

Tips on Using Infrared During a Home Inspection

Jan 5, 2017

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Continuing Education?

46.0 °F

46.2



39.0

 FLIR



57.7 °F

78.1



 FLIR

43.6





Poll Question:

What substance or building material that you see during a home inspection emits the most infrared?

concrete, wood, drywall,
insulation, water

To easily find water using infrared,
quickly change the temperature
surrounding the suspect water area.



Keep Going!

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70.2 °F

73.0

Keep Going!

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65.7

 FLIR

Keep Going!

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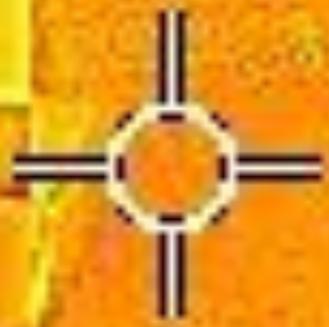
70.0 °F

71.9

Keep going!

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MI



64.5

FLIR



68.4 °F

73.0



59.7

 **FLIR**





65.8 °F

72.0



60.8

FLIR



Recommended minimum pixel resolution of 120 x 120 pixels.
C2: 80 x 60. E8: 320 x 240.

"Inspector Outlet is the best place for inspection tools, like the FLIR C2, that help home inspectors do their job better."

- Nick Gromicko, Founder of InterNACHI

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In marketing, if the perceived value is greater than the cost, it's a good decision.

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Q: Why use infrared?

A: It'll help you do a better job. It helps you see things you wouldn't normally be able to see without it.

A: And it's a killer marketing strategy.

The science of infrared may seem complicated, but the cameras are easy to use.

Difficult part is the interpretation and confirmation.

~47.8 °F

52.7



15.3

 FLIR

74.7 °F

91.7



 FLIR

67.8



Training and certification is critical. Don't use a camera without being Infrared Certified®.

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First Law of Thermodynamics:

Energy is constant. And it just moves around from one thing to another. Can't be created or destroyed. Think refrigerator.

Second Law of Thermodynamics:

Everything is gaining entropy (chaos, disorder) and energy is always moving from hot to cool temperatures. There's always a difference in temperature.

Using an infrared camera takes advantage of the Second Law of Thermodynamics, where energy is always moving, and that there's always a heat gradient (difference) in temperatures.

The more sensitive the camera, the less temperature gradient is needed. **Example, two cups.**



The thermal capacitance is related to how different materials absorb and store heat at different rates.

In general, the heavier and denser the material, the higher mass it has, the more heat energy it can store, and also the longer it will take to release that heat energy.

Examples: air, wood log.

Poll Question:

Guess what substance or material that you may come across during a home inspection has the greatest capacity to hold heat energy (thermal capacitance)?

Air, fiberglass insulation, drywall, wood, brick, concrete, water

Water - greatest capacity to hold energy.

water

concrete

brick

wood

drywall

fiberglass insulation

air

68.4 °F

73.0



59.7

 **FLIR**



Water has twice the thermal capacitance of the nearest substance - rock or stone, the material with the next highest heat storing capacity.

So, water can hold a ton of energy.

Because water can hold a ton of energy (big thermal capacity), it takes water a lot longer to release that heat energy.

Big capacitors tend to change temperature very slowly.

For example, air changes temp very quickly. Water does not. Water takes a long time to change temp.

Why is this important to a home inspector?

(... that water hold a ton of energy, and it's slow to change it's temperature)

If you have a thermal gradient (or thermal window, 2nd law) you should be able to “see” water. Because water has an extremely high thermal capacitance, water will be the last thing to heat up and the last thing to cool down. Water holds a lot of energy, and it's very slow to change temperature.

Why is this important to a home inspector?

Everything emits infrared radiation. Emissivity is a measure of a material's radiating efficiency. An emissivity of 1.00 means that the material is 100% efficient at radiating energy. An emissivity of 0.20 implies that the material radiates only 20% of that which it is capable of radiating.

Question:

What holds the most energy (thermal capacitance) AND is slow to change temperature AND is a great emitter of infrared radiation (waves)?

Water at 95%.

Water radiates about 95% of that which it is capable of radiating.

Human skin at 98%.

70.3 °F

84.7

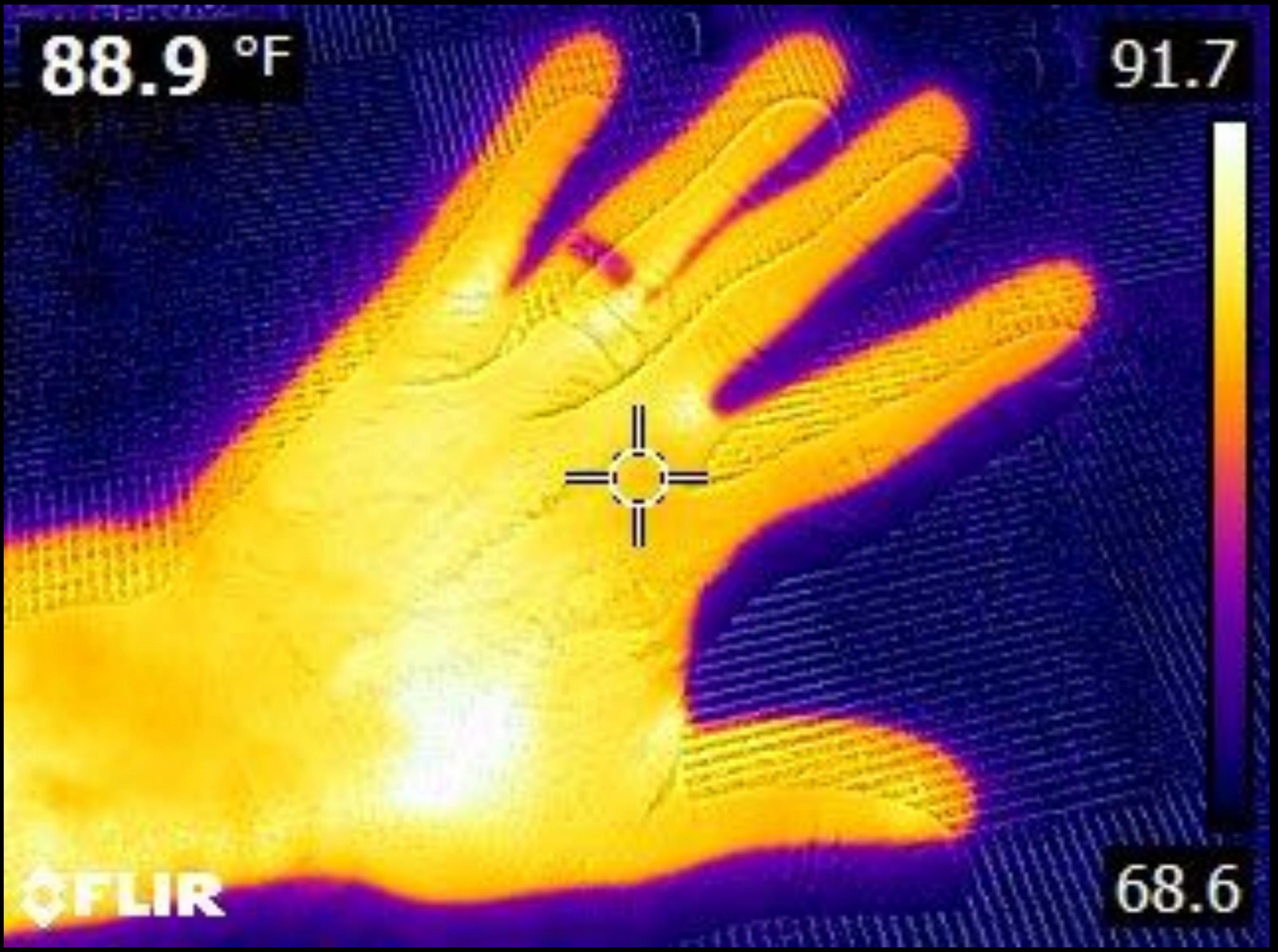


61.4

 FLIR

88.9 °F

91.7



FLIR

68.6

Water:

- holds a ton of energy,
- is slow to change temperature, and
- emits a ton of infrared.

To “see” water intrusion using infrared, quickly change the temperature surrounding the suspect water area.

Exterior Wall:

When the sun rises, you have the best opportunity to “see” anomalies when the sun hits an exterior wall. At sunset, best time is after the sun leaves the wall.

70.0 °F

71.9

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MI



64.5

FLIR

Reflectance:

Don't point your infrared camera to metal or metal-plated objects. They reflect a ton of false thermal information.

~68.7 °F

75.3



FLIR

62.9





Thermal Blindness:

Happens when everything is the same temperature.

Wind Effect:

A 10 mile-per-hour wind can reduce a temperature reading by about 50% of the actual temperature.

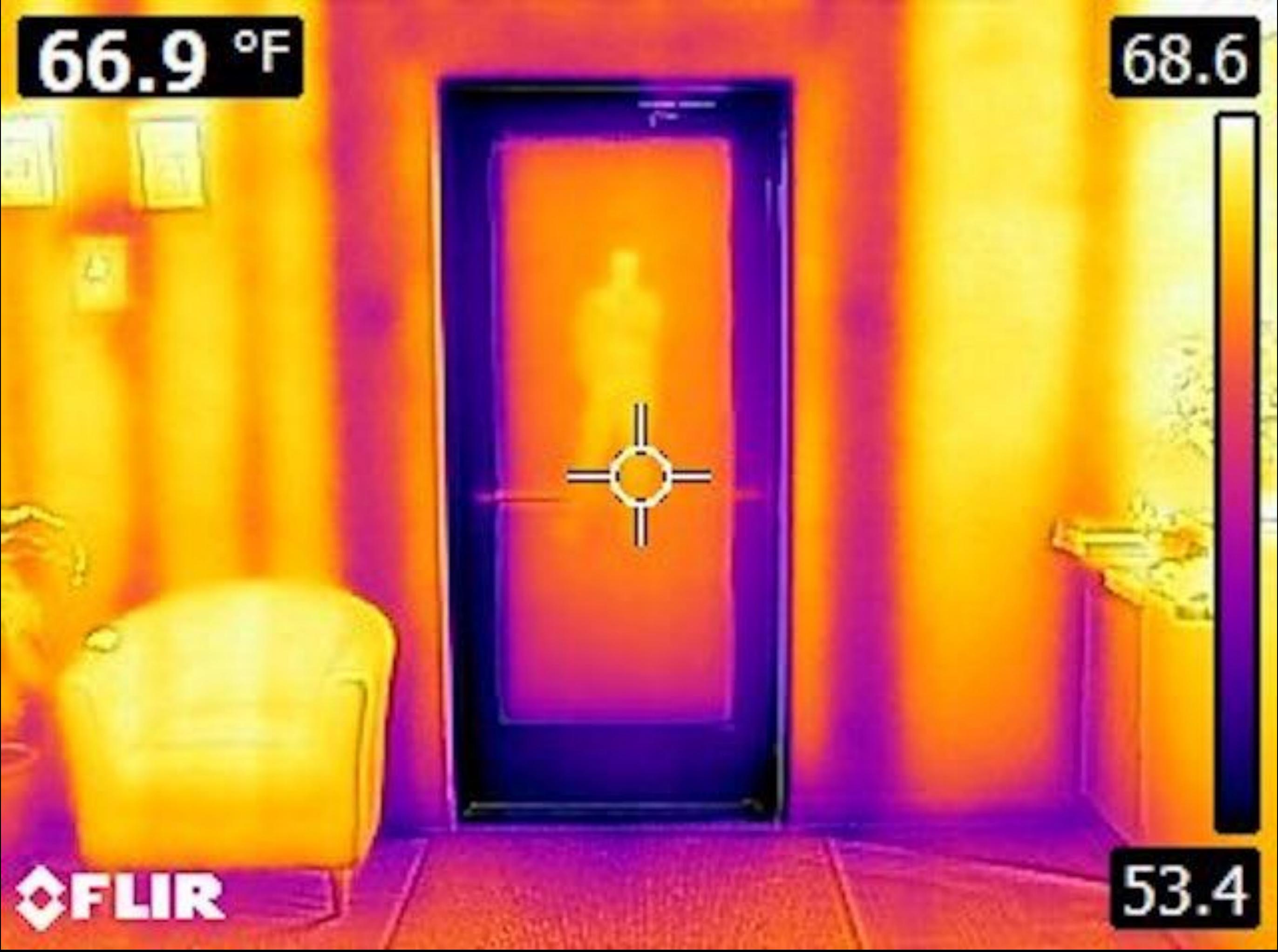
Example: wet finger mark on desk with air.

Glass:

Don't be fooled.

66.9 °F

68.6



 FLIR

53.4



71.4 °F

74.2



 FLIR

66.9



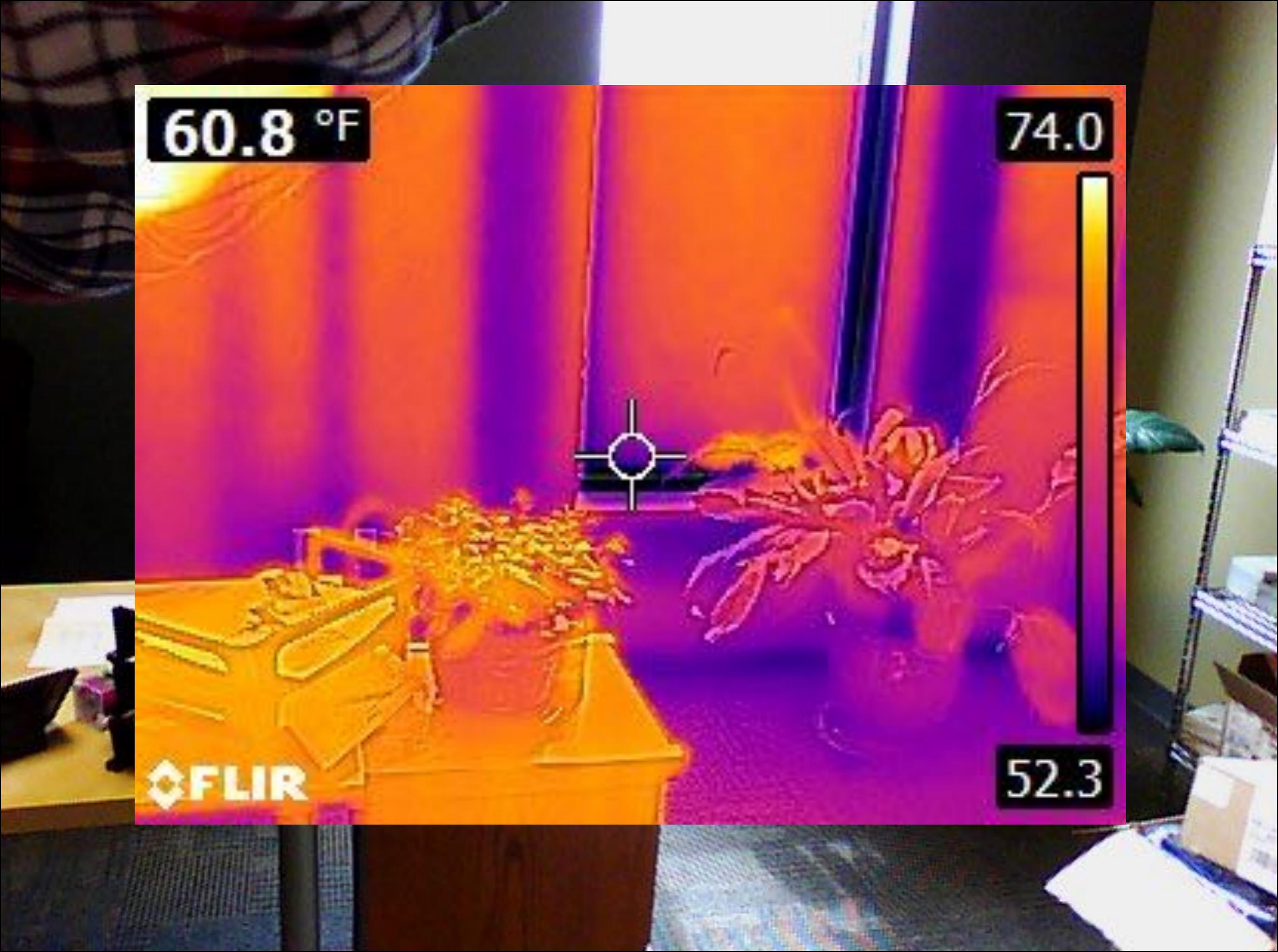
60.8 °F

74.0



FLIR

52.3



Glass is opaque in relation to long wavelength infrared radiation. The long wavelength infrared radiation waves are “blocked” by the glass.

Example: a greenhouse with glass all around. Sun energy waves go in, but the re-emitted long wavelength infrared radiation is now “trapped” inside the green house by the glass.

In general, you want to know **3 things** when using an infrared camera:

- the thermal characteristics of the material
- actual differences in temperature
- ability of heat to be removed from the substrate by evaporation.

HVAC - turn it on to change the environment.

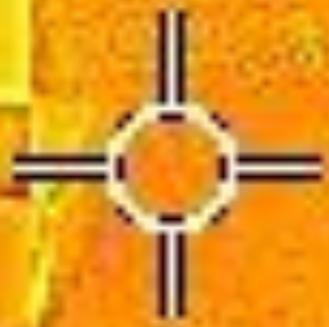
70.0 °F

71.9

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64.5

FLIR

Qualification vs. Quantification

Confirmation:

Essential companion to an infrared camera is a moisture meter. Don't leave home without it.

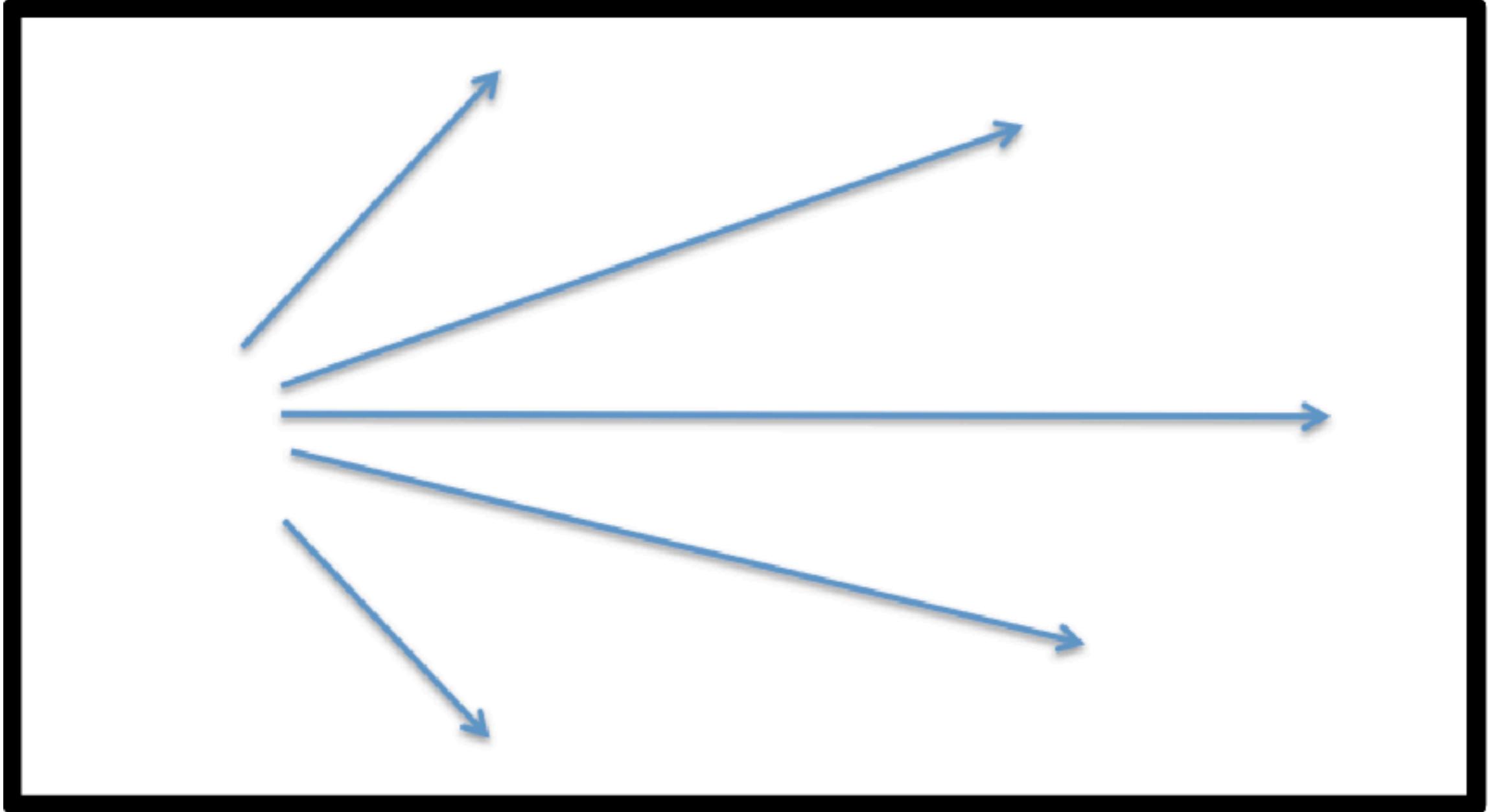
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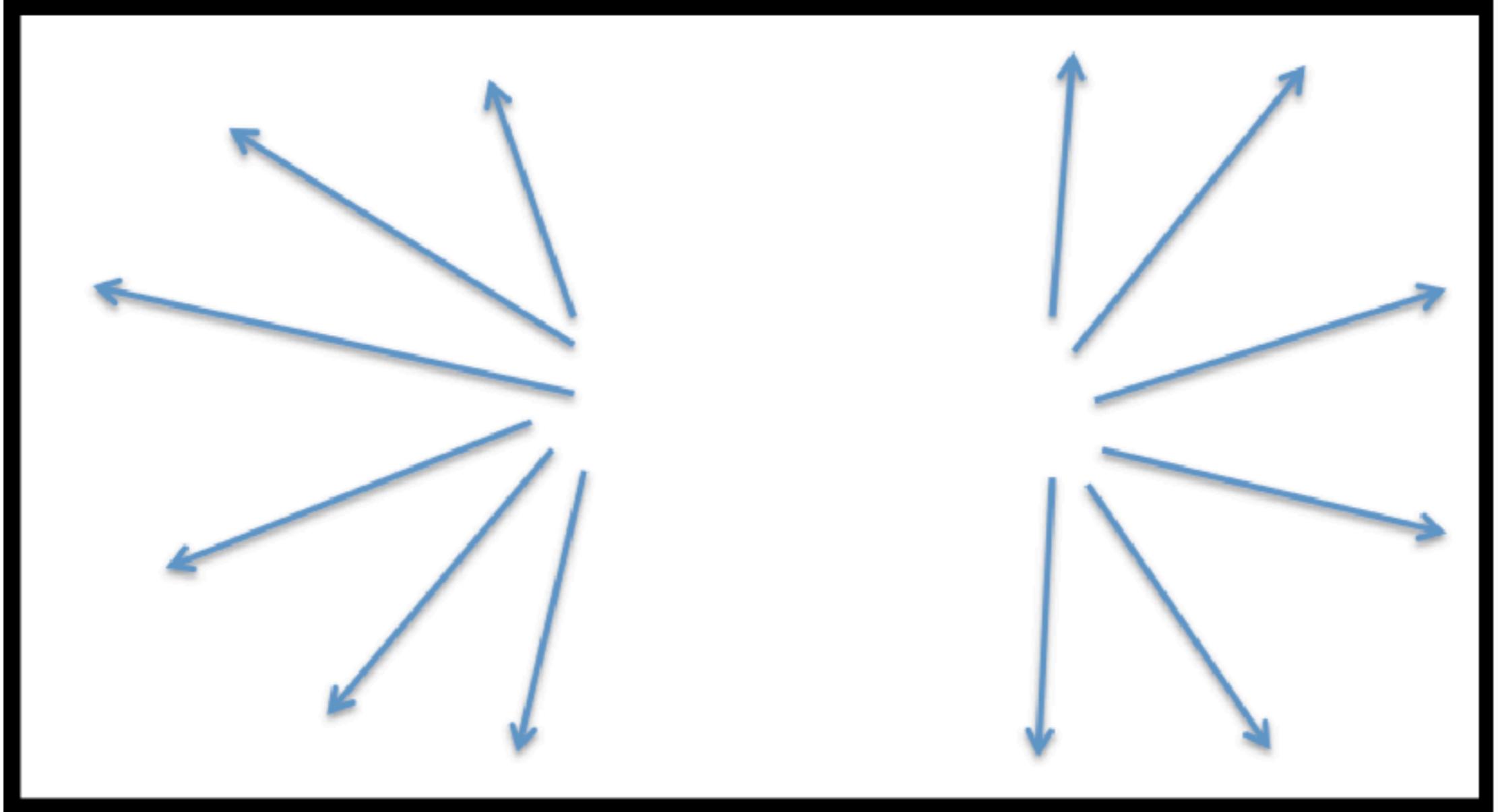
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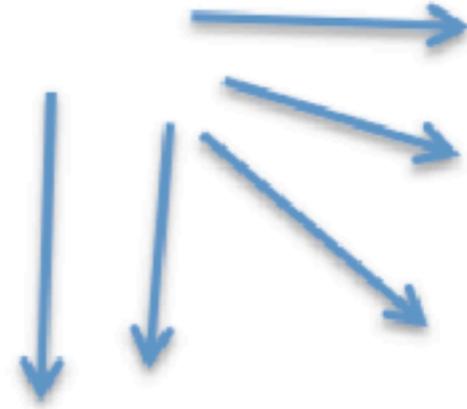
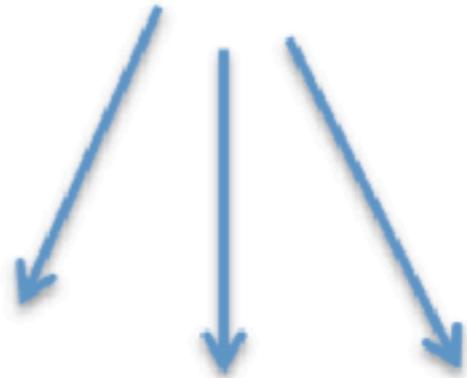
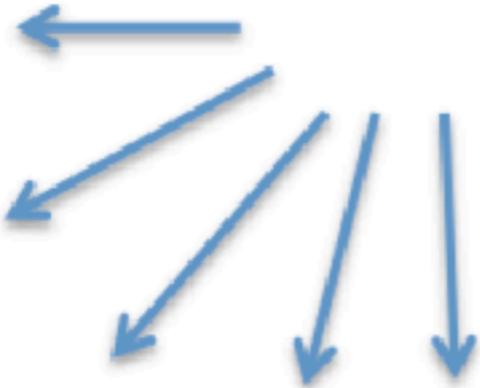
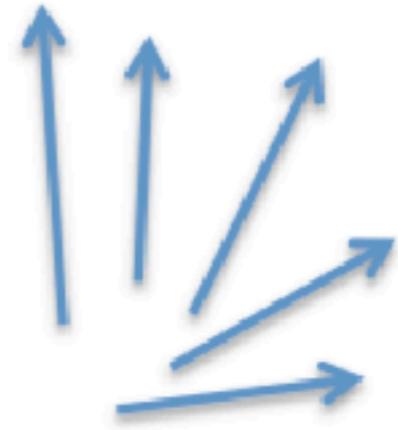
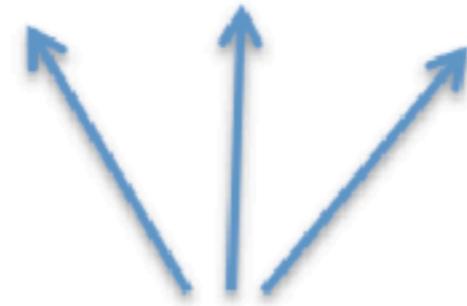
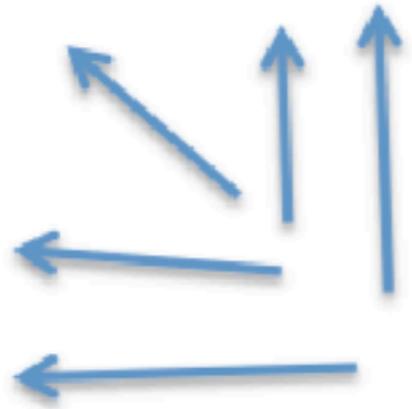
“observed indications of...”

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“I did not observe
any indications of
[insert defect]
during my inspection.”







~47.8 °F

52.7



 FLIR

15.3



78.4 °F

79.0



 FLIR

71.6





79.1

71.7





75.2 °F

84.4



60.5

 FLIR

79.7 °F

82.6



 FLIR

65.3



64.8 °F

91.7

FLIR

63.3



65.1 °F

73.3



62.4

 FLIR





72.7 °F

86.7

FLIR

66.3



63.1 °F

65.8

FLIR

58.4



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