to aid the Department's Energy Co-ordinator Martin Howes in identifying targets for improving the energy efficiency of the main department building (D013).

Main Findings

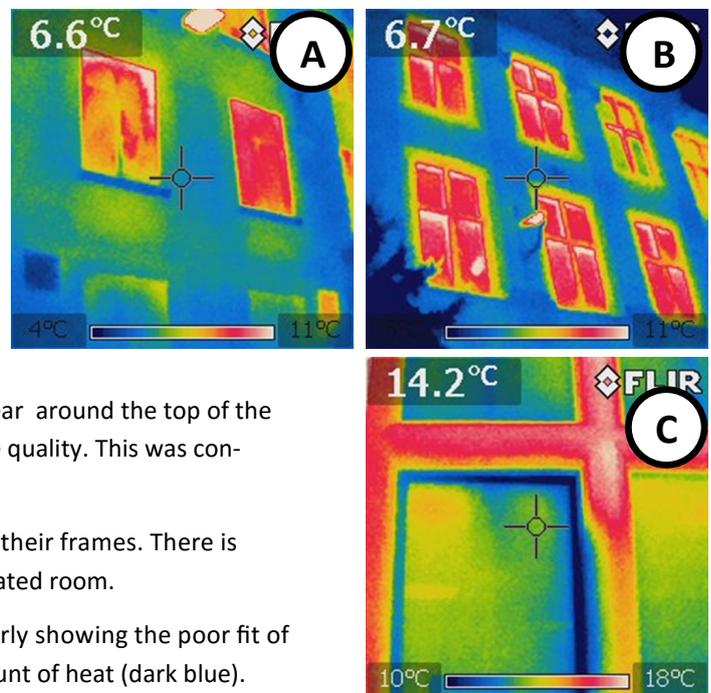
1) Draughty Windows

The majority of single-glazed older windows show signs of colour bleed in images taken, indicating draughts—especially the openable panes. Not only is this a concern for energy efficiency, but Defra regulations warrant most laboratories in the building to be safely sealed off from outside.

A) Mezzanine (south side) - heat loss is particularly clear around the top of the left window frame suggesting degraded window frame quality. This was confirmed by daylight investigation.

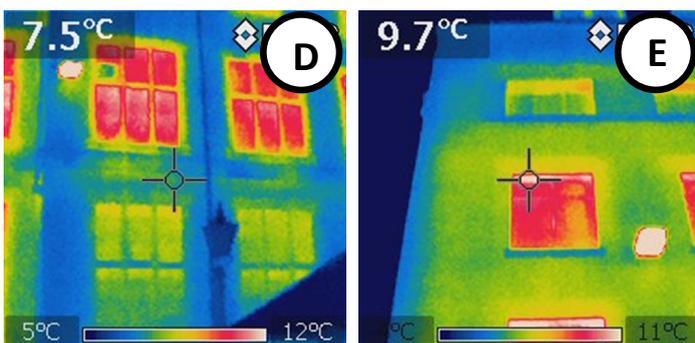
B) Windows of both labs 116 and 213 lose heat from their frames. There is clear colour bleed. The top right window is of an unheated room.

C) Internal image of a Lab 208 openable window, clearly showing the poor fit of the window when closed, letting out a significant amount of heat (dark blue).



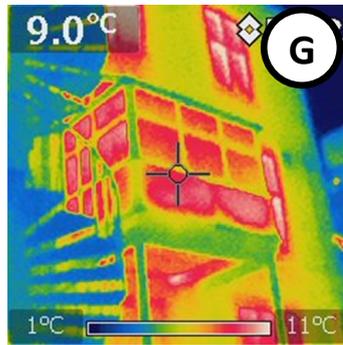
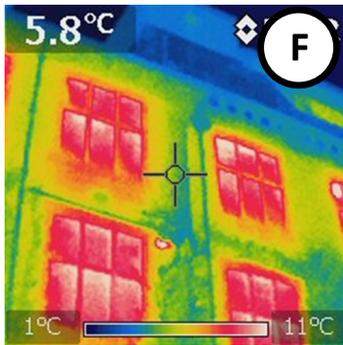
2) Secondary Glazing

The reduced heat loss from secondary glazed windows is obvious from the thermal images taken. With no prior information, surveyors could instantly identify them as in all cases there was several degrees difference.



D) Secondary glazing of the teaching laboratory has a clear effect in comparison to the admin offices above. The radiative surfaces are up to 4°C cooler.

E) Lab 201's secondary glazing (top) is nearly ten years old yet is still very effective compared to Lab 101 beneath. Lab 101 had its windows re-framed one year ago and in turn loses less heat than the mezzanine below (See **A**).



4) External wall radiators and Office 127

In several locations relatively warm wall patches match where radiators lie on the inside suggesting that heat from the radiator hot water circuit is being lost through the building fabric.

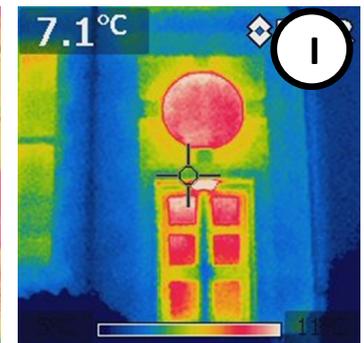
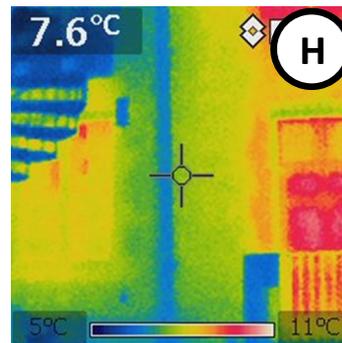
F) The first window in Lab 208 (top left) shows a relatively warm patch that matches the location of a radiator. Figures **A)** and **C)** also show lesser similar patterns.

G) Office 127 has five external faces and is difficult to heat. Surprisingly, from the thermal image it appears that the side-panelling and underside radiate similar amounts of heat as the windows themselves.

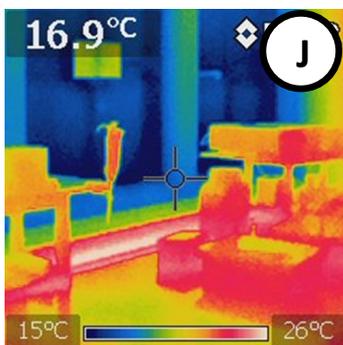
5) External doors

A surprise finding from the survey is the heat loss from the security and fire doors on the ground floor—especially those with panelled construction.

H) The teaching lab loses more heat through the fire exit door than through the secondary glazed windows (left of image).



I) The east foyer entrance to the north side of the building is well heated by a radiator. A lot of heat escapes through the higher panels (and circular window) to outside.



6) Trapped-in radiators

Many laboratories have boxed-in radiators, allegedly to make it easier to keep labs cleaner and more hygienic. Arguably, the inaccessibility of the radiator voids lead to a build up of litter, dust and debris anyway. In addition, the radiators cannot heat the space effectively and air conditioning is sometimes required to provide additional heat.

J) Mezzanine radiator void— even three hours after the central heating was switched off, the void is holding rather than dispersing its heat.

Action Points

- Maintenance work to restore single-glazed window frames and seal laboratory windows must be prioritised.
- Secondary glazing should be a standard measure in future refurbishments
- Budget secondary glazing options should be investigated for reasonable pay-back retrofits.
- Radiators should be exposed where possible and reflectors positioned behind radiators on external walls to minimise heat loss through building fabric, especially in spaces where heating is often deemed insufficient.
- Radiant barrier wall insulation or similar measures should be evaluated for use in office 127 and on external doors.

