



Infrared Thermography: Brilliant but Dangerous

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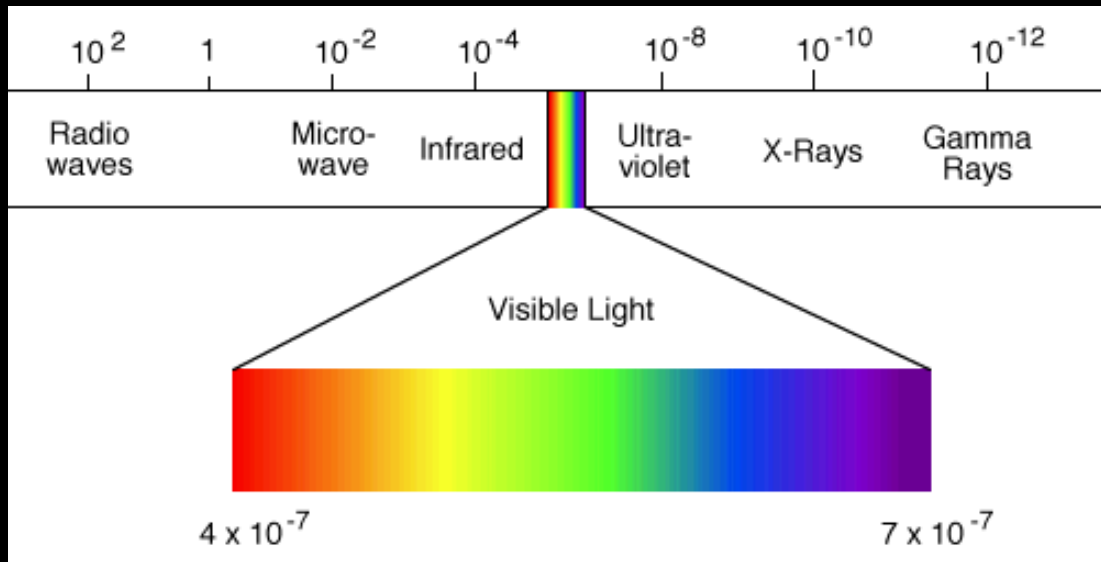
Trainer, Building Performance Workshop

Exec. Director, IL Assoc. of Energy Raters & Home Performance Professionals

HERS QAD, BPI BA/EP/HP/AC/MFBA/Installer, LEED AP

Definition

- Visual Display of amount of infrared energy emitted, transmitted, and reflected by an object
- Shows heat of solids (NOT AIR)



Material Temperatures

**Incident Energy =
Emitted +
Transmitted +
Reflected**



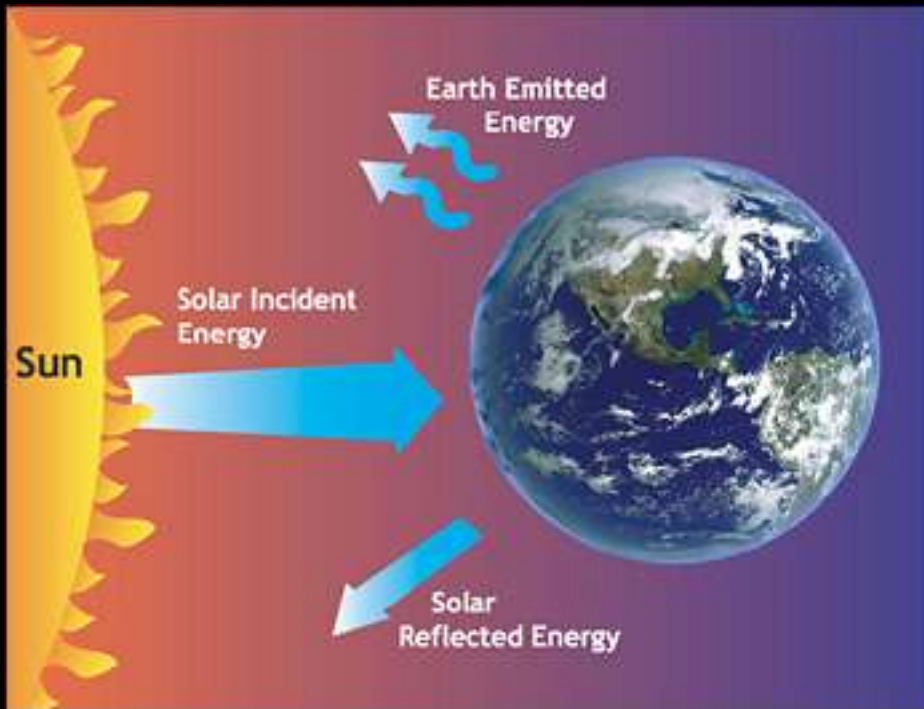
Hard to pin down exact temperatures of objects, but differentials can be helpful for building analysts

Emissivity

- The ability of materials to absorb or emit heat
- Between 0.00 & 1.00 (0% & 100%)
- Most materials have fairly high emissivity (0.95, or 95%)
- Metals are lower (silver is 0.02)



Transmittance



Know where the
sun is at all
times!





Reflectivity

Infrared will show you reflections on ceilings, walls, and floors.

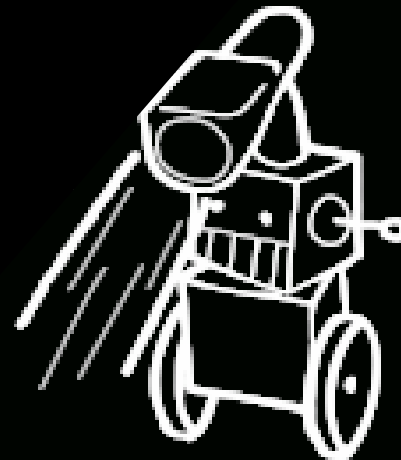
$$\rho(\lambda) = \frac{G_{\text{refl}}(\lambda)}{G_{\text{incid}}(\lambda)}$$

Your camera is just a tool. It can be used for GOOD or for EVIL.



Know Your Camera

- Your camera is not a genius.
- Your camera is not BPI certified.
- Your camera wants to please you.
- Your camera will show you pretty colors even if they are meaningless.



INFRARED SCANBOT



For Example



9/25/2009 3:58:19 PM

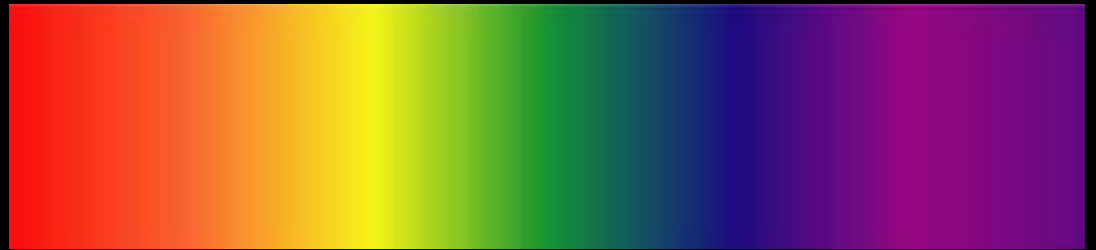


Palettes

- Your camera will display temperature variations in 3 basic color palettes:
 - Perception-relative (according to a person's understanding of color)
 - Spectrum-relative
 - Grayscale

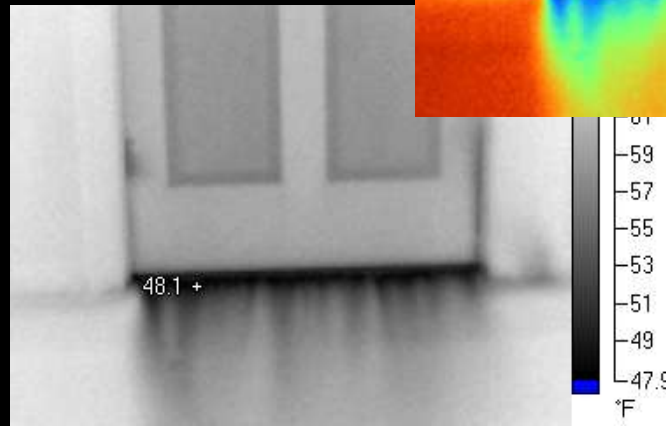
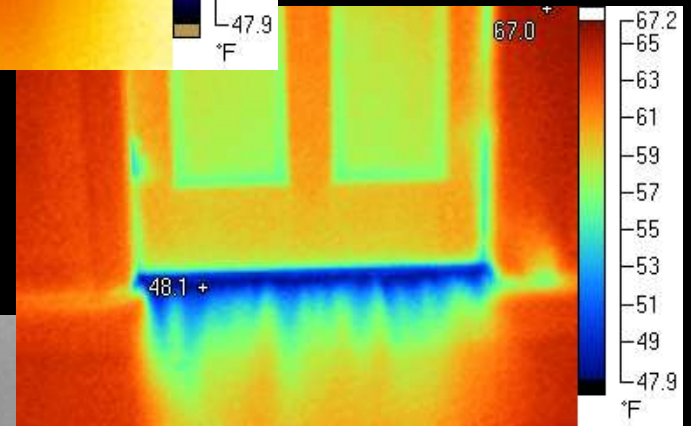


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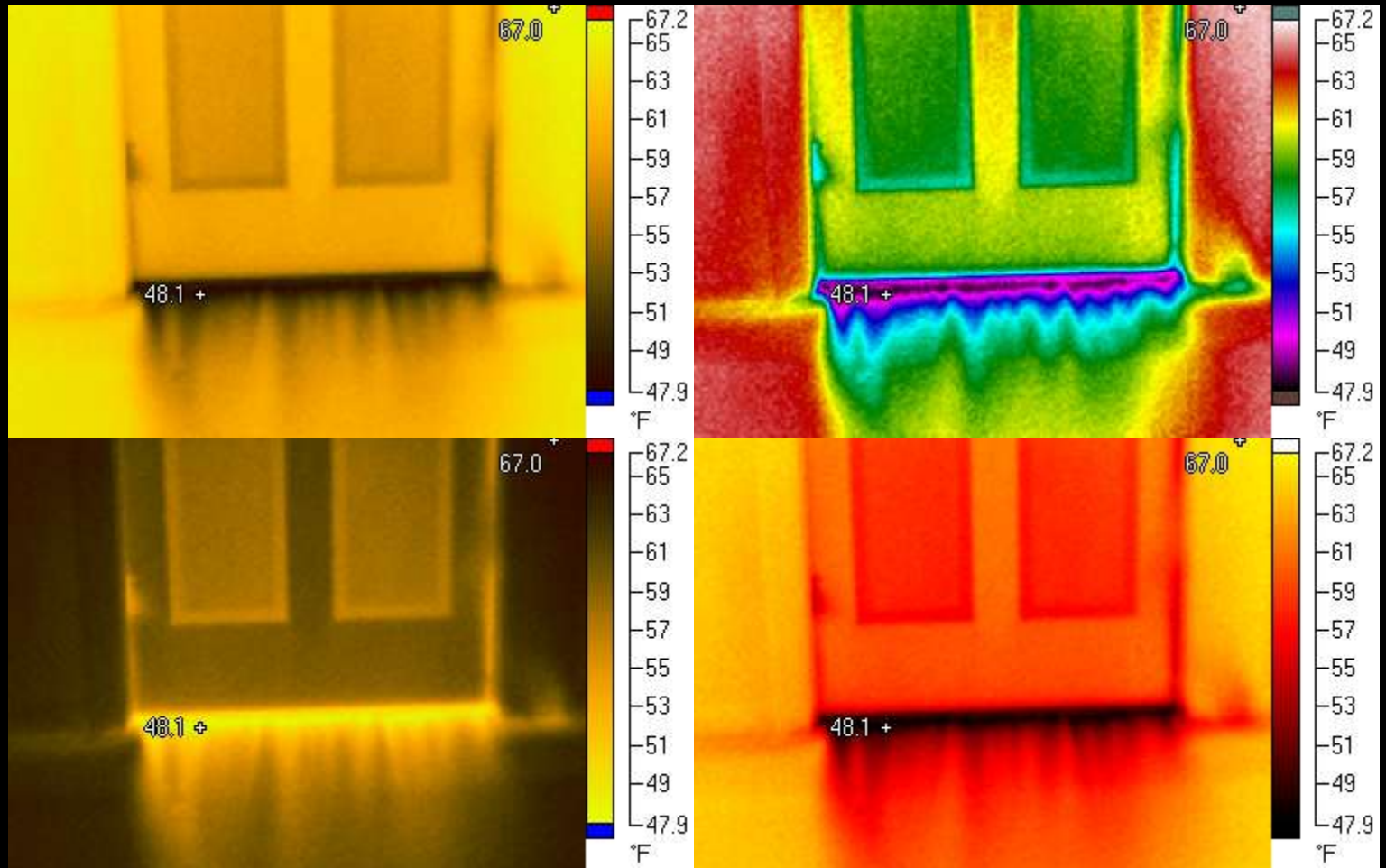


3 Basic Palettes

- Perception-Relative
- Spectrum-Relative
- Grayscale



Derivative Palettes





Range

- Automatic Setting will re-calibrate the display to show all colors regardless of range
- Manual Setting establishes an unchanging range
- Always refer to the display range. Remember- your camera wants to show you pretty colors all the time!

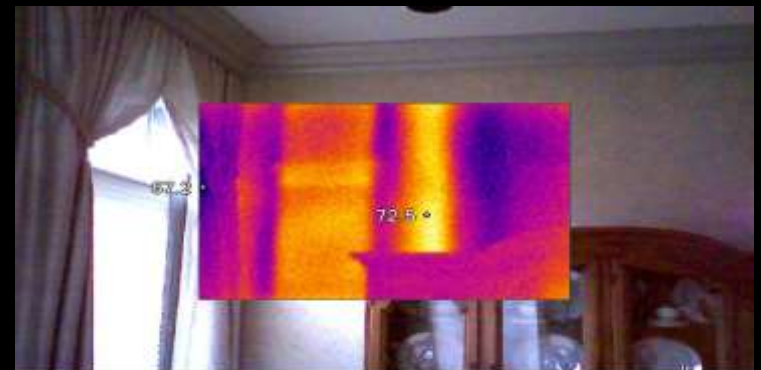
What Does It All Mean?

- Palette?
- Range?
- Date?
- Time?
- This IR photo could mean ANYTHING!



First Glance IR Scan

- Look for Conductive and Radiant Heat Transfer
- Get a Baseline, to compare with scan during Blower Door Test
- Locate pipes/ducts
- Locate moisture



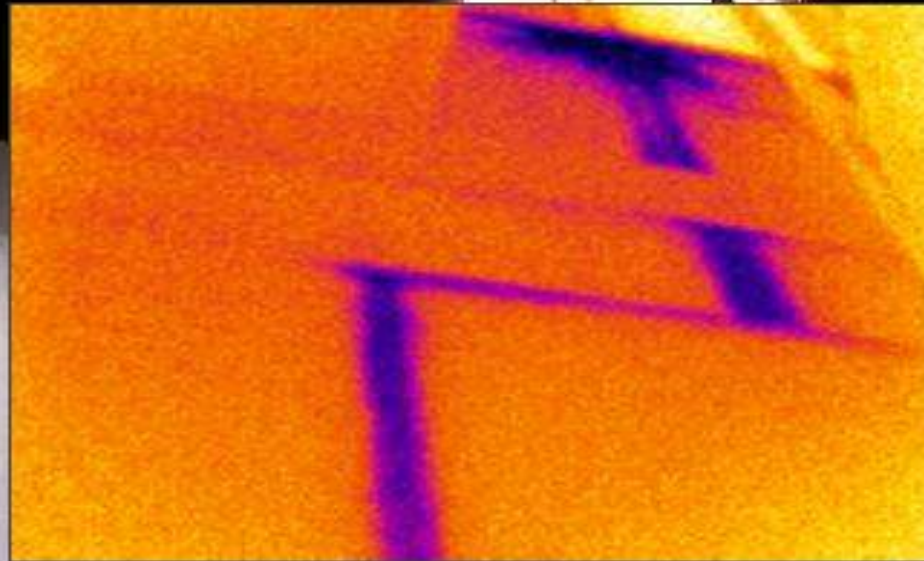
Leakage Signature

- Sharp
- Uniform
- Falling
- Verifiable





Leakage Signature

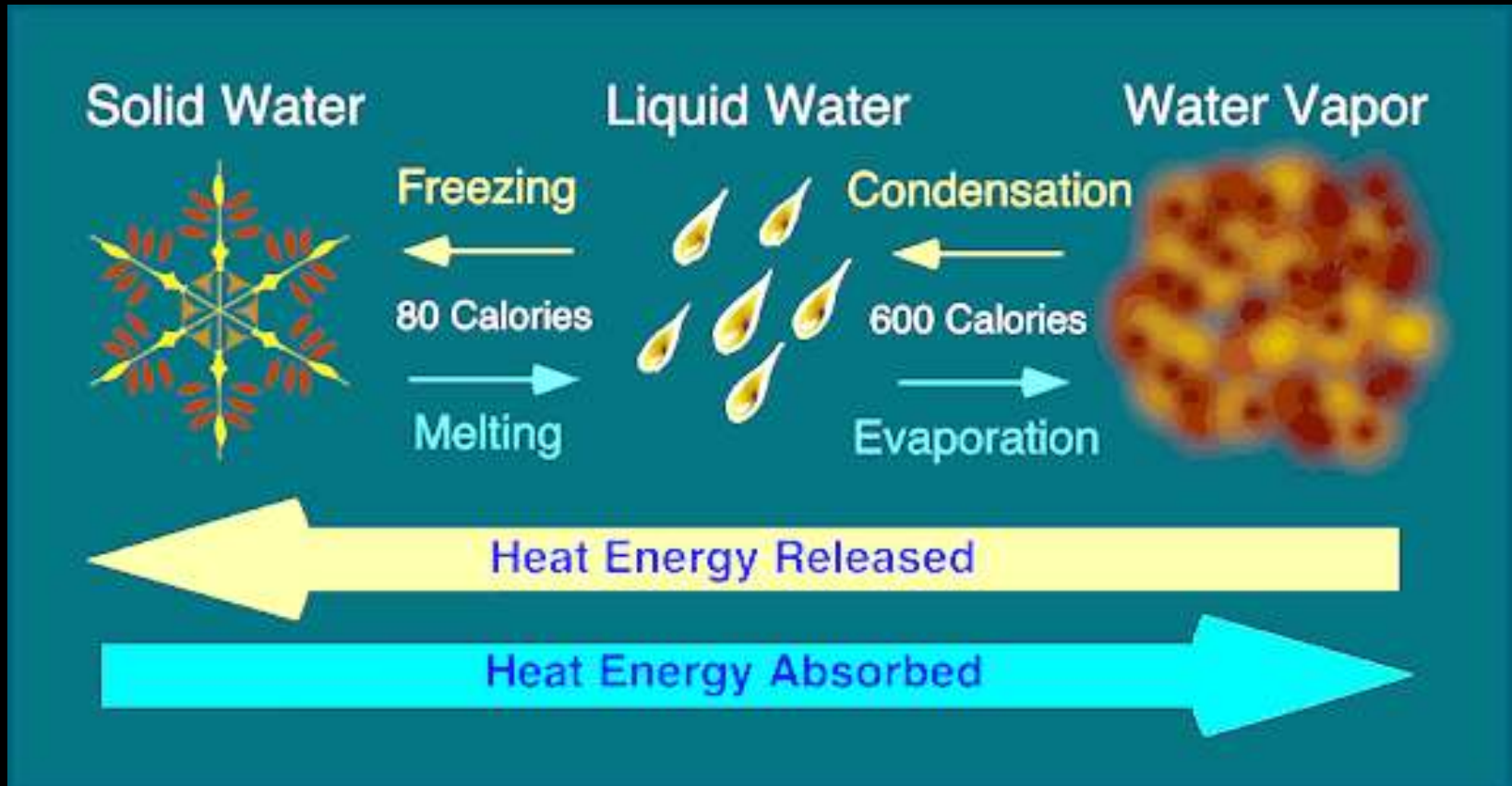


Condensation Signature

- Sharp
- Graded
- Occurs at air bypass
- Verifiable

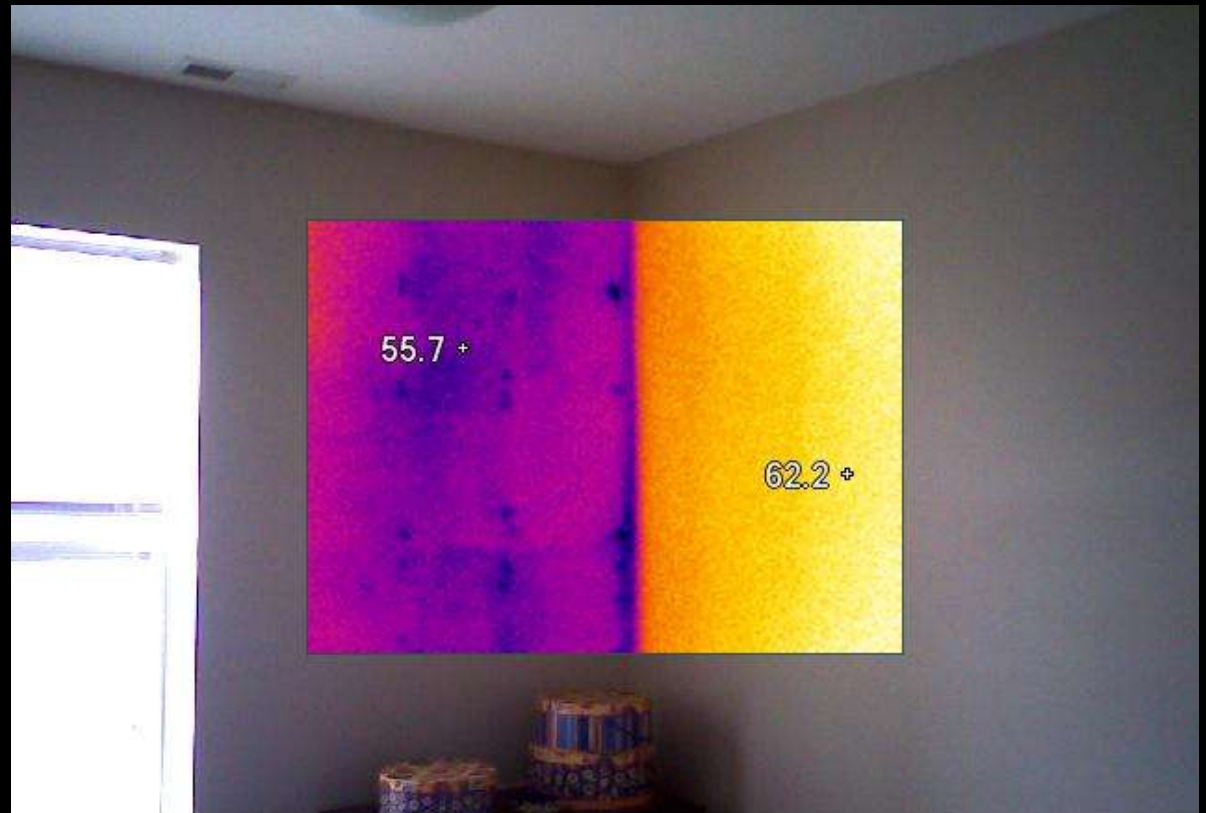


Why We See Water with IR



Conduction Signature

- Soft
- Reliant on sunlight incidence
- Verifiable



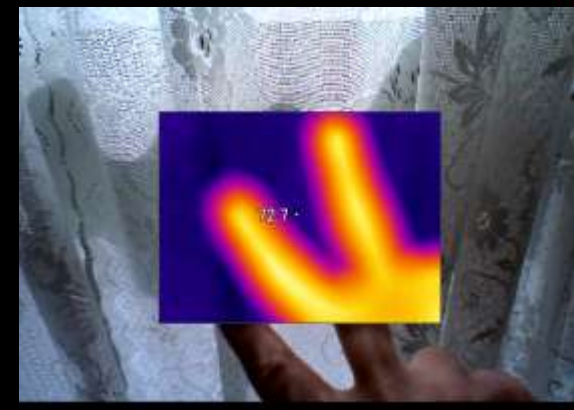
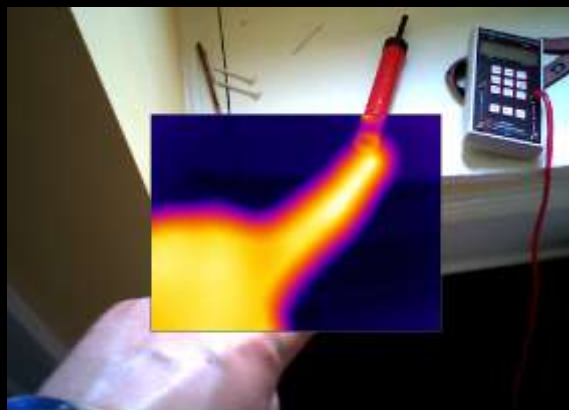
Once the Blower Door Runs

- Airflow may overpower temperature variation from conduction or radiation, OR IT MAY NOT
- Know the temperature outside
- Know where the sun is



Where to Begin?

- Start shooting the zone that was lowest pressure BEFORE the blower door kicked on.
- TIP: Use hand signs to let yourself know when you've moved floors.





Be Efficient With Your Time

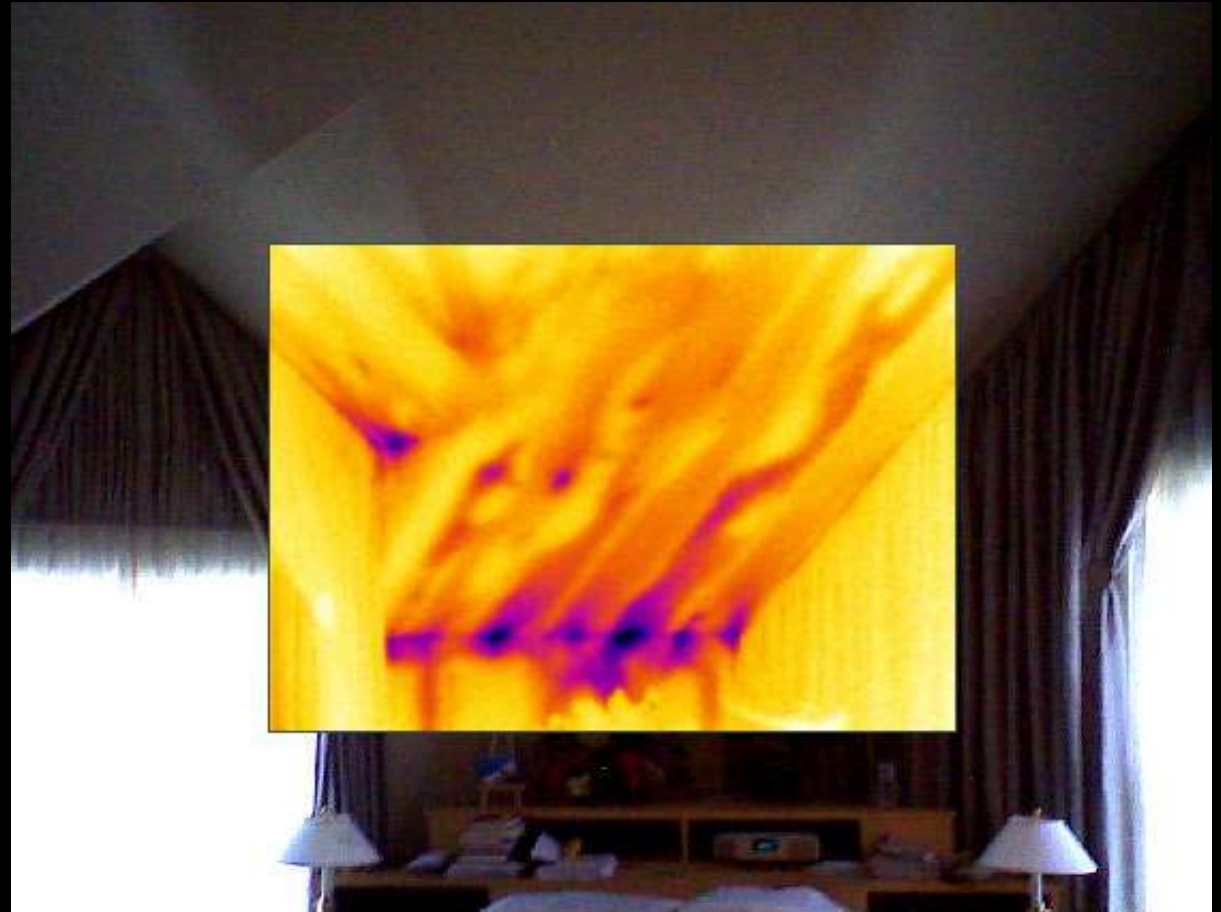
- Scan from as far away as you can, then get closer to places you target
- Don't waste time on non-issues
- Don't assume the homeowner or the installer knows where the envelope



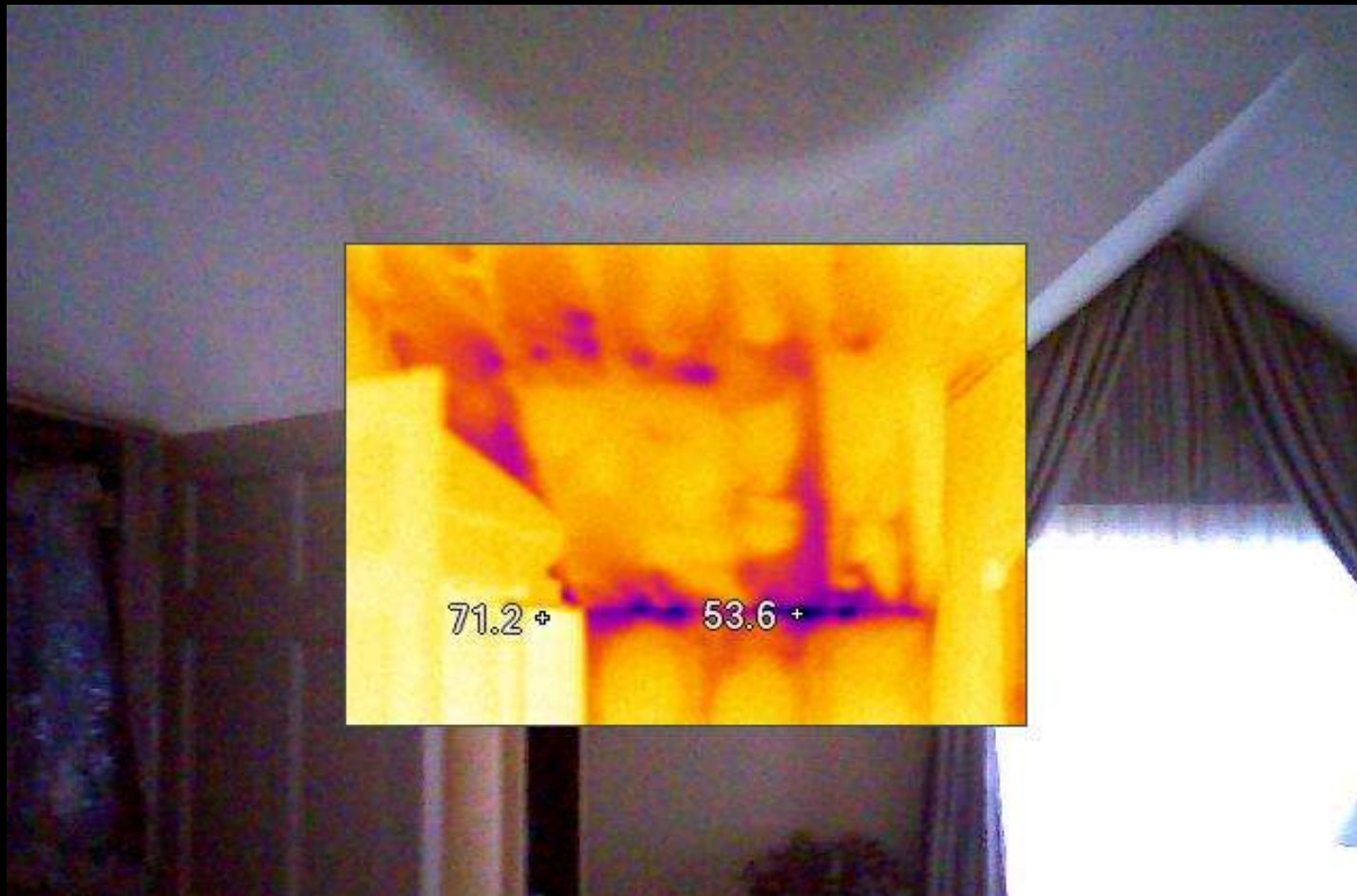
ACTUALLY is.

Airflow Signature

- Sharp
- Finger-like
- Verifiable

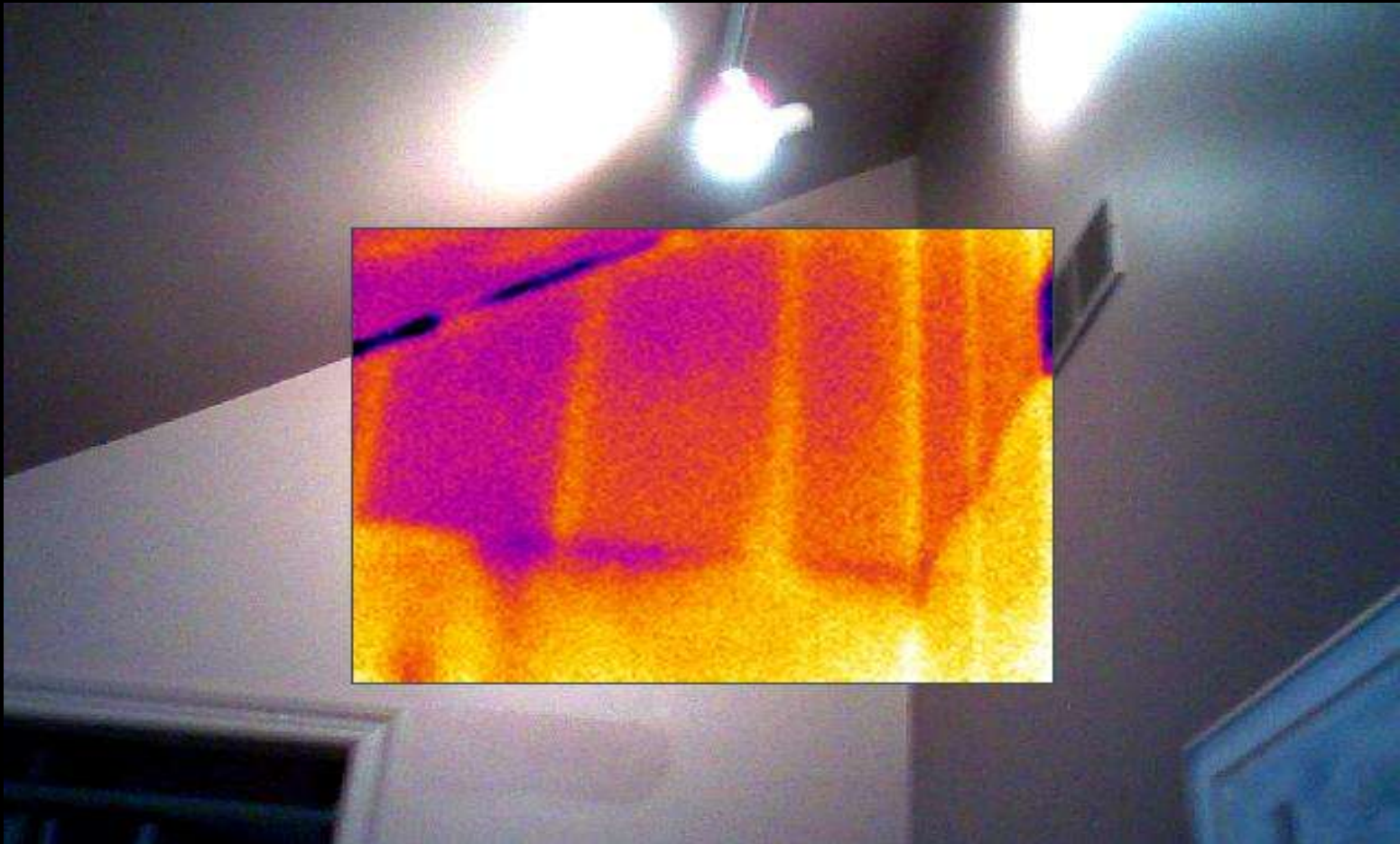


Poorly Installed Batt Insulation

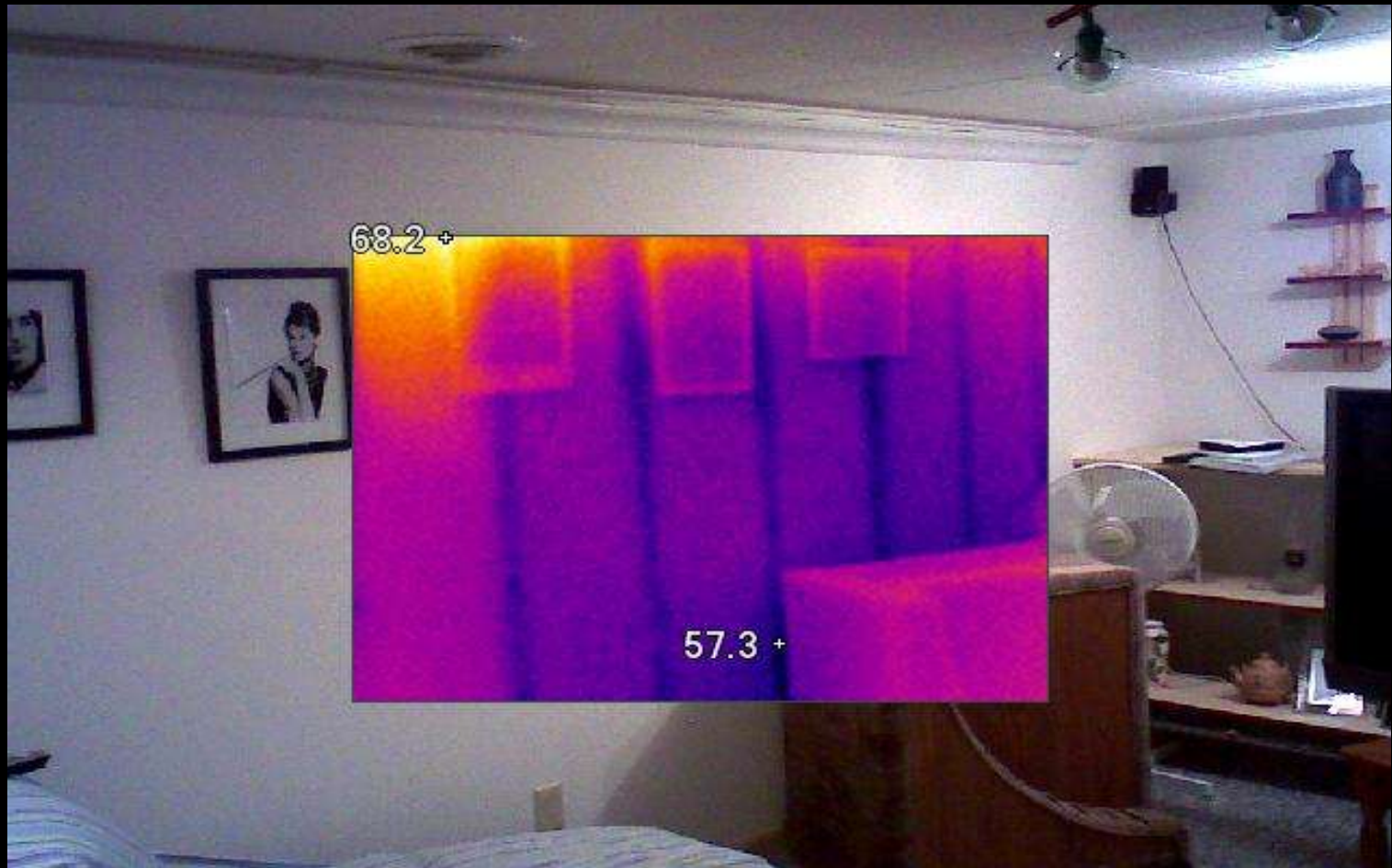




Cool Cavity, Warm Framing



Warm Cavity, Cool Framing





Plaster Walls





Know What To Look For





Outdoor Recessed Light

Indoor Recessed Light



Scan the Entire Envelope

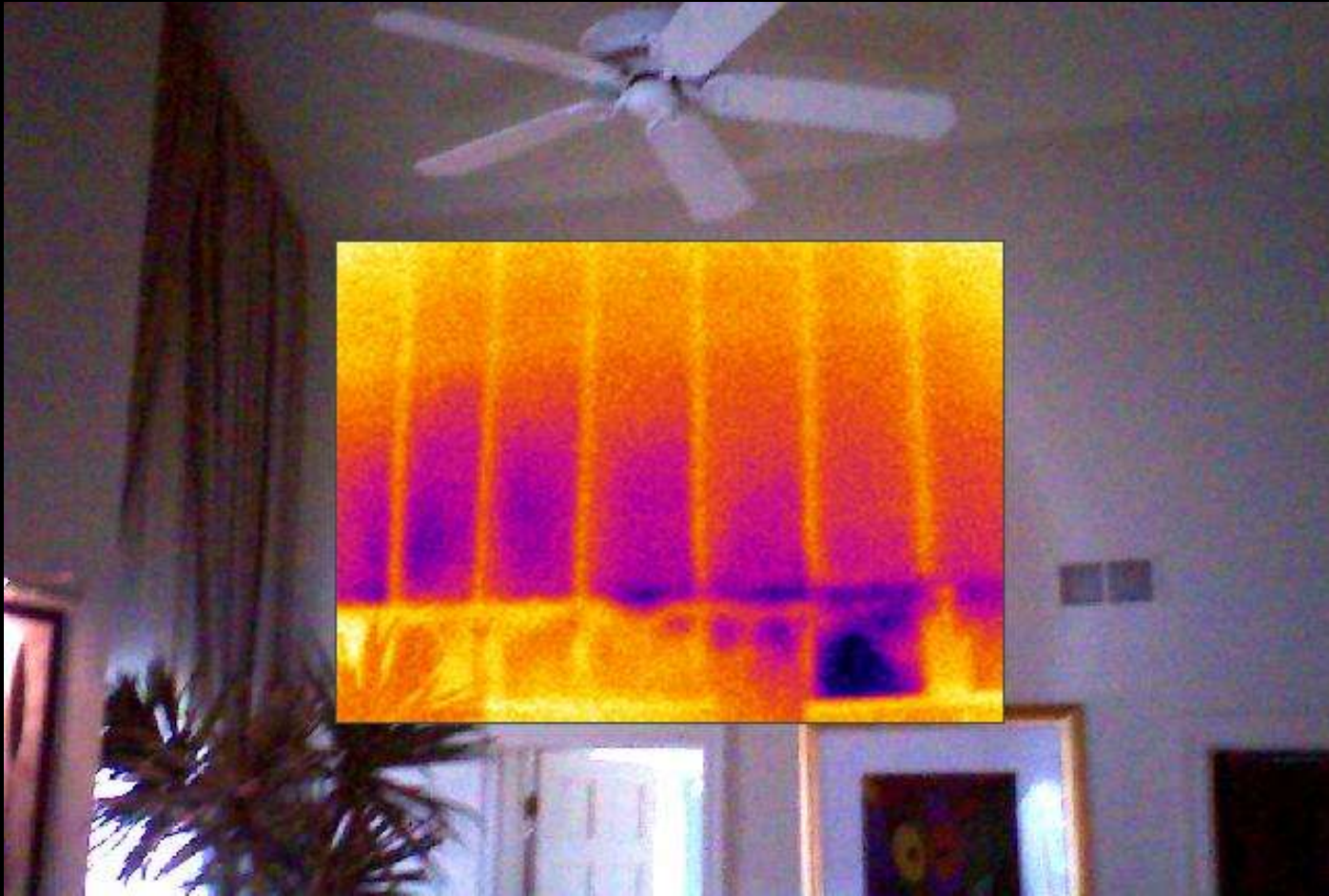


Don't Forget the Top Plates





Why You Inspect First



Consider the Image's Use



Fit Several Things in the Frame



Focus! Focus! Focus!



04/30/2010

12:30:38PM

Focus! Focus! Focus!



04/30/2010

12:31:14PM

Brands: Fluke, FLIR, etc.

Range: \$2,000-20,000

Same Work, Faster & Easier



B2



BCAM



B360



Extech 15



E45



BCAMSD



GREEN DREAM GROUP

A Solid Investment

- \$4,000
- Digital photos + Infrared photos
- Excellent software
- Can be dropped by your client





Thanks for attending!

Questions?

Comments?

Building Performance Workshop

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Your presenter was:
Corbett Lunsford

