Thermal Imaging Training

Cambridge Carbon Footprint

Wed 3rd Dec 2025, 7:30 – 8:30pm

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Thermal imaging

- **get free training**, *then:*
- **borrow a camera**
- **find heat leaks**

See your home in a new light:

- **reveal thermal problems**

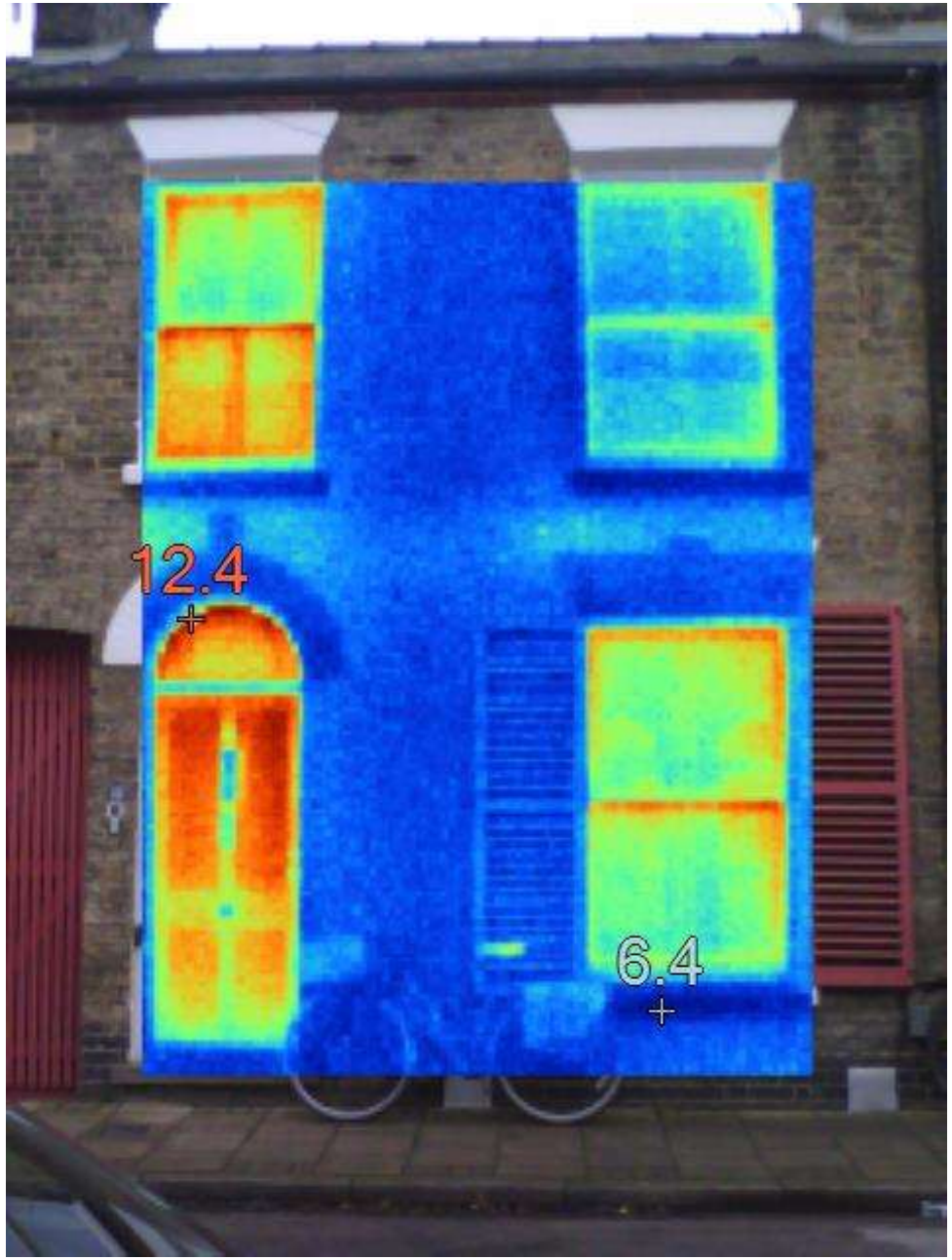
and fix them

- ***improve comfort***
- ***cut bills & carbon emissions***

Sections of this Training

1. Uses of Thermal Imaging
2. Using a TI Camera
3. Interpreting Images: pitfalls
4. Borrowing a Camera

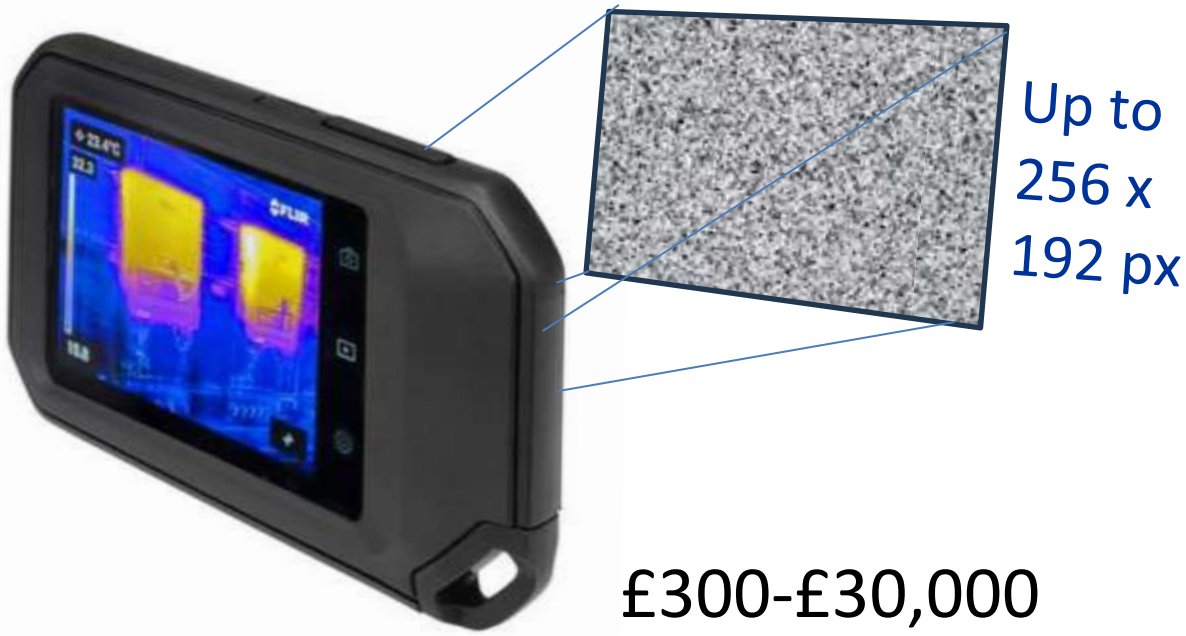
   - Questions after each



IR Thermometer

£20-£60

Thermal Camera



£300-£30,000

Both measure Infra-Red to show <u>surface</u> temperatures

Can show thermal effects of deeper structures, insulation, etc

White-hot objects emit *visible* light; all surfaces glow in *Infra-Red*, more so at higher temperatures

Uses of TI

Insulation Problems

Looking up at top-floor ceiling

From inside: blue, cold = leaky

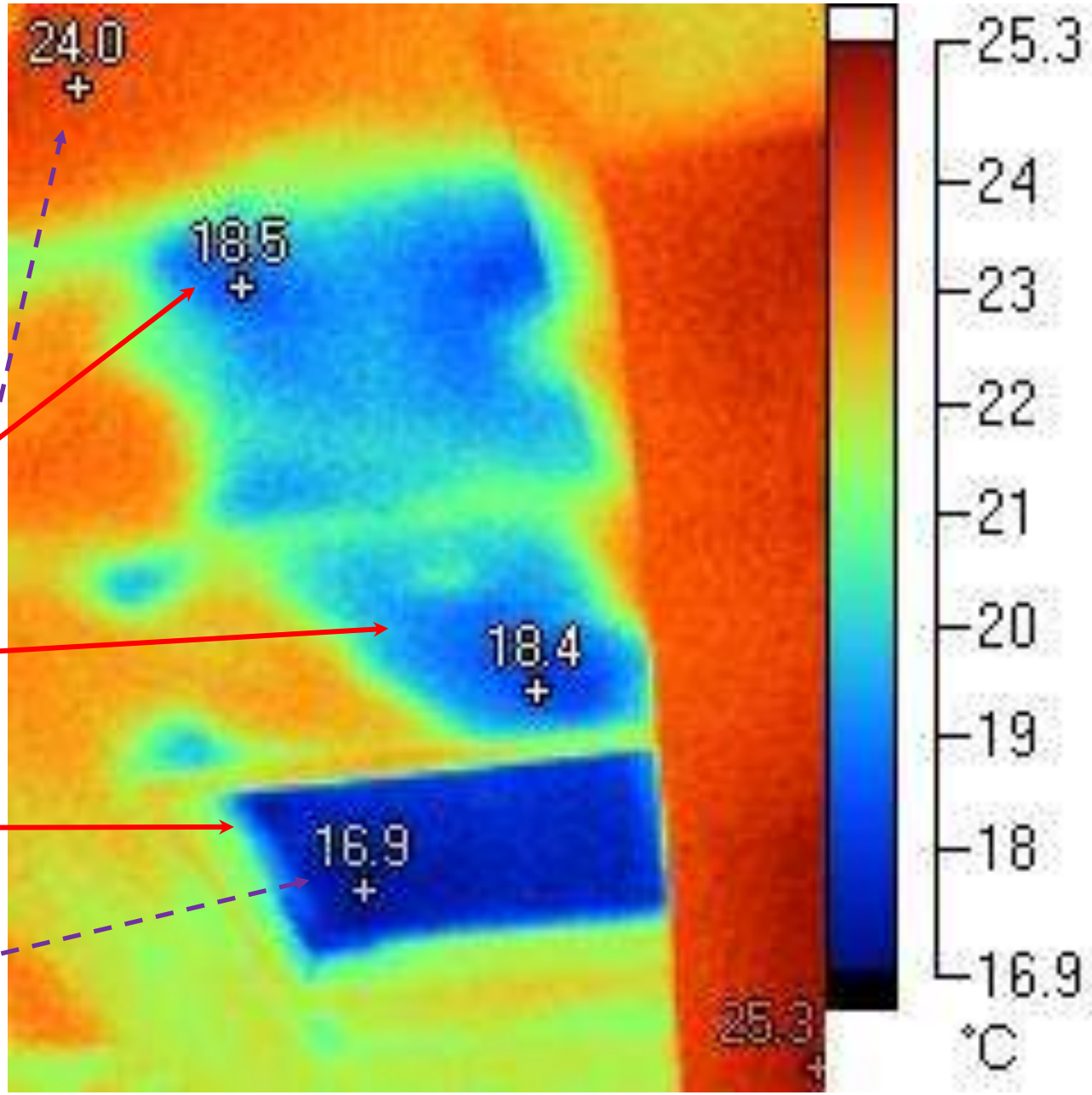
What are we seeing?

Loft insulation missing or thin

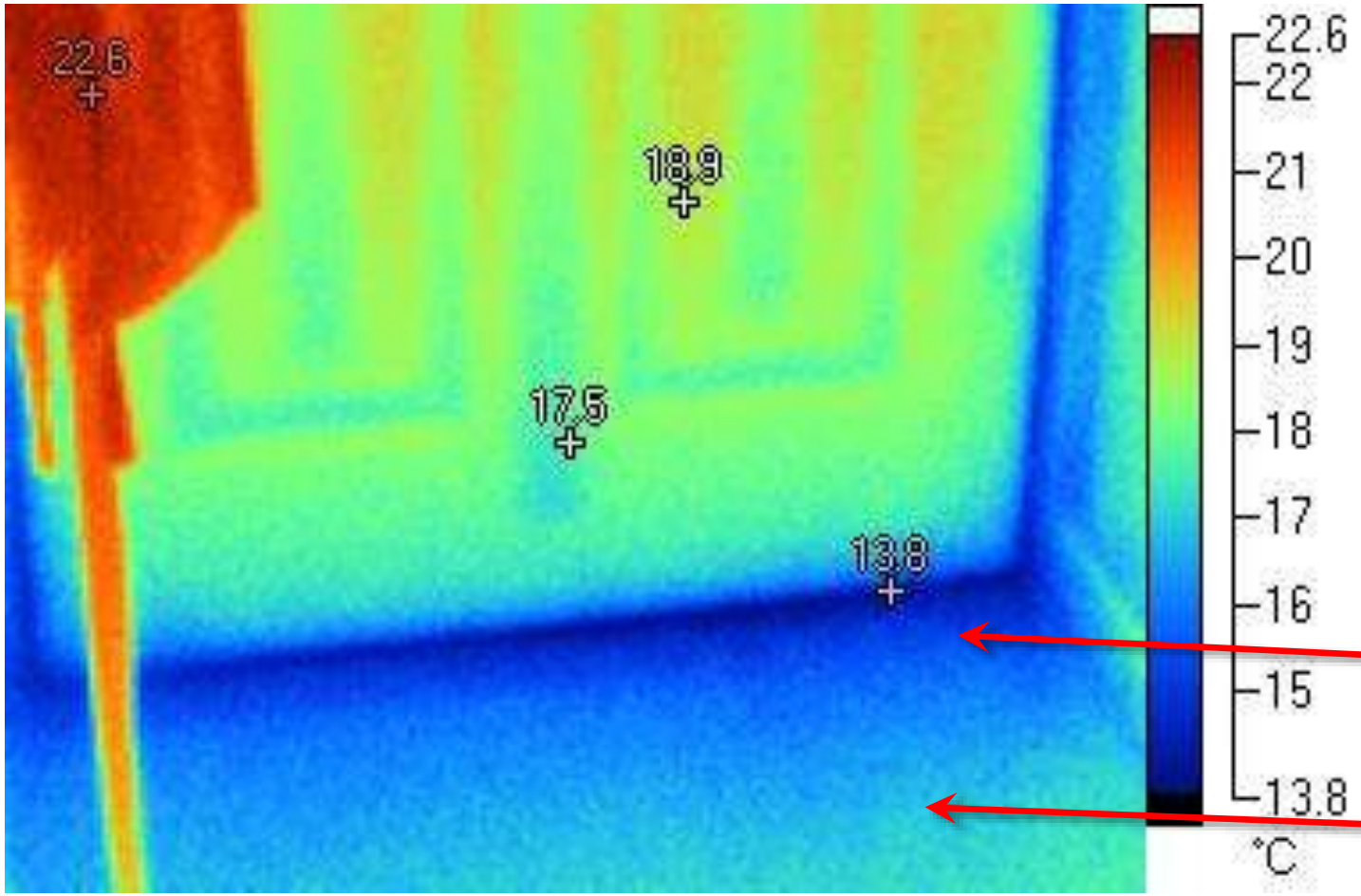
Poorly insulated loft hatch

>5°C difference - worth fixing

Depending on area, ambition



What's this? Draughts



Find more draughts on a windy day or **turn extractor fans to max** to draw cold air in through leaky spots.

Cambridge Retrofit Hub offers DIY workshops making Big Window Fans for leak detection. *More in Chat*

Cold draught under door

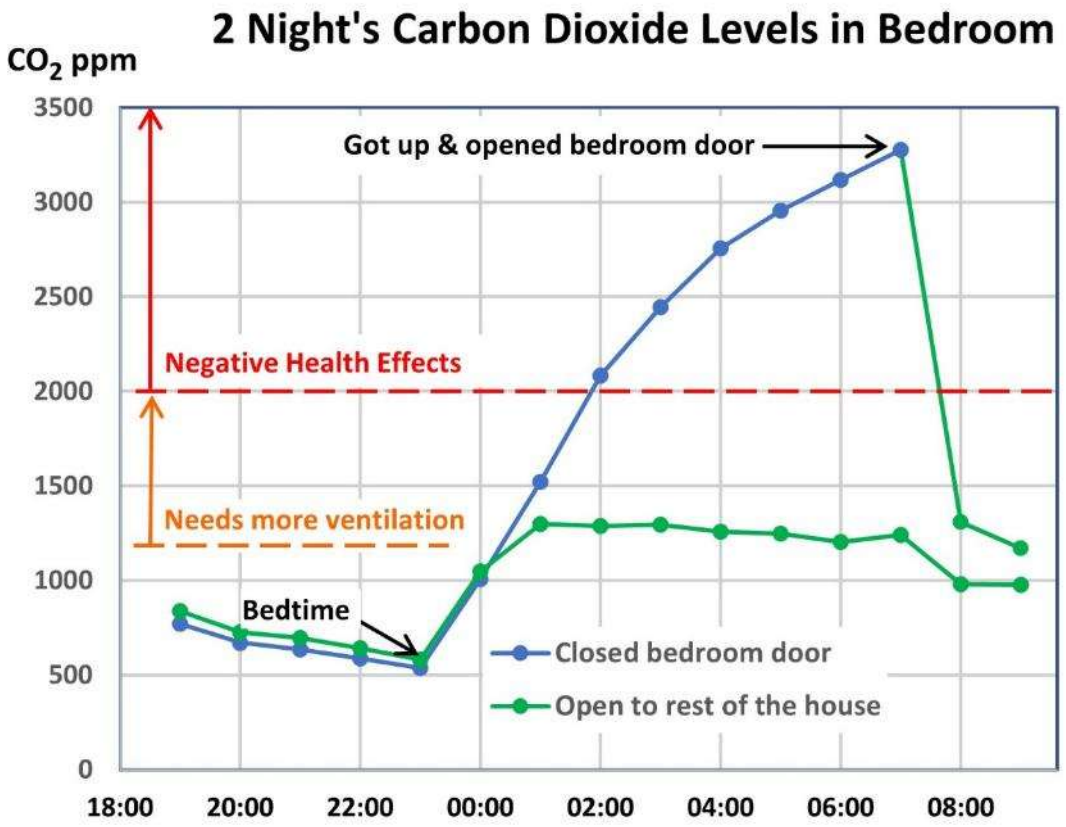
Typical indistinct edge

Balance draught-proofing your home with the need for ventilation!
Don't block vents, unless you're sure they're not needed.

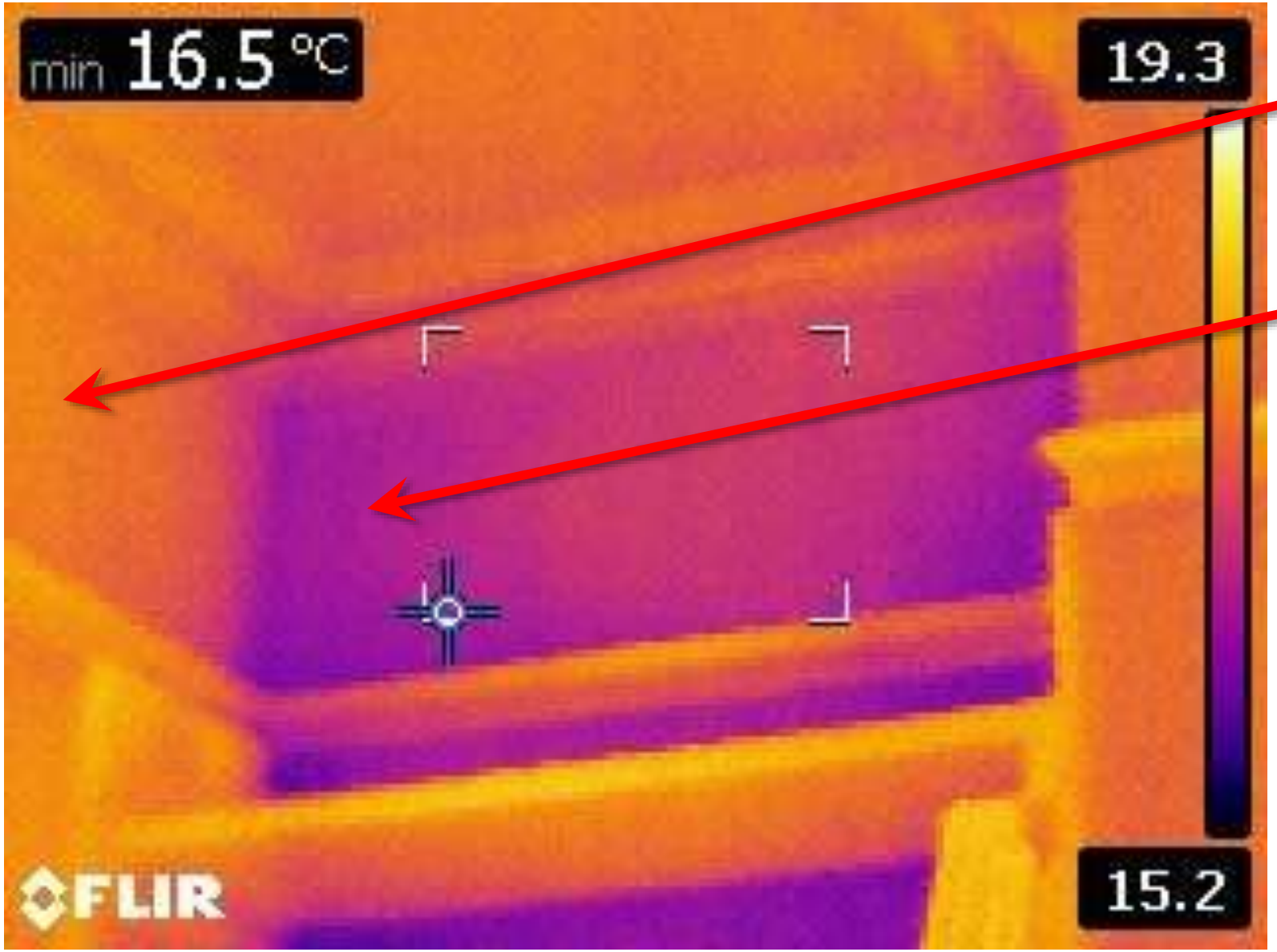
CO_2 Monitor Loans from Newnham Cambourne, Histon or Eddington

Check for poorly ventilated rooms

Fri pm to Fri am loans. Online resources, no training needed



Checking insulation on External Walls



Internal wall – another warm room on the far side.

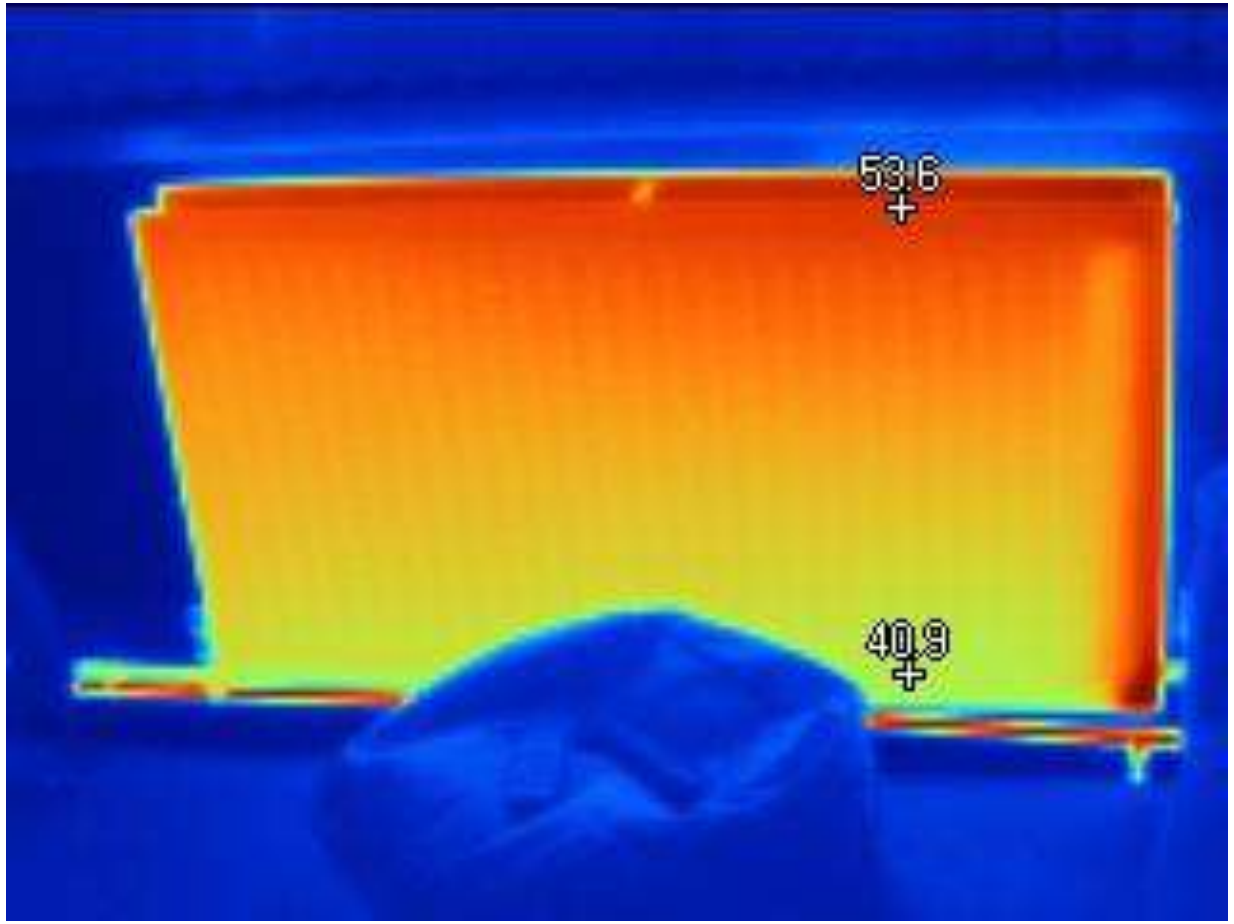
External wall - cold outside on the far side.

If all the **external** wall is more than **1-2°C cooler** than the internal wall, then **better insulation** of the outside wall would be good.

- as in this case

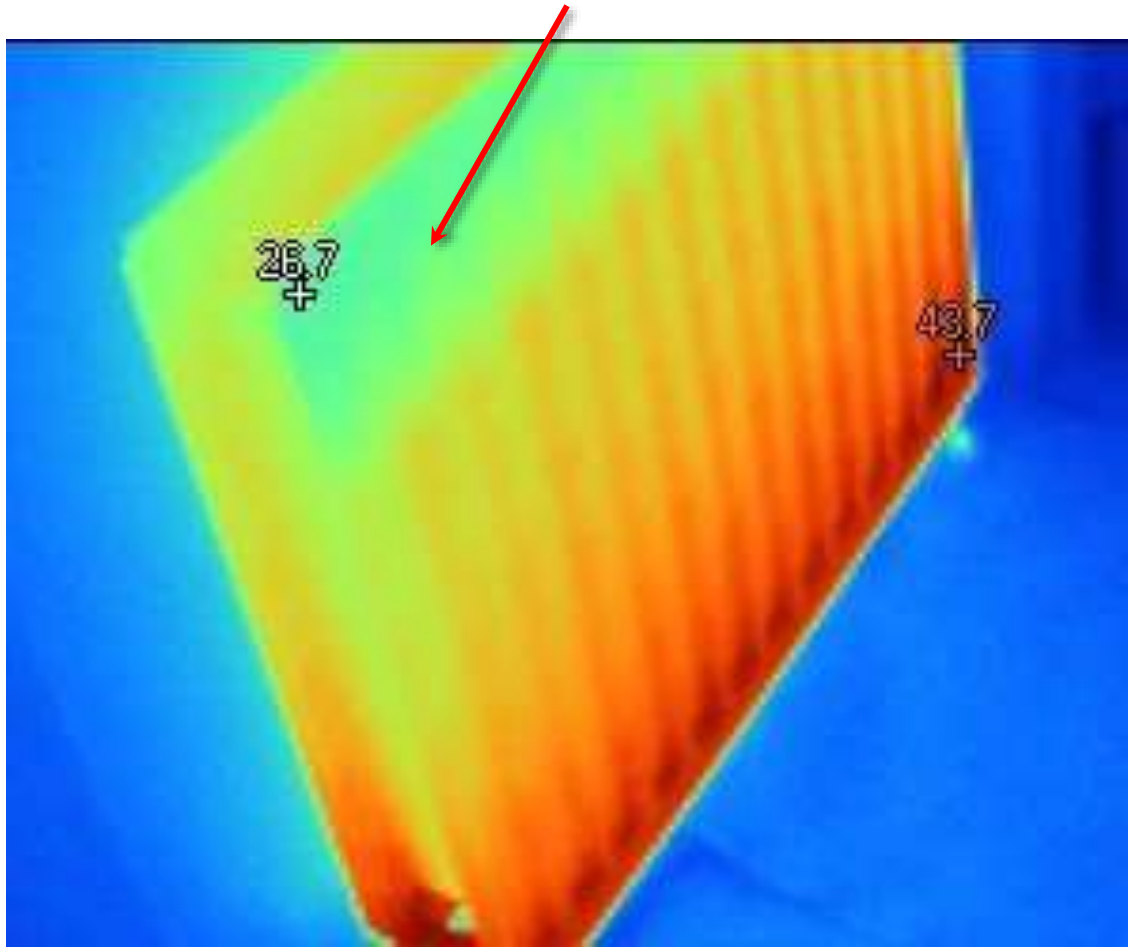
Heating Systems

Normal radiator



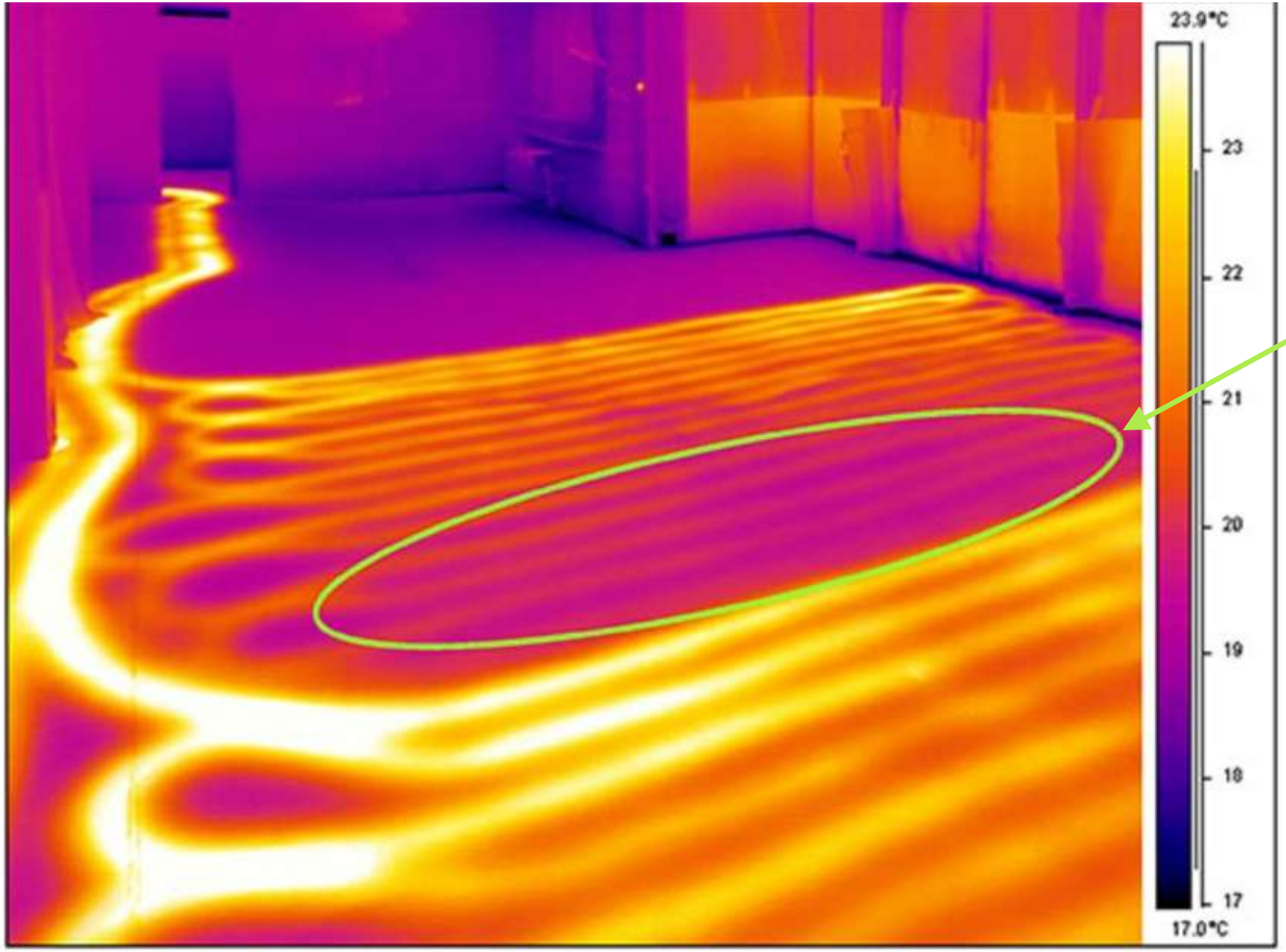
What's wrong?

Air in top of radiator



How to Bleed a Radiator

Under-floor Heating



One heating circuit gets cooler towards the end - probably insufficient hot water flow.

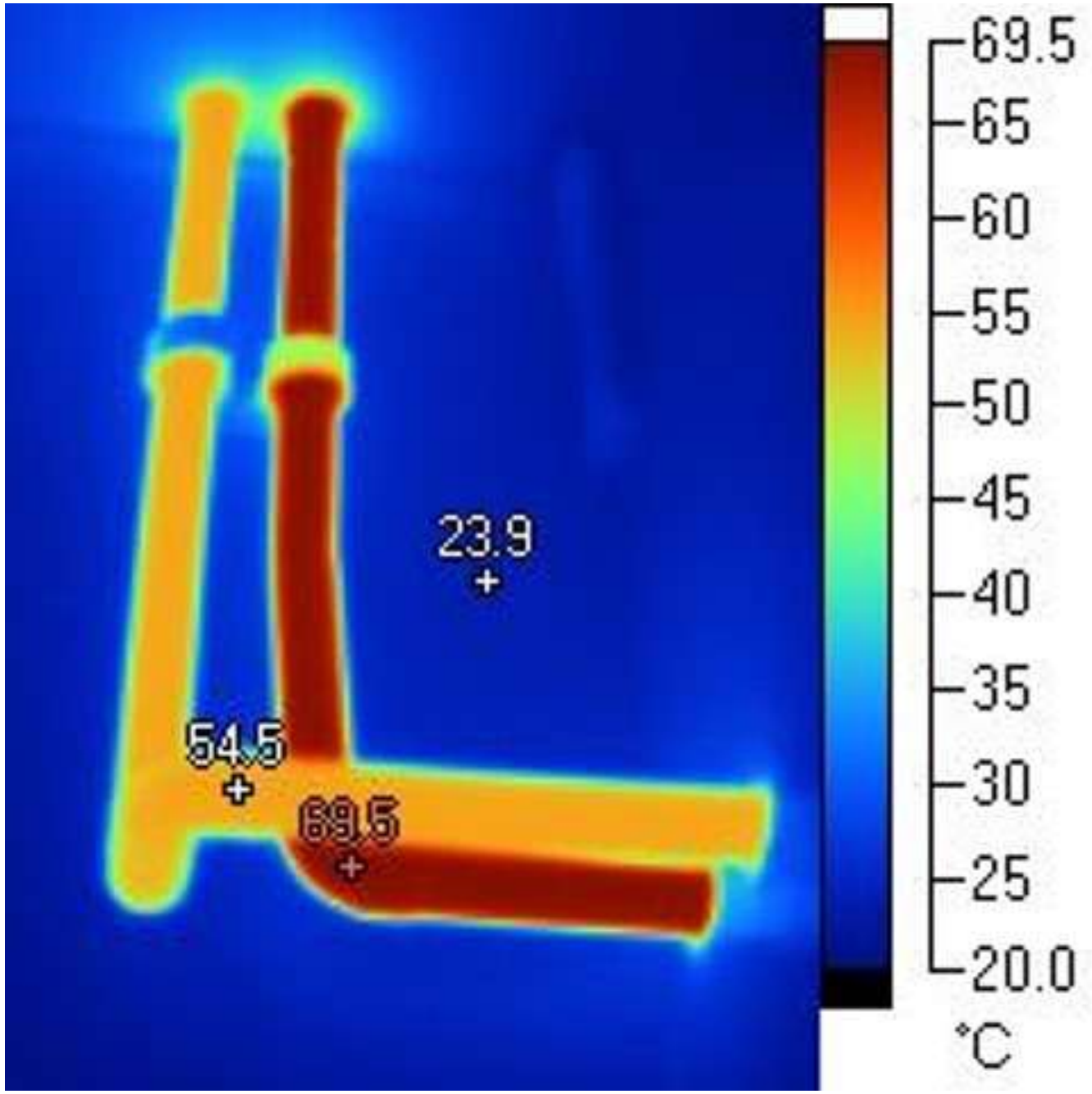
Normally adjustable with a valve

Image from Red Current

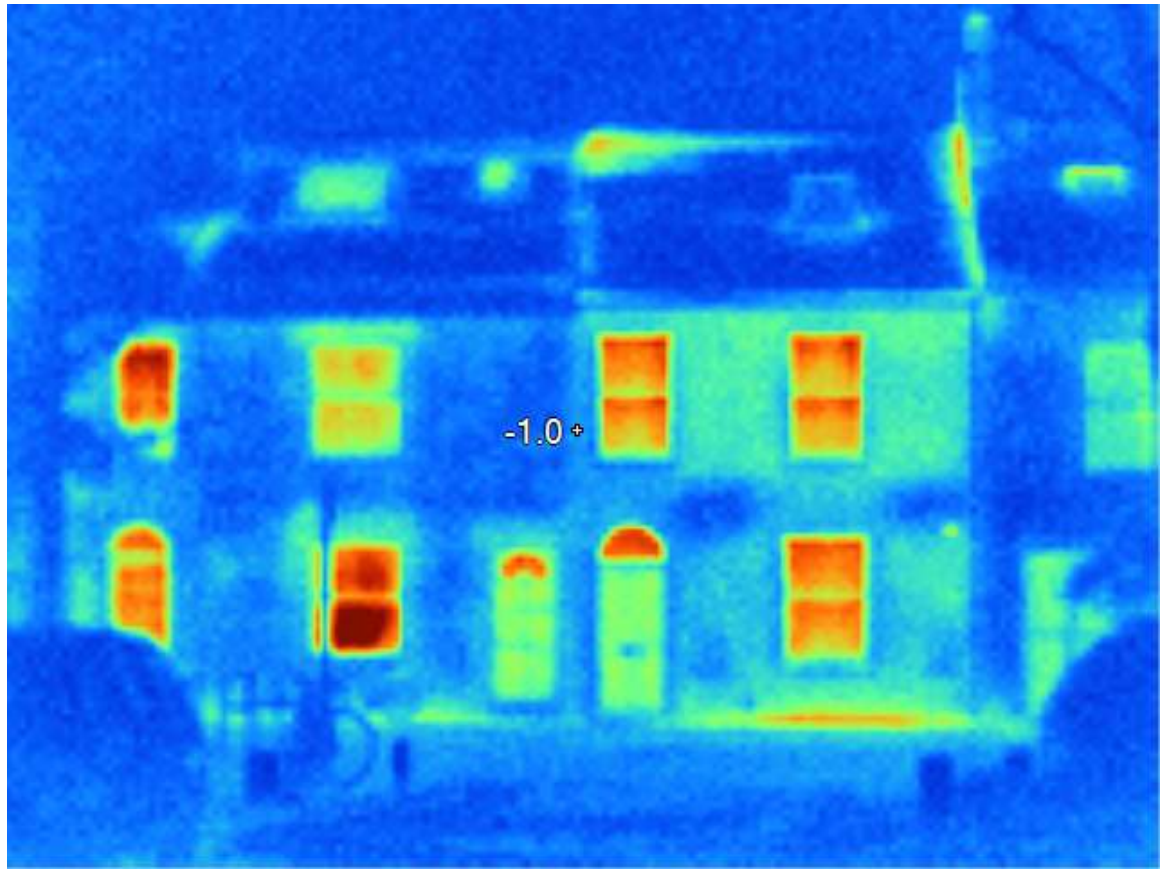
Hot Pipes

Heating pipes outside the thermal envelope need Insulation.

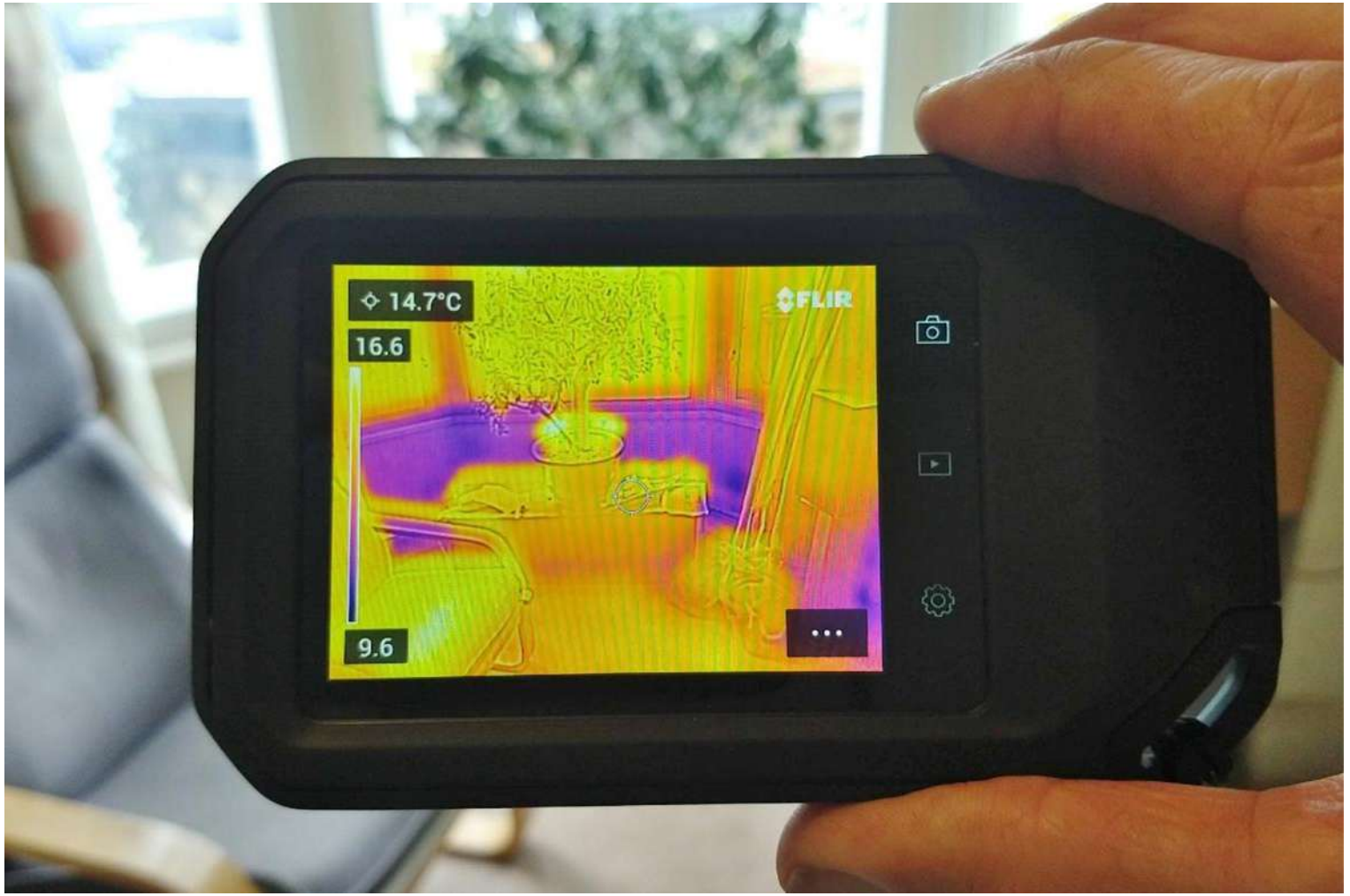
Hot water pipes always need insulation because they are hot in summer too when heat leakage is unwelcome.



Questions 1: Uses of Thermal Imaging



Section 2: Using the cameras



Thermal Cameras

Bosch GTC400C (1)
160x120px

Internal Memory, USB

FLIR E4 (1)
80x60 px

FLIR E40 (1)
160x120px

Manual Focus,
SD Card, Lens cap

FLIR One Edge Pro (1)
160x120px With phone

Flir C2 (5) 80x60px

FLIR C3-x (1) 128x96 px

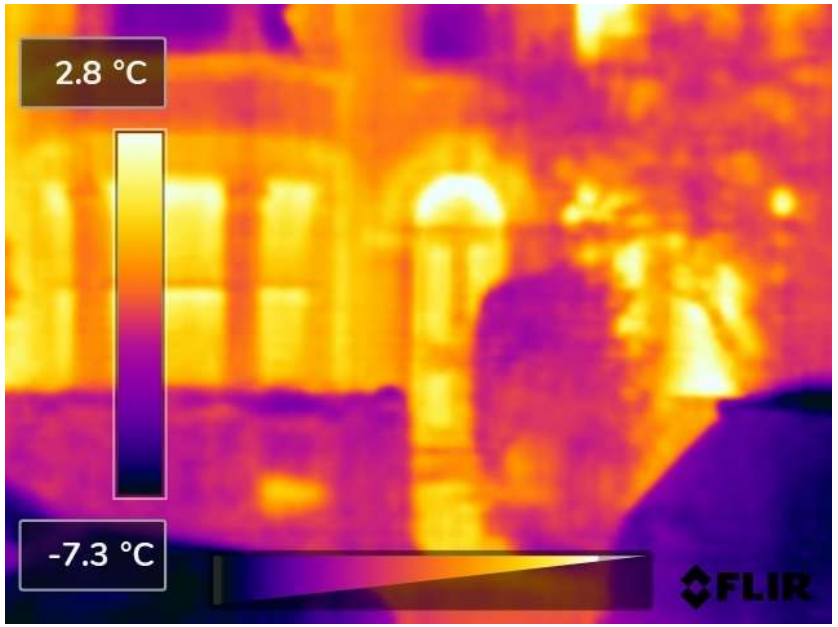
FLIR C5 (1) 160x120px

Touch screen, USB connection

Hikmicro Pocket 2 (5) 256x192px

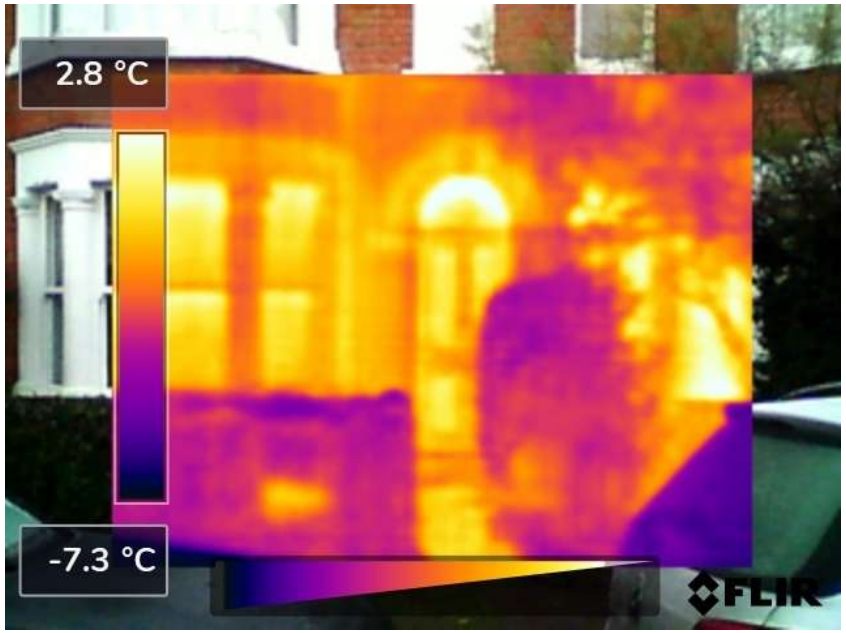
See Video & User manual for your camera

Picture modes



Thermal Only

With MSX



Picture-in-Picture

Colour –Temperature Scale

55°C

Temp Scale

4.9°C

Auto

Always re-adjusts scale to include hottest & coldest temperatures in view

Best for normal use

But extreme temps cut thermal resolution

25

4.9

Manual or Locked

Locks the current temperature scale

Useful if temperature extremes are in view, giving better temperature detail.

- Or for comparisons, keeping the same scale

White = off-scale, hot

14.9 **Auto**

Includes clear cold sky at -50.9°C!

Span

-50.9°C

Set a Manual Scale:

Cameras vary in manual setting of Temp scale. *See camera's User Manual.*

Or, more easily:

In Auto, point camera at area of interest, without any Temperature extremes and then switch to Manual

8.2

Manual

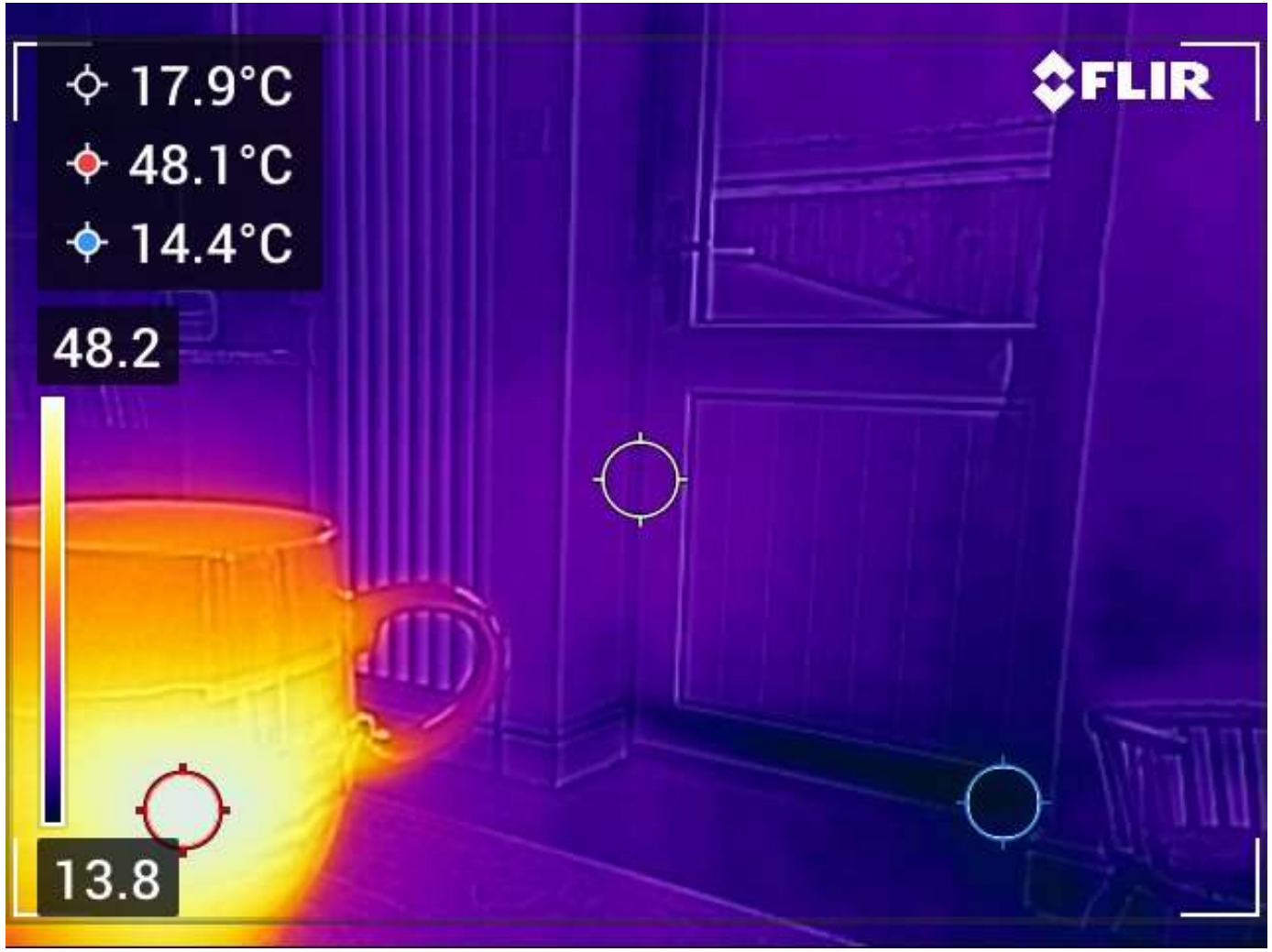
Black = off-scale, cold

-7.7

Optional Spot temperatures

- Centre-spot
- Moving spots: hottest / coldest in view

Cameras vary in this



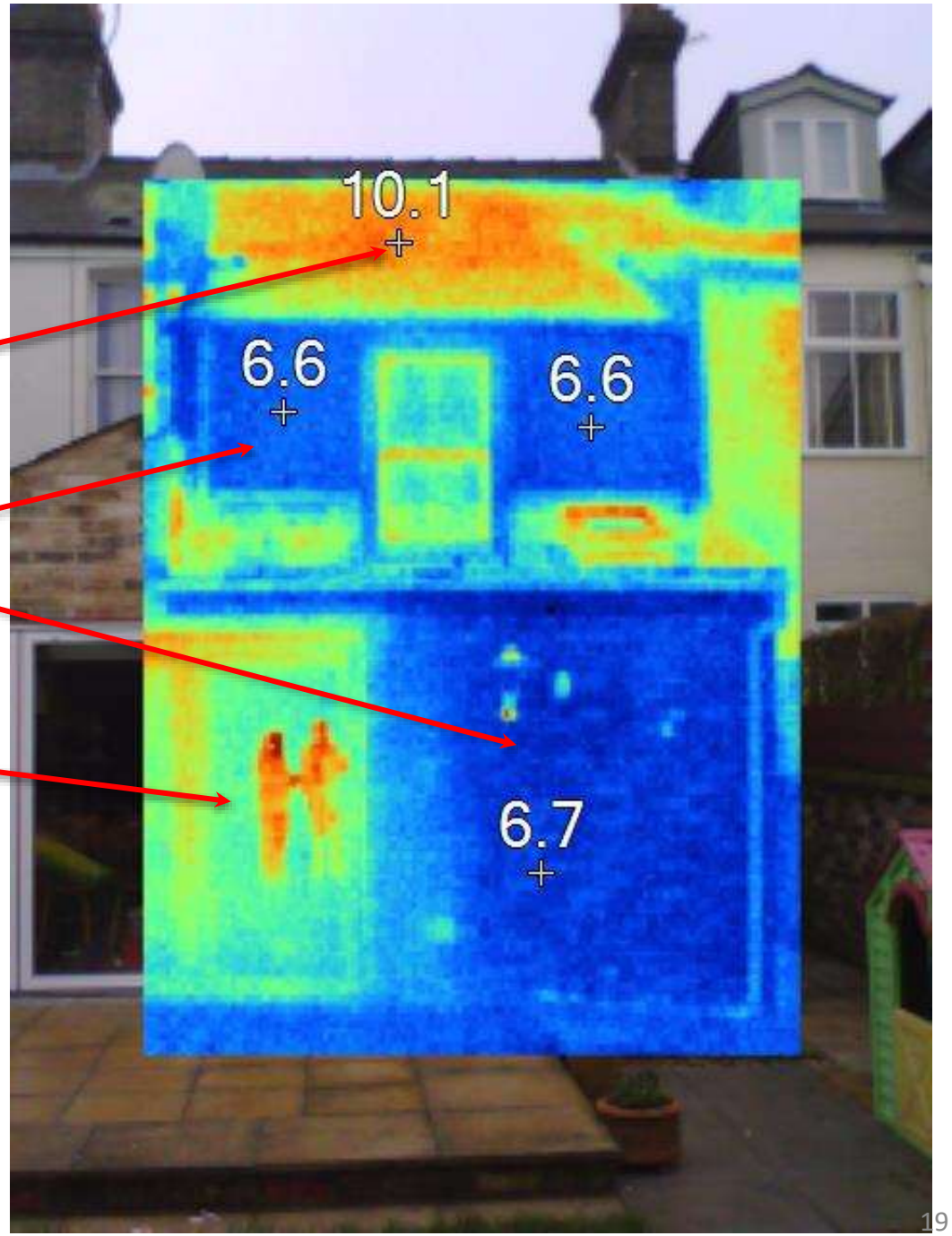
Viewing the outside

Hot = leaky

Warm: poor Loft Insulation

Cool: good Wall insulation

Reflections in glass



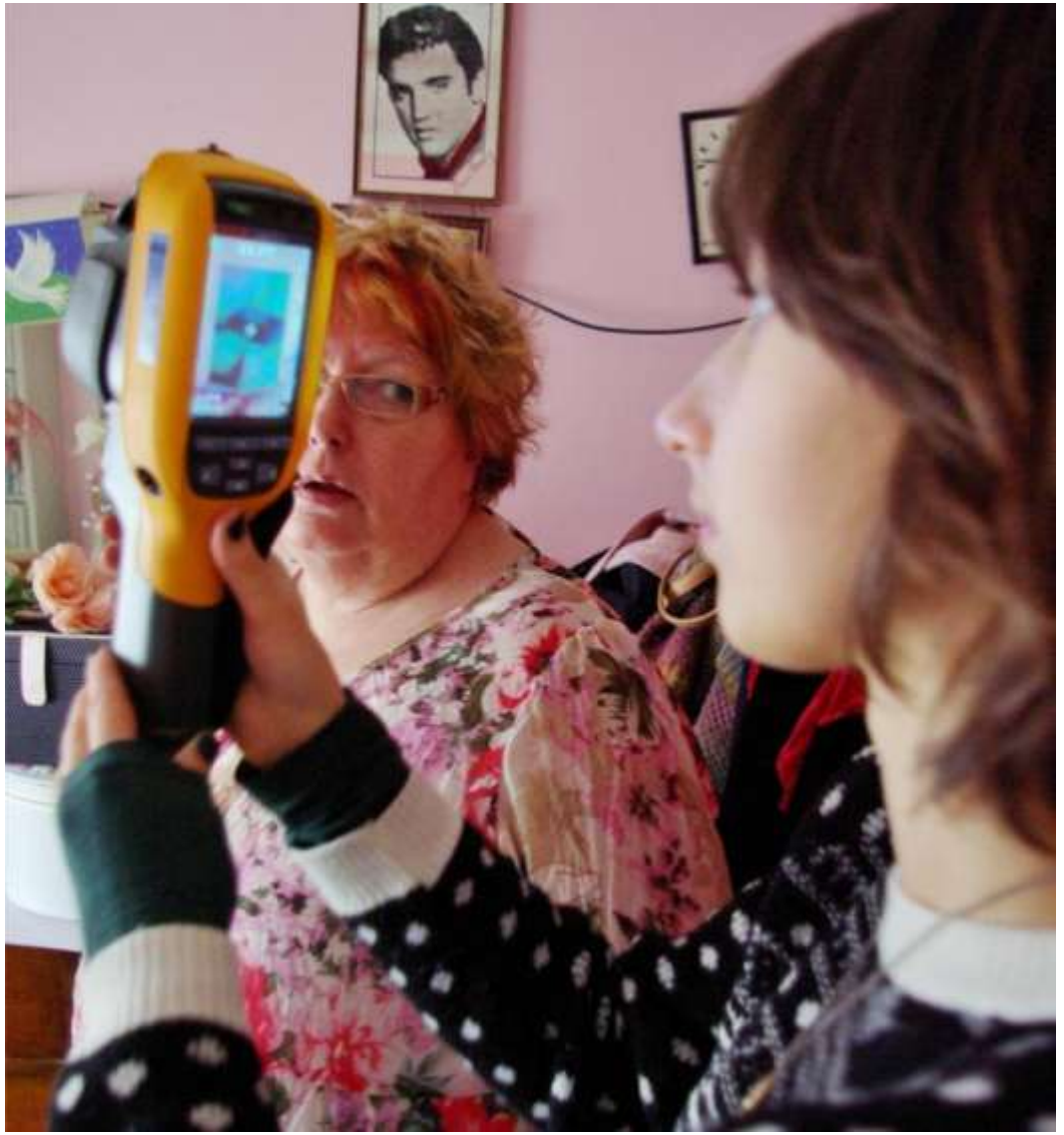
House Survey - allow ~ 90 min

Preparation:

Choose a time when it's cold outside:
preferably >10°C warmer inside than out.
If not, pre-heat the house for several hours.
Ideally without sun, wind or rain
Check the camera's charged & working

Survey:

Look all around every room:
What is unexpectedly hot or cold? Why?
Investigate those places: distant and close
Make comparisons
Check from the outside too
Take plenty of images with notes



House Survey - more details to look for

Walls:

From inside: cold windows, doors and patches on wall.
Draughts all round the frames. Also letterbox & extractor fans.

Ground Floors:

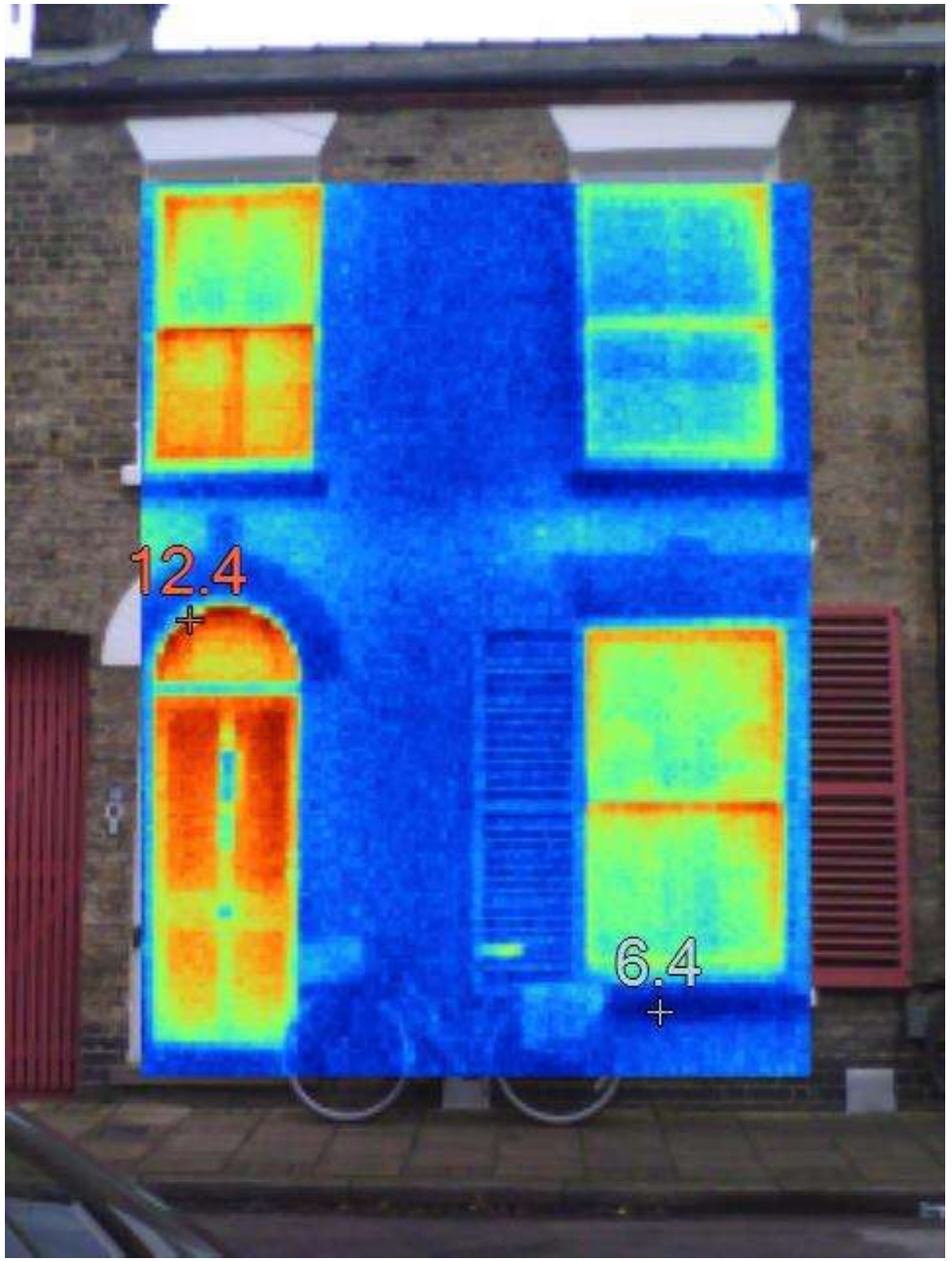
Cold patches (could mean water leakage or damp).
Suspended floors: Hot pipes with poor insulation
Draughts between floorboards, Skirting boards

Upper ceilings/attic

Skeilings (Sloping Ceilings under roof) are tricky to insulate.
Missing or thin loft insulation (should be none below a cold-water tank). Loft hatch - fix any draughts and poor insulation

Outside:

Draughts around windows, warm roof or patches on walls.
Don't worry about heat leaking from vents, unless you're sure they're not needed and could be blocked.



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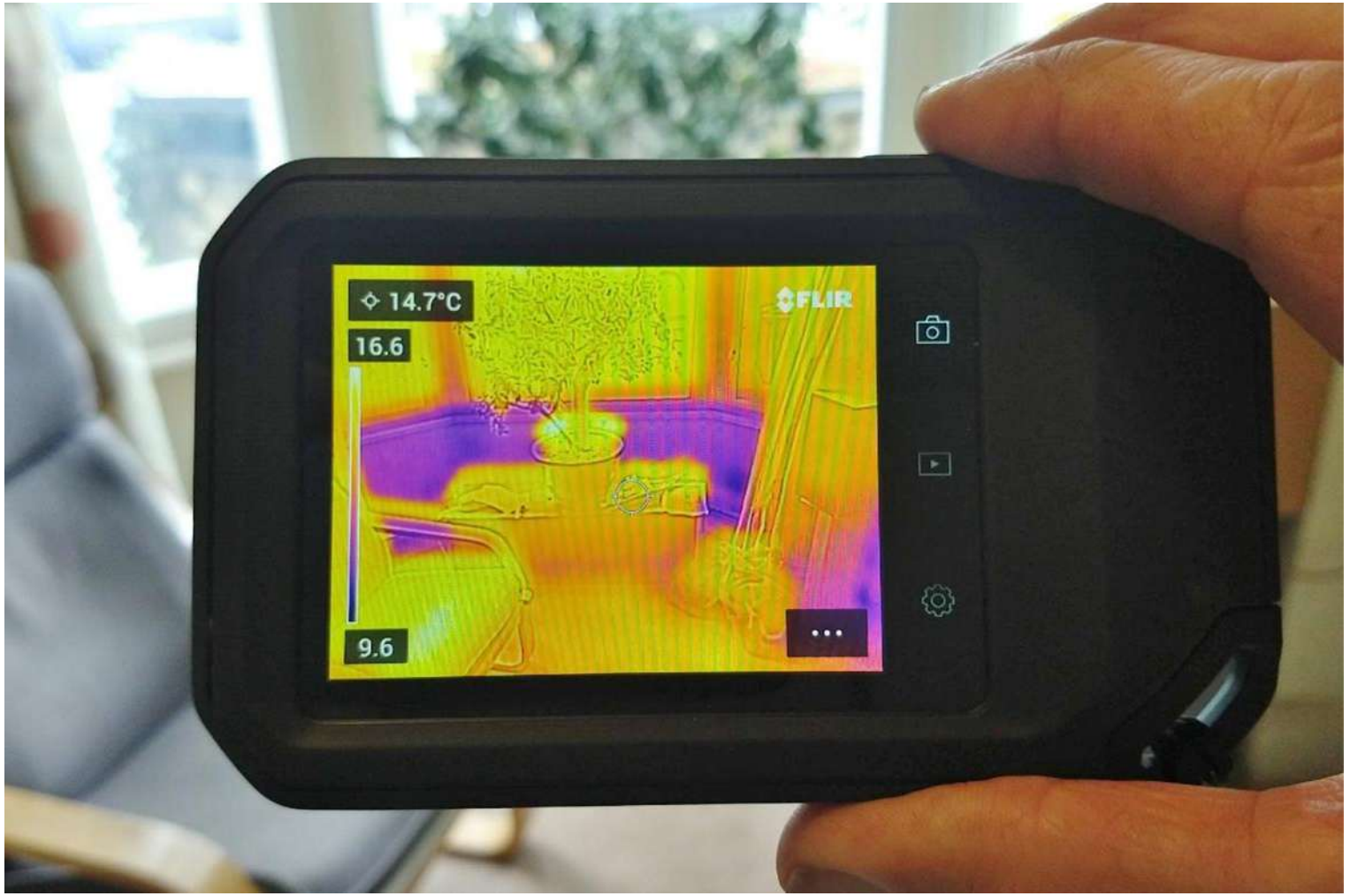
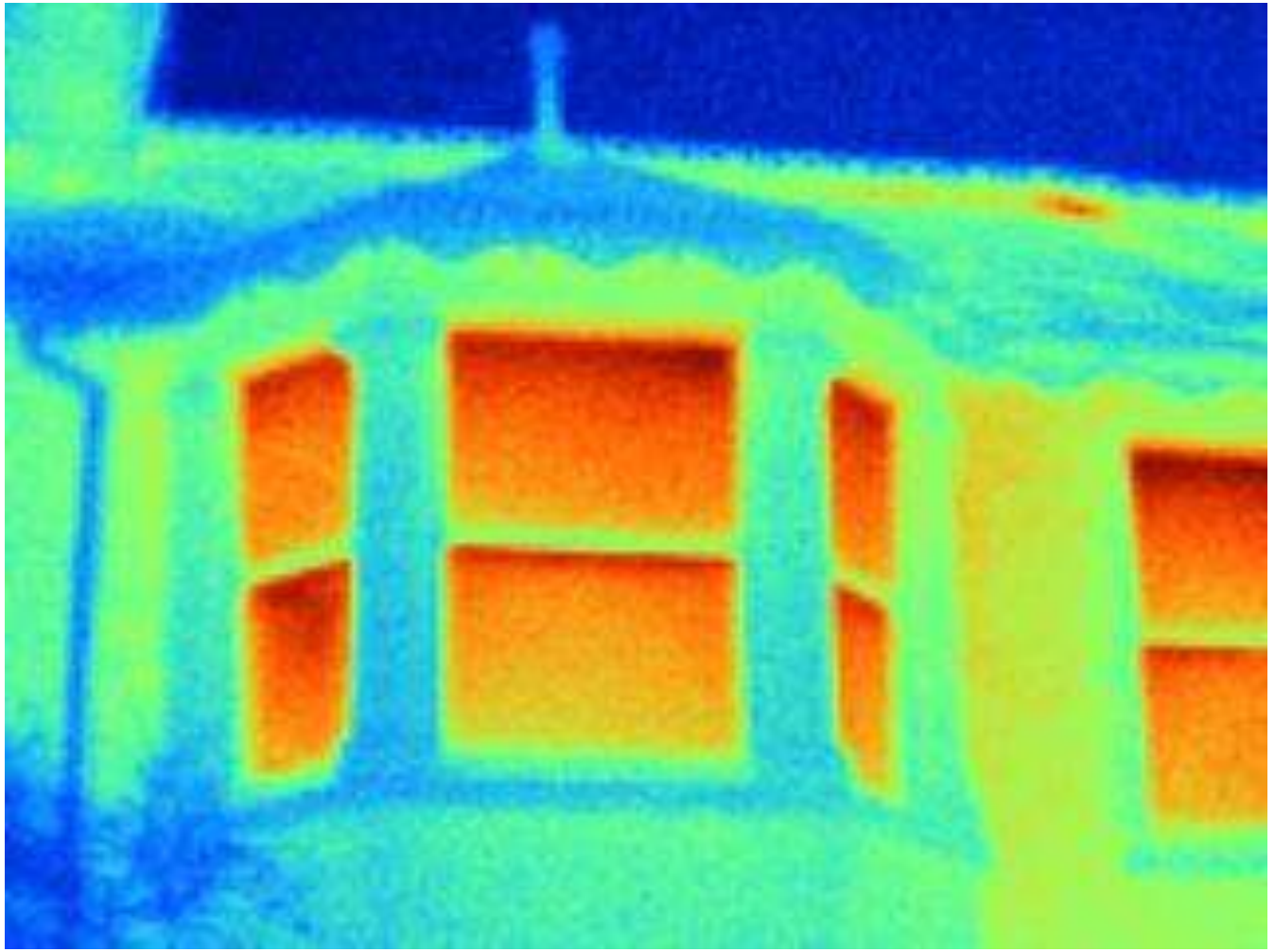


Section 3: Interpreting Images



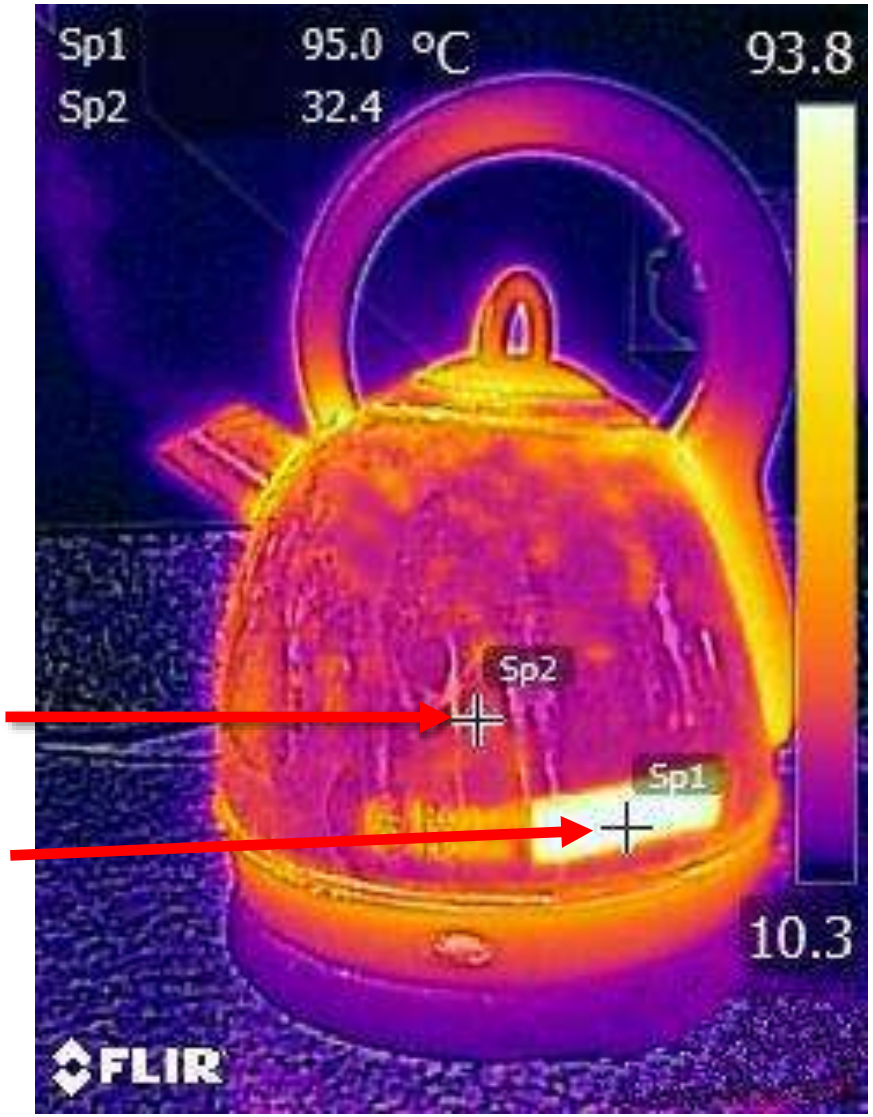
Reflections

When light hits a surface it can be reflected or absorbed. The same goes for IR radiation. Bare metal reflects a lot so you get the wrong temperature.

Just-boiled stainless steel kettle:

Bare metal reflects the surroundings – the temperature reading is much too low: **32.4°C**

PVC Tape shows the true temperature: **95°C**



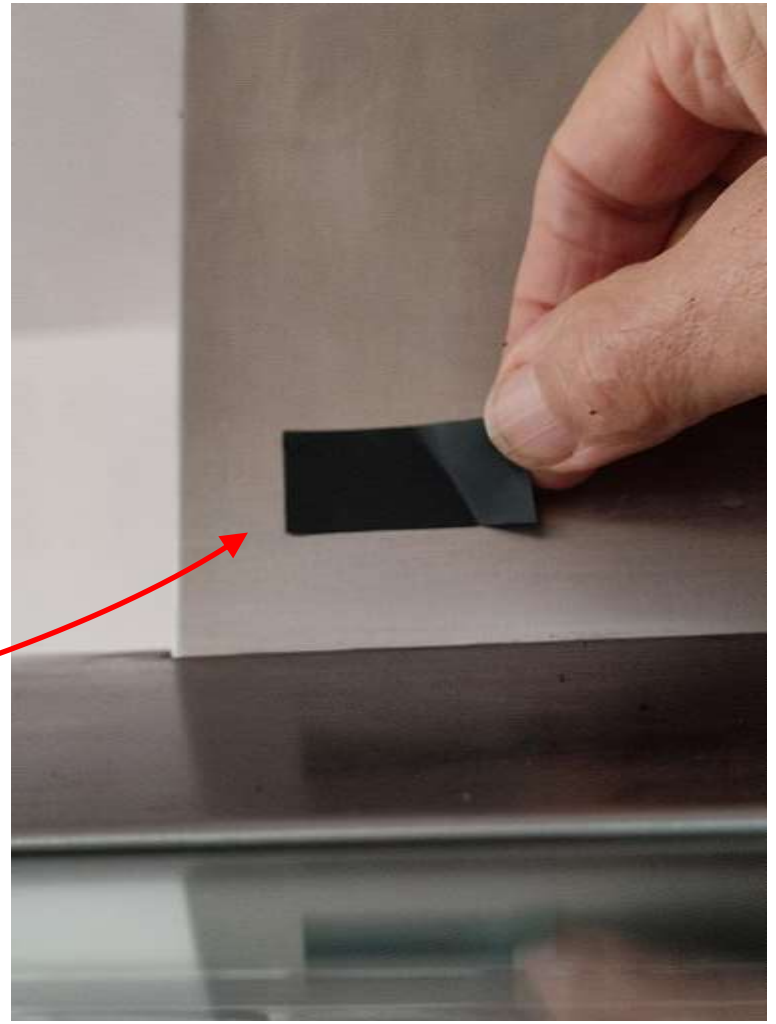
Readings of Reflective Surfaces

Most building surfaces give good readings :

- Brick, stone, wood, plastics, etc
- Paint (unless metallic)
- Carpet, curtains, fabrics ...etc.

But for reflective or transparent materials apply PVC tape & measure its temperature:

- Glass
- Bare metal
- Bare concrete



A Cooker Hood Flue

Why is the upper window so cold?

Sky - 60°C

Upper Window -12°C

Reflected Sky

Solid Brick Wall -8°C

Why are the walls different temperatures?

Walls **will stay warm from the sun** for hours

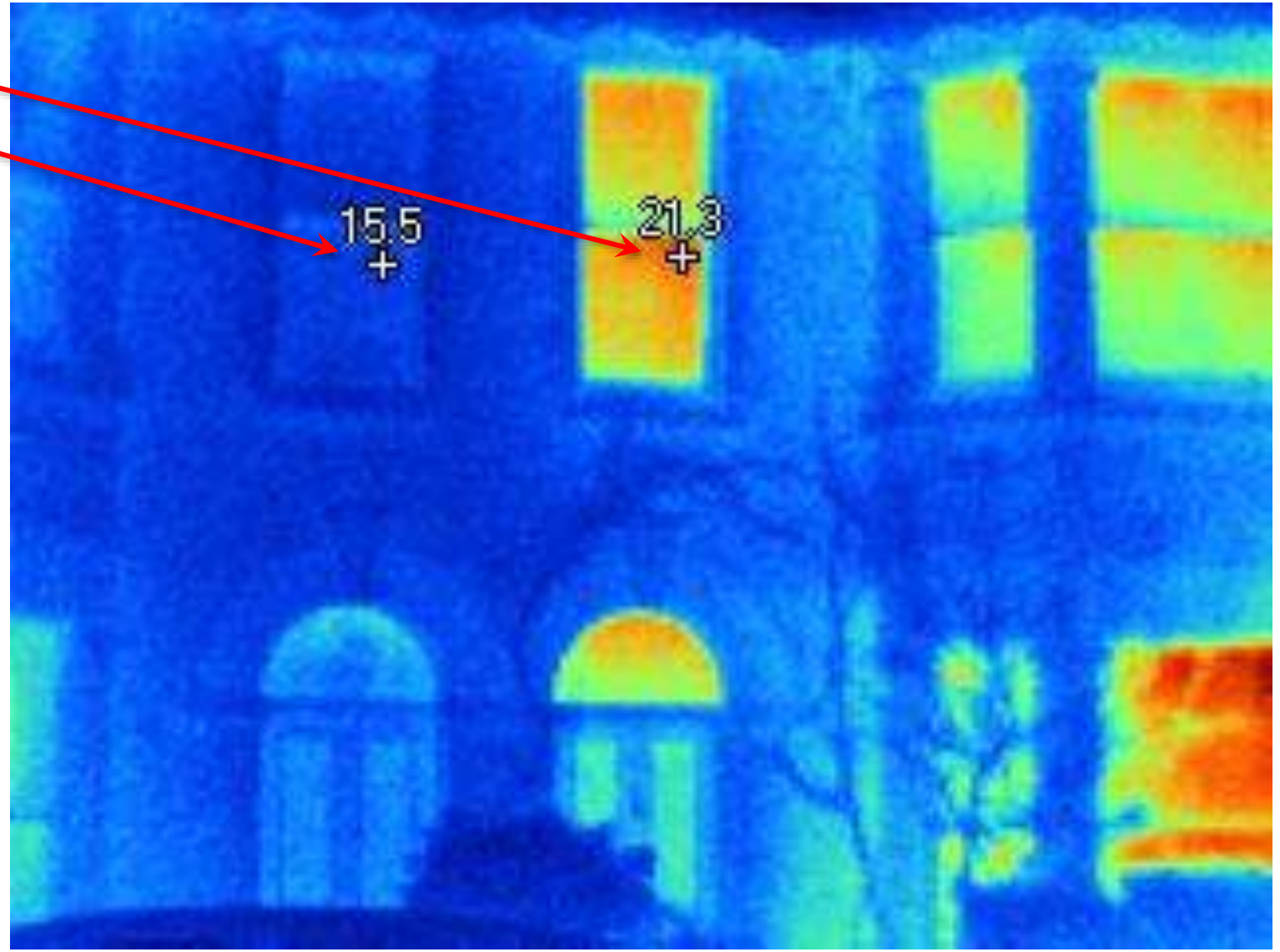
Why are the houses so different?

Why Different Temperatures?

Tom's house on left: Low thermostat, warm clothes, secondary glazing

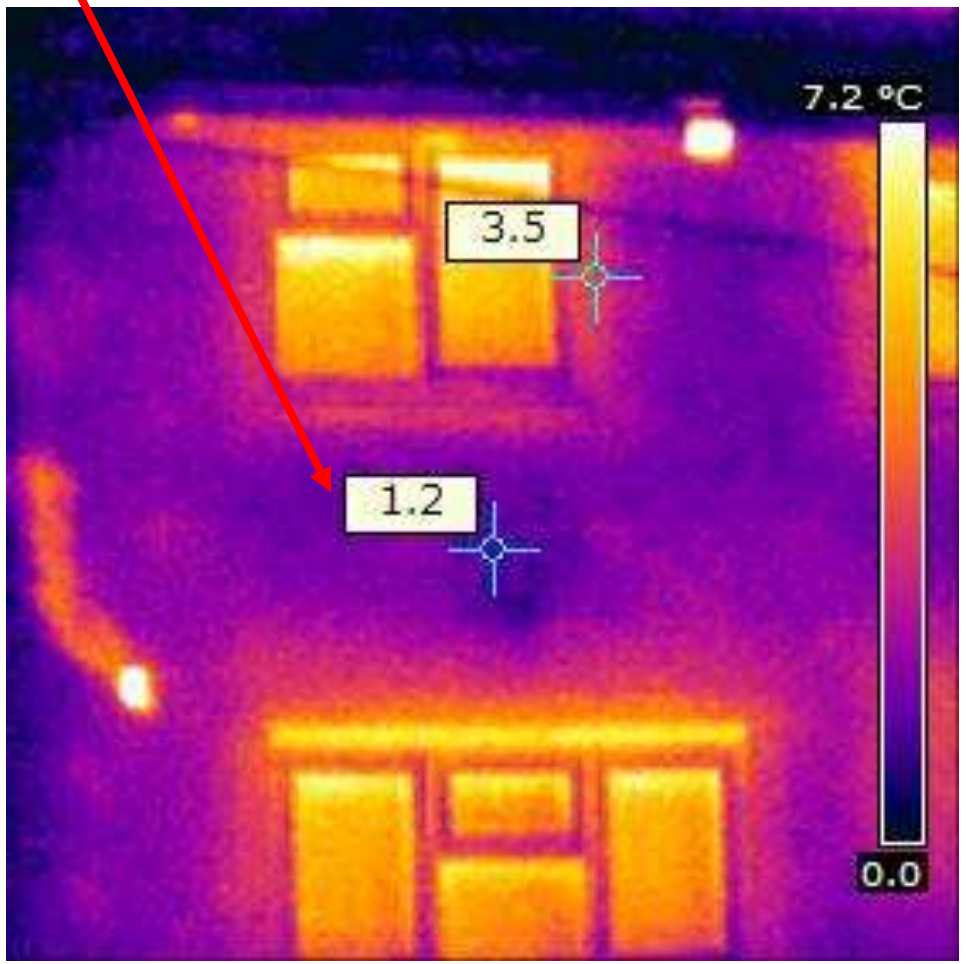
Neighbour had health problems needing warmth

More than technical issues….



What Problems?

Why the difference in temperature below the windows



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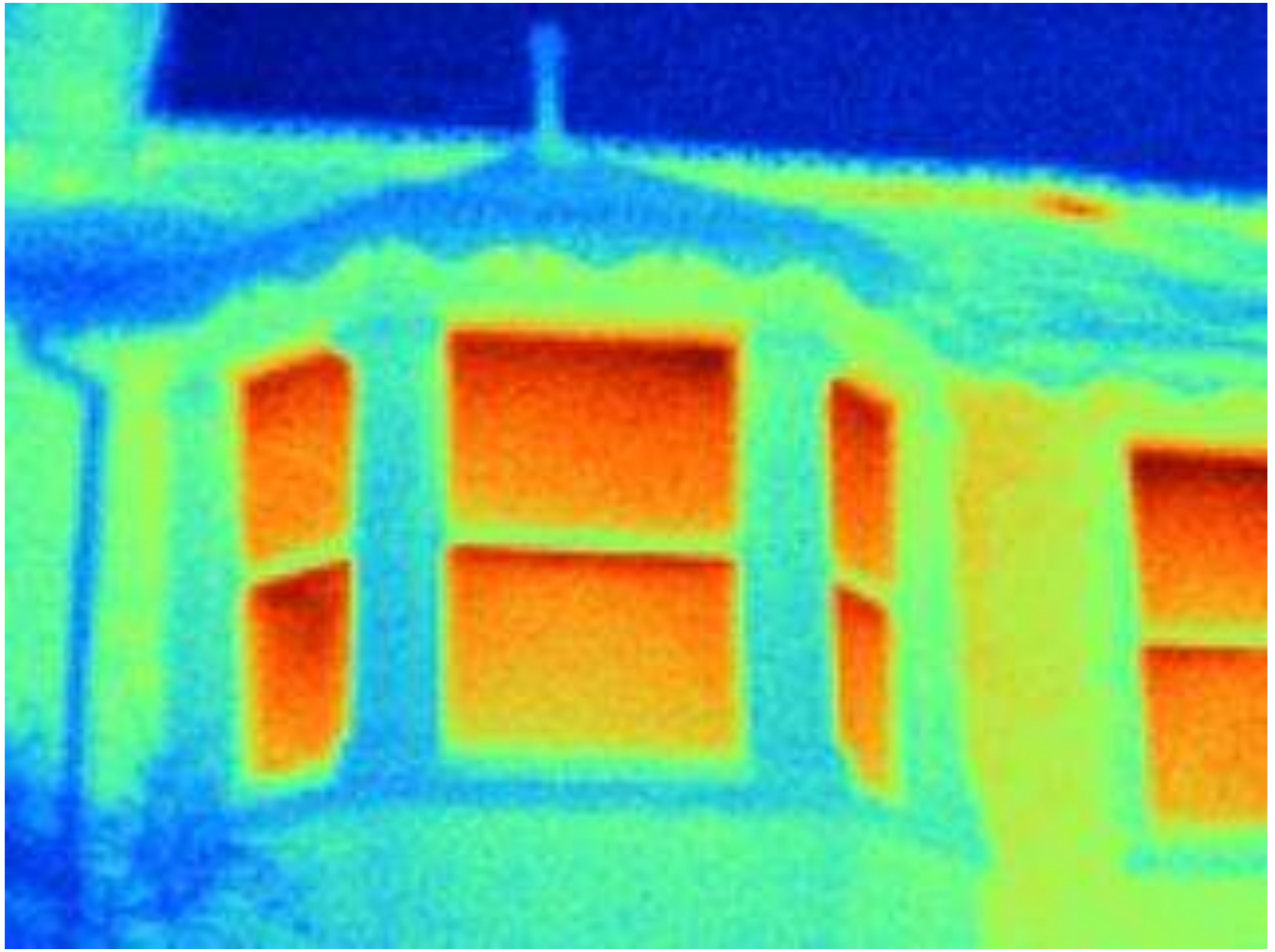


Section 4:

Booking etc

Borrowing a camera

First ‘Sign’

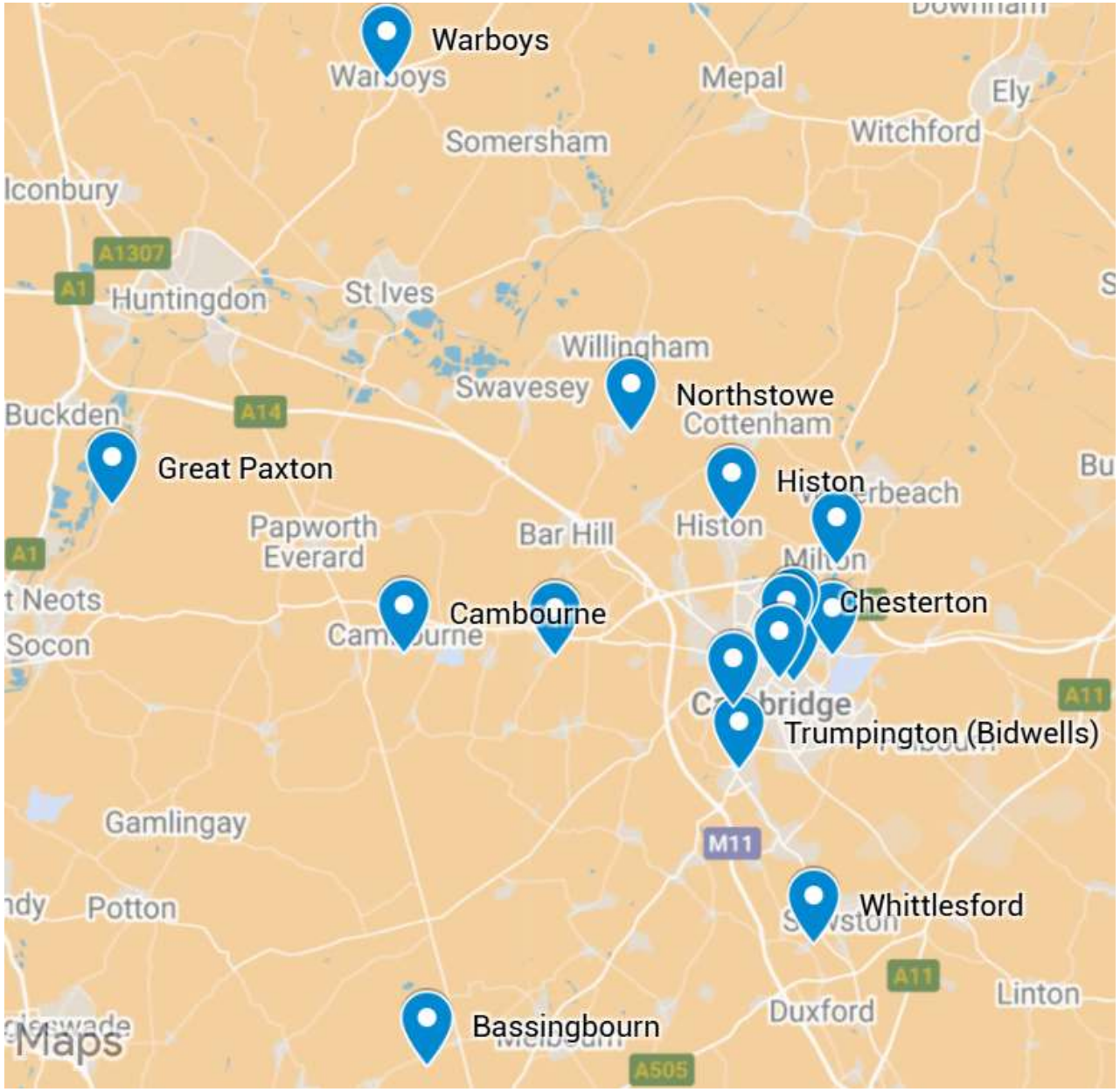
TI Camera Borrowing Agreement:

- Keep camera with you or in a locked place
  Don't lend it to anyone else
- Collect & return the camera as agreed
- **After**: fill Survey Record form for each building
  - used to measure our impact

Book a Camera after Training

Normal Collection & Return times			
Weekdays		Weekend	
Collect	Return	Collect	Return
Monday	Friday	**Friday**	Monday
13:00-17:00	9:00-12:30	13:00-17:00	9:00-12:30

Location	Camera
Bassingbourn	Flir C2
Cambourne	Flir C2
Cambridge Petersfield	Flir One Edge Pro
Cambridge, Abbey	Hikmicro Pocket 2
Cambridge, ARU	Bosch GTC400C
Cambridge, Chesterton 1	Flir C3-x
Cambridge, Chesterton 2	Flir E4
Cambridge, Milton	Hikmicro Pocket 2
Cambridge, Newnham	Flir e40
Cambridge, Trumpington	Flir C5
Great Paxton, Hunts	Hikmicro Pocket 2
Hardwick	Flir C2
Histon and Impington	Flir C2
Northstowe	Hikmicro Pocket 2
Warboys, Hunts	Hikmicro Pocket 2
Whittlesford	Flir C2



Booking Calendar

Choose the Monday or Friday when you want to collect

Your booking in progress

Bassingbourn, Flir C2

November 2023 December 2023 »

MO	TU	WE	TH	FR	SA	SU
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

MO	TU	WE	TH	FR	SA	SU
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

– Available – Booked

Select a pickup time*:

2:30 PM – 3:00 PM

First Name*:

Booking confirmation

Your booking has been confirmed

Booking

Item booked: Cambridge, Castle

Collection date: 6 November 2023 12:30 pm

Booker contact details: Booker details

Collection

Camera host:

Contact details: Host Details

Pickup address:

Changing or cancelling your booking

Please let your volunteer camera host know if there are any changes to your pickup or drop off time, or use the links below links to:

- Change the date of your booking
- Cancel your booking

← email from 'CCF Bookings'

If you haven't received it within 1 hour of booking, check in Spam folder.
If not found, please email:
info@cambridgecarbonfootprint.org
We'll confirm your booking details

Look out for an email from your host, maybe with new information

Keep them updated.
Collect & return at agreed times

Cambridge Carbon Footprint

CCF Thermal Imaging homepage:

cambridgecarbonfootprint.org/thermal-imaging

To borrow a camera for a week or more - for multiple surveys, please email: info@cambridgecarbonfootprint.org

Resources

Thermal Imaging:

- Camera manuals and videos
- More thermal image examples
- Thermal Imaging New Homes NHBC

Admin:

- Book a Camera when you're trained
- Thermal image survey record
- CCF Donation page

Software: to post-process images - optional!

- Flir Thermal Studio Windows only, Free 'Starter'
- Flir Tools Apple & Android free App
- Hikmicro Analyser free, but windows only

FIXES: for problems revealed

- Transition Cambridge
- Centre for Sustainable Energy
- Energy Saving Trust
- **Cambridge Retrofit Hub:**
  Training, surveys, advice and installers

Finding building professionals

- Open Eco Homes Directory
- TrustMark limited data
- + Grants for retrofit locally

If you're in any doubt or for complex problems, do get professional advice

Final Questions

Booking etc

Good luck with your Thermal Imaging….

Cambridge Carbon Footprint

Any donations to Cambridge Carbon Footprint welcome

Where’s your home - & others - leaking heat?