

# Installing Contractor Insulation Boot Camp

## Lesson 5: Diagnostic Equipment & Testing

# Lesson Topics



## What we will cover:

- An overview of diagnostic tools
- How to run a blower door test
- How to use an infrared camera
- An introduction to the BPI Standards and Certification
- Asbestos and vermiculite



## MINNEAPOLIS BLOWER DOOR™ QUICK GUIDE VIDEO



T.E.C. - THE ENERGY CONSERVATORY



# Air Leakage & Blower Doors

Home energy professionals use a blower door as a diagnostic tool to determine how much air is entering or escaping from a building. This determines a home's airtightness.

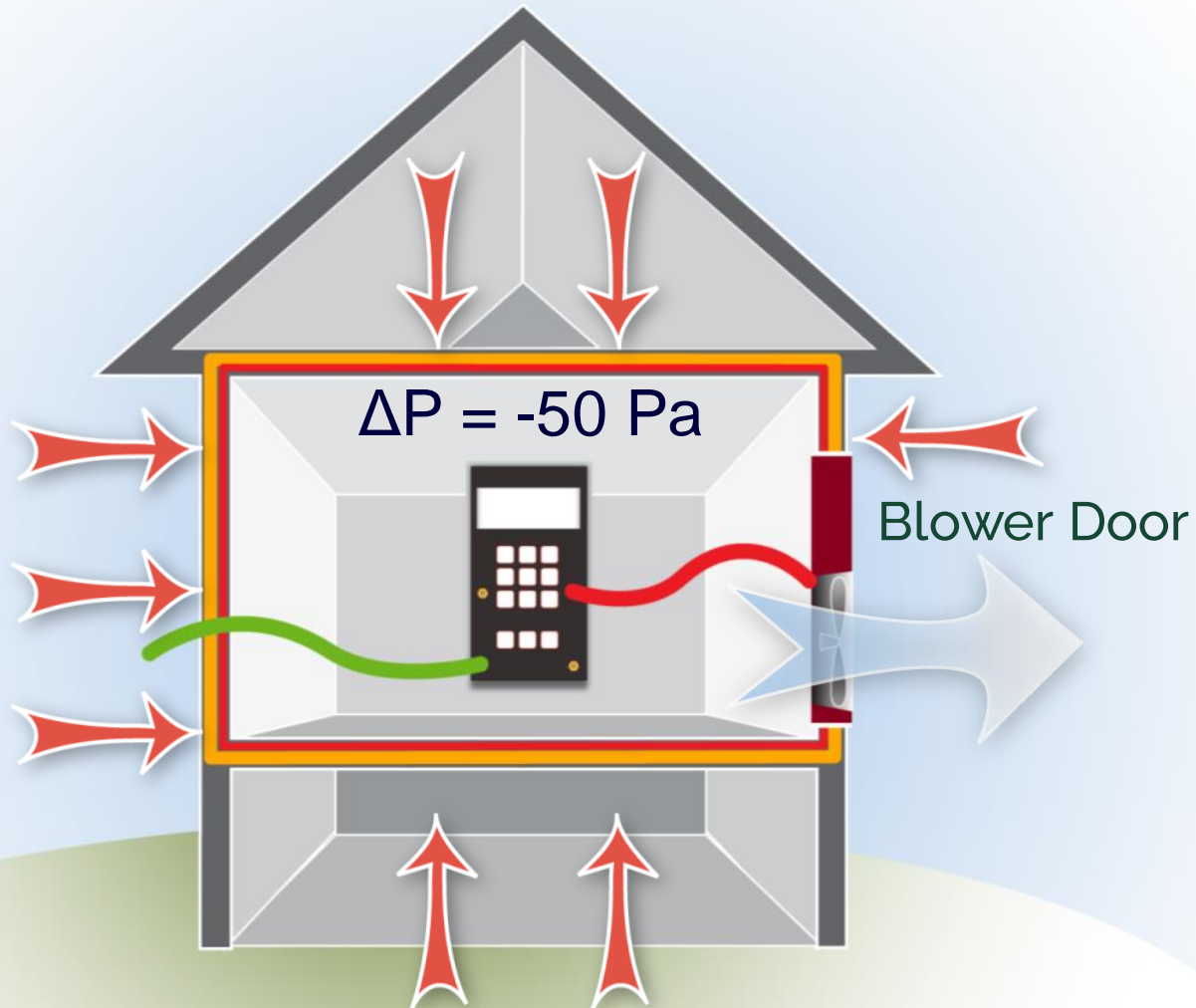


# Before Running the Test



- Put house in winter mode by closing all exterior doors and windows and opening all interior doors
- *Turn off all combustion appliances*
- Close all fireplace dampers, make sure all fires are completely out
- Remove all ashes

# Blower Door Testing



# Blower Door Testing



- Air leakage measured by the blower door can indicate the size of the holes in the house between inside and outside.
- Blower tests can:
  - be run before and after air sealing to determine the effectiveness of the work.
  - tell us which houses have the most potential for energy savings through air sealing.
  - demonstrate how much air sealing is required.

# Common Blower Doors



Energy Conservatory



Retrotec

# Stop Test Items

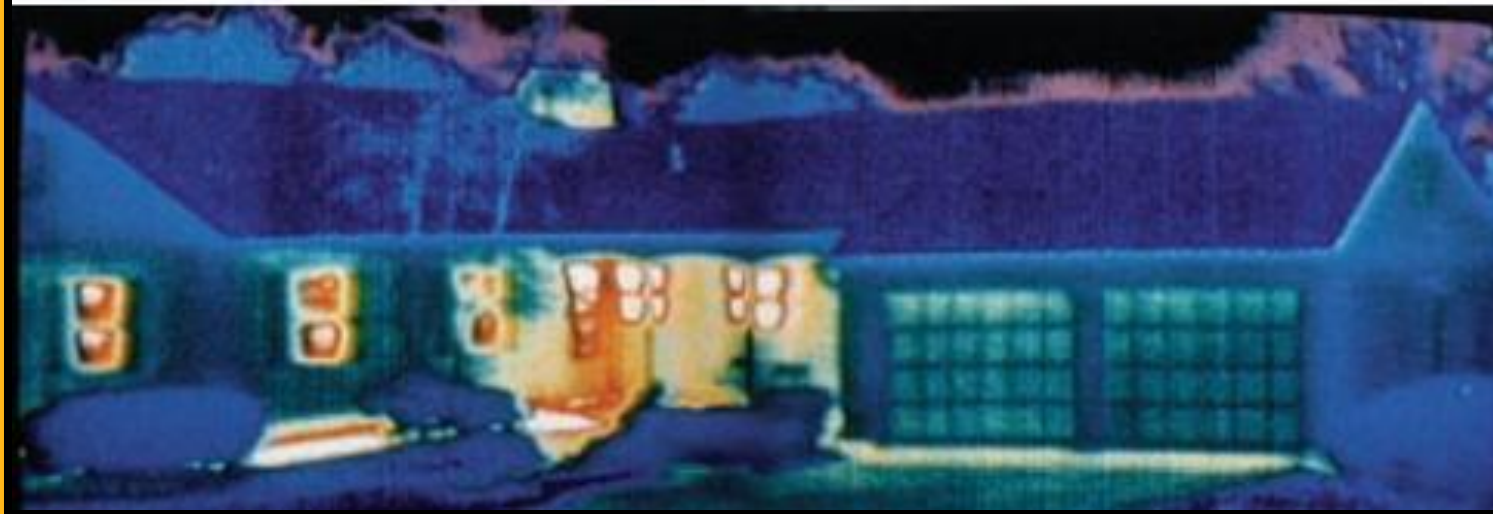
- Asbestos inside the house
- Mold
- Vermiculite
- Wood fires/warm chimneys
- Currently-firing combustion heating and hot water appliances



Asbestos on  
steam pipes



# Infrared Cameras



# Infrared Camera

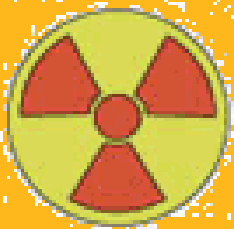
## What we'll cover:

- The basics of infrared light
- Infrared cameras
- What they show
- What they do not show
- How to interpret IR images
- Finding leakage using an IR camera with a blower door



# Infrared Light

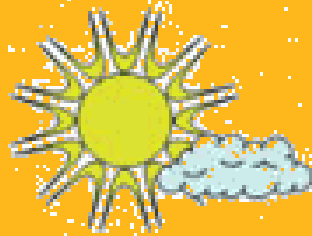
Light includes the visible, infrared, ultraviolet, X-ray, radio, and other frequencies



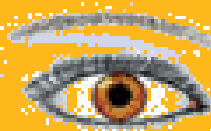
**Gamma ray**



**X-ray**



**Ultraviolet**



**Visible**



**Infrared**

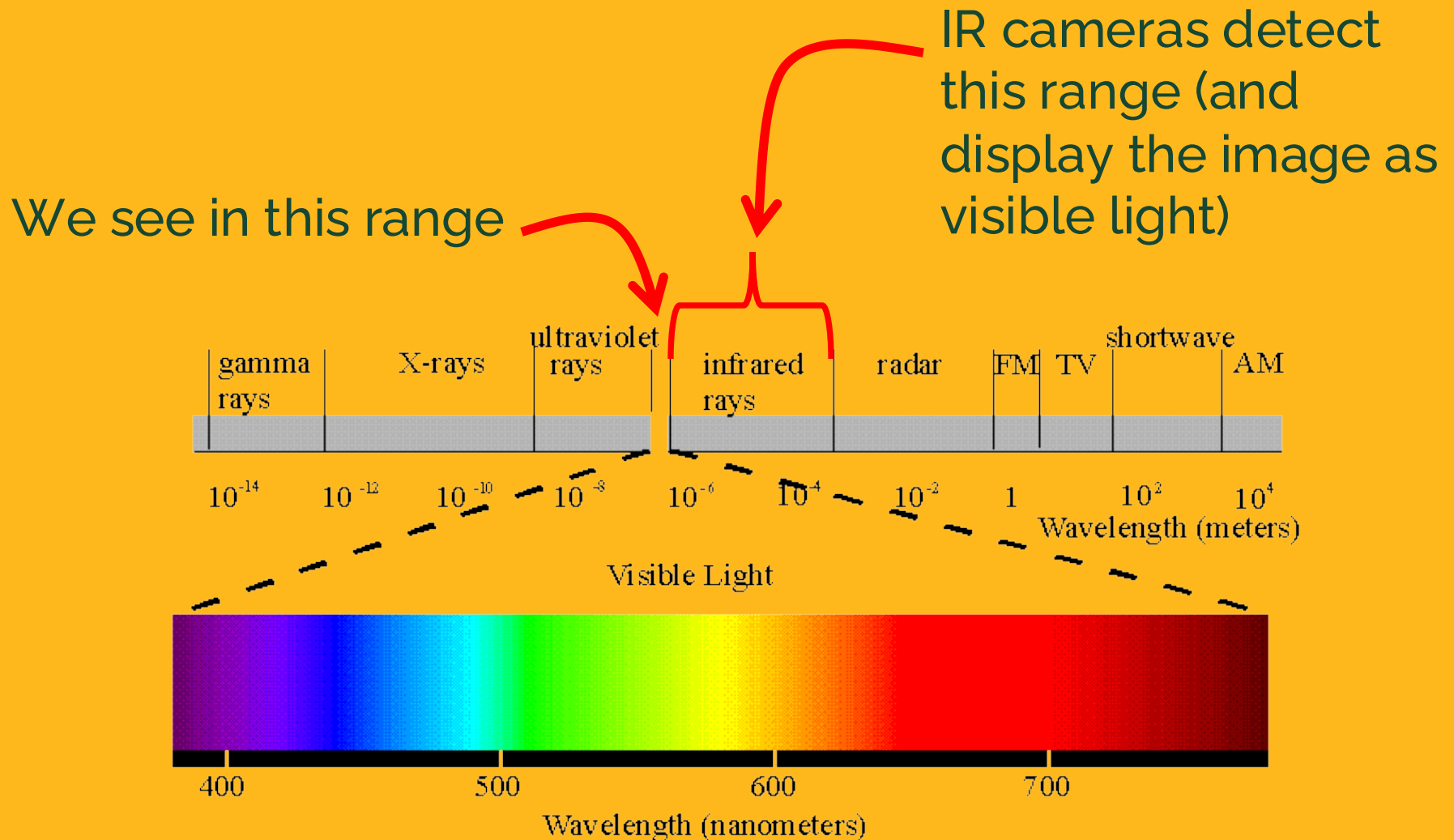


**Microwave**



**Radio**

# Infrared Light



# Demonstration

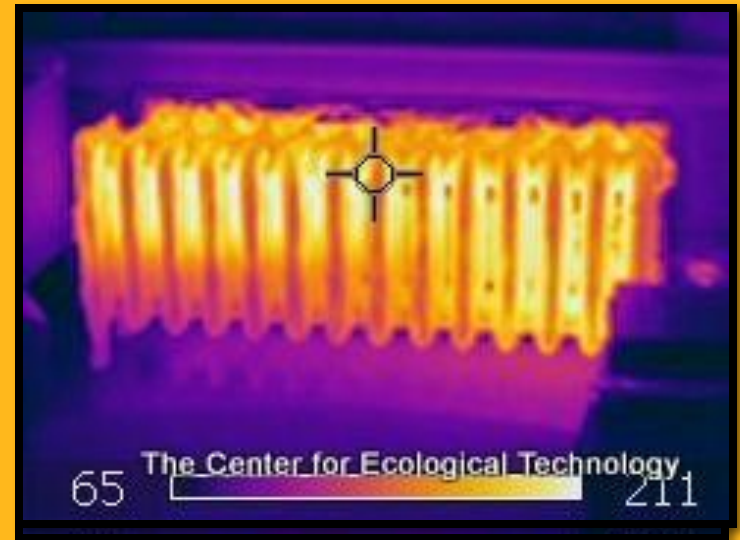


# Infrared Light

- All objects emit infrared (IR) light
- The amount of IR light emitted depends on the surface temperature
  - A greater intensity of IR light indicates a higher temperature



Visible light

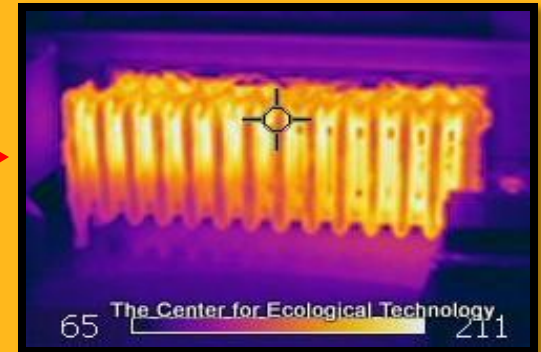


Infrared light

# How IR Cameras Work

- IR Cameras can show the image in a number of color schemes
- The iron and the black and white settings are often the most useful

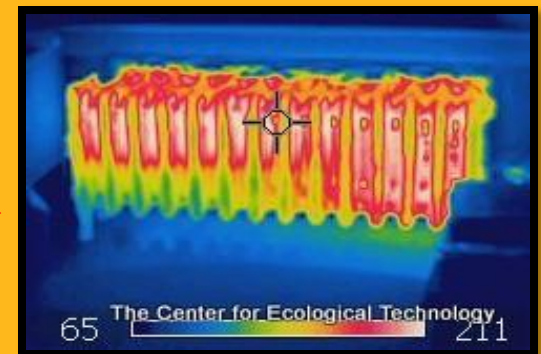
“Iron” →



Black and white →



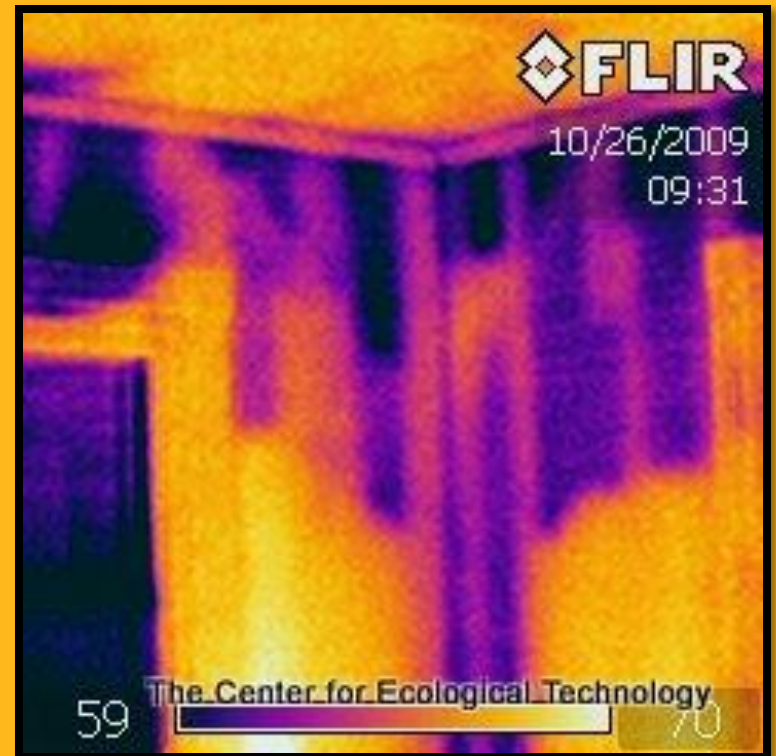
“Rainbow” →



# Using an IR Camera

## IR Cameras:

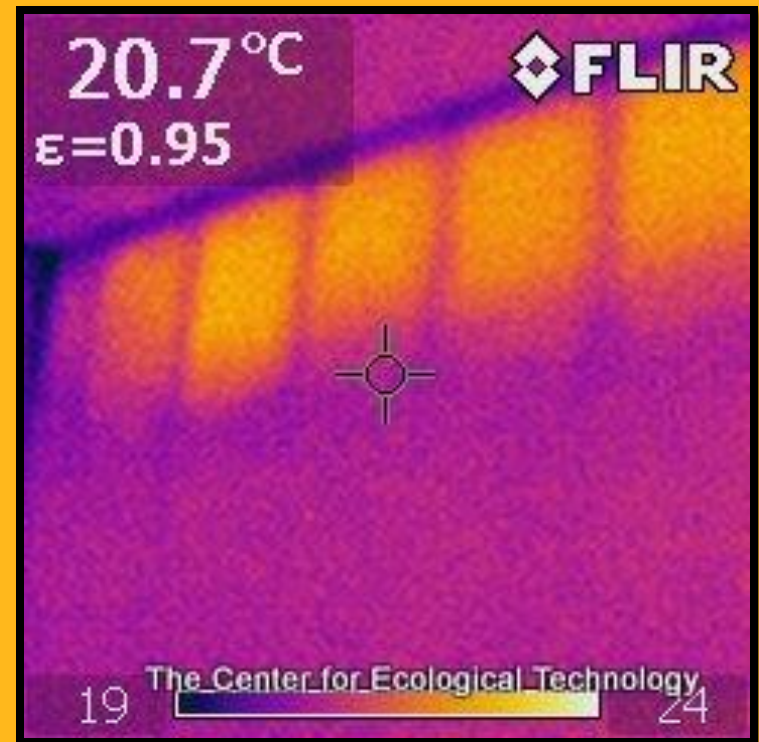
- Show the surface temperature of objects.  
*They do not see through walls.*
- Need at least 18° F difference across the wall section for clear results



# IR Cameras & Weatherization

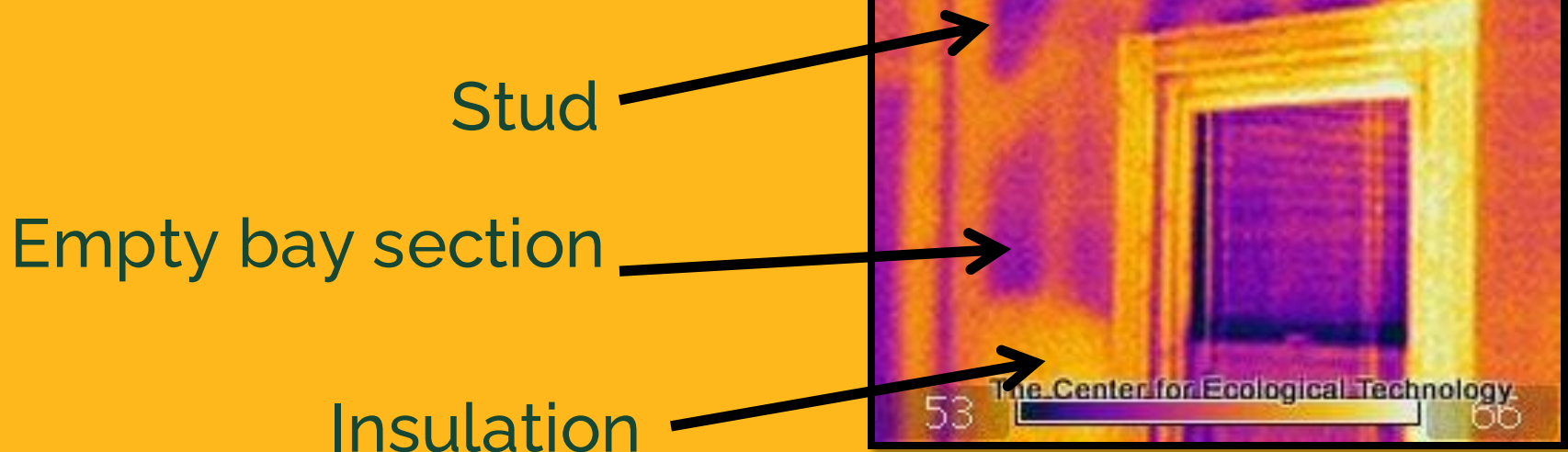
- IR Cameras can be used to locate:
  - Gaps in wall insulation
  - Framing members
  - Air leakage sources\*
- IR Cameras *will not* show:
  - The type of insulation
  - The depth of insulation in a bay (interior to exterior)

\* When used with a blower door



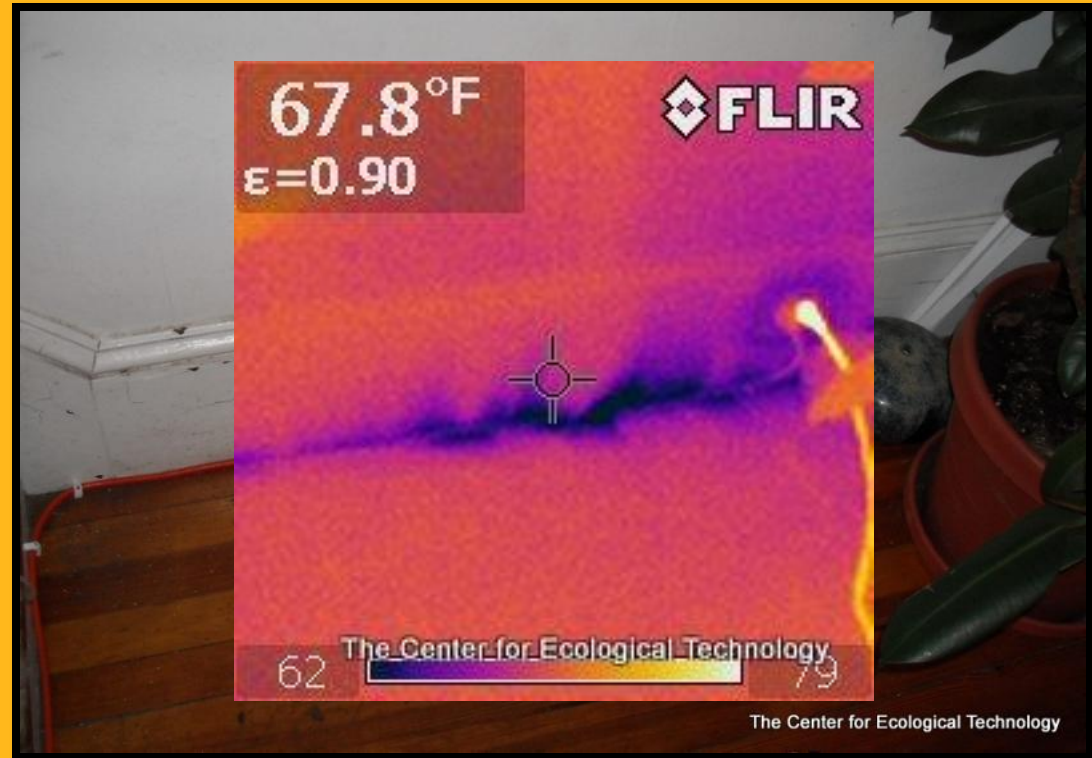
# Interpreting an IR Image

- The exterior walls of a warm house on a cold day will have:
  - Warm insulated sections
  - Cool stud sections
  - Cold empty bays



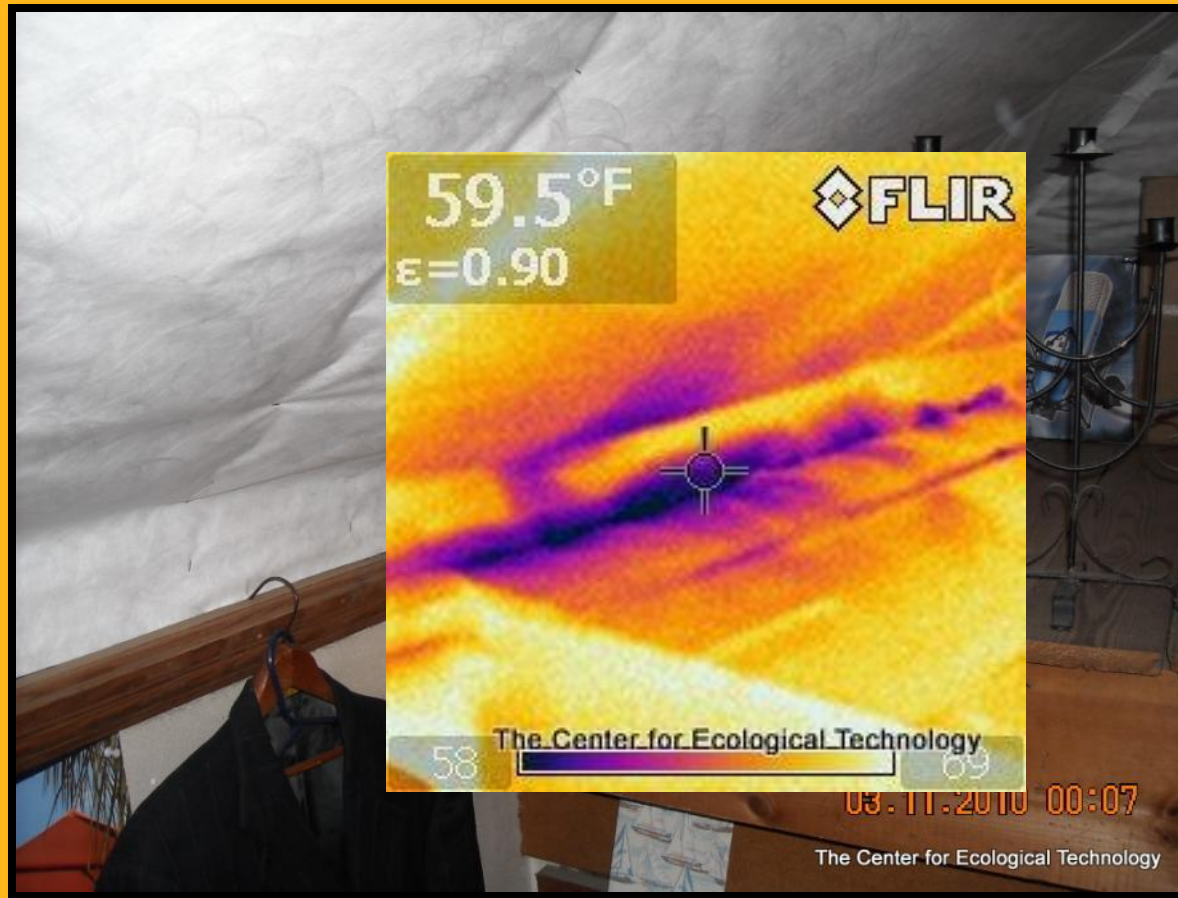
# IR Camera and Blower Door

- A blower door can exaggerate the air leakage in a home
- An IR scan may reveal otherwise hidden air leakage



# IR Camera and Blower Door

## Where should you air seal?



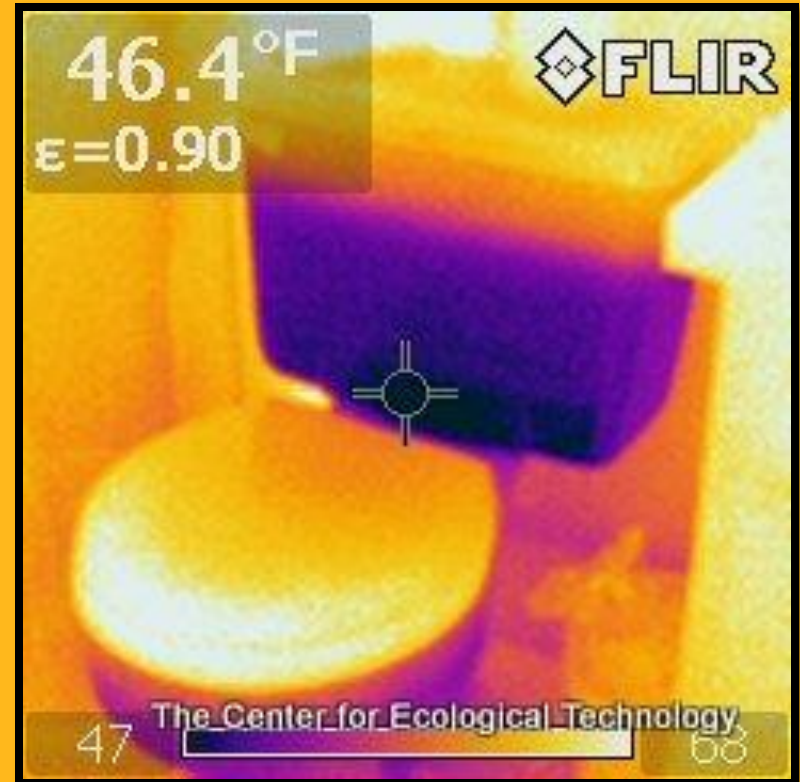
# IR Camera and Blower Door

How about here?



# Locating Moisture

## Where is the water line?

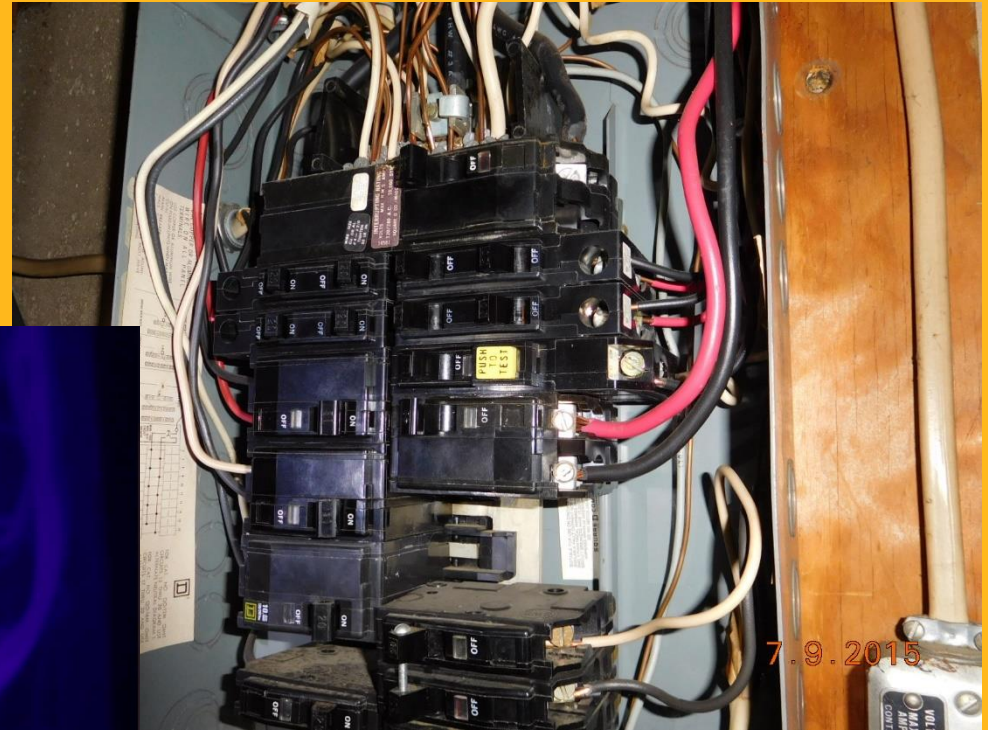
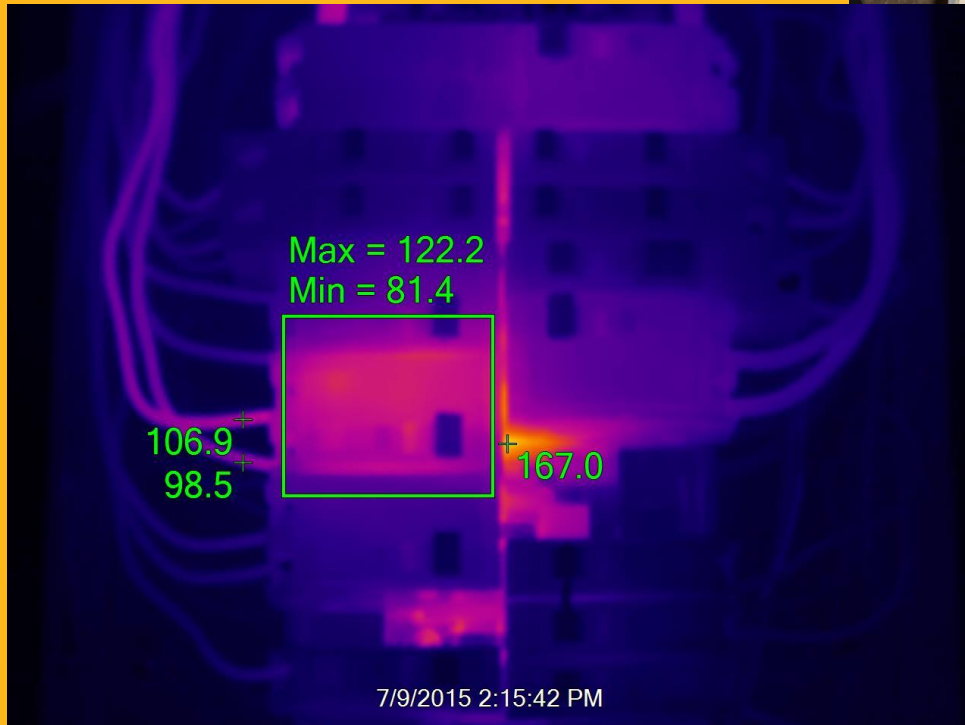


# Locating Moisture

## Determining if moisture is active



# Locating Electrical Defects



## Follow-up Questions

What kind of information do diagnostic tools provide?

How can the information provided by these tools aid in a weatherization project?

Infrared light is:

- Invisible to the human eye
- Emitted from objects
- Brighter with higher temperatures
- Displayed with an IR camera

## IR Cameras:

- Interpret surface temperatures
- Do *not* see through walls
- Require judgment based on the season

## The Blower Door

- Can quantify whole house air leakage
- Can be used to find air leakage points
- Should not be run if stop test items are found
- Should be run before and after air sealing to:
  - demonstrate progress and potential energy savings from air leakage reductions
  - ensure the house is not over-tightened

# Questions

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