



● MOISTURE & INSULATION BEHIND FINISHED SURFACES

Building envelope & roof *moisture primer.*

Thermal imaging reads the surface-temperature signatures that trapped moisture and missing insulation create, so you can map problems behind finished surfaces without opening them. It is a screening and targeting tool: infrared finds the spot, a meter or a core confirms it.

01 / MECHANISM Why thermal works here

MOISTURE • EVAPORATIVE

Cooling

Water leaving a wet surface carries heat with it, so an actively damp area reads cooler than the dry material around it.

MOISTURE • THERMAL MASS

Lag

Water stores far more heat than dry building material. As the space or roof changes temperature, wet areas heat and cool more slowly and show up during the swing.

ENVELOPE • INSULATION

Drift

Where insulation is missing or compressed, the interior surface drifts toward the outdoor temperature — a cool streak in heating season, warm in cooling season.

02 / THE ONE CONDITION A thermal driver, or you see nothing

Every one of these effects depends on heat moving. With no temperature difference to reveal it, wet material and an insulation void can read the same as sound, dry construction. Establish the driver before you trust the image.

ROOFS • ASTM C1153

Scan at night after a sunny day has loaded the assembly and the surface is releasing heat. Wet insulation holds the day's warmth and lags the dry field. Confirm every anomaly with a core.

WALLS & ENVELOPE • ASTM C1060

Work with a real indoor-to-outdoor difference — roughly 10 to 18°F. Early heating-season mornings, or a blower door depressurizing the home, give the cleanest images. Mild days wash the signal out.

03 / READING GUIDE What the signature usually means

THERMAL SIGNATURE	WHAT IT USUALLY MEANS
Irregular cool bloom on a ceiling or wall	Active or recent evaporation from a current leak in the assembly above or behind the surface.
Cool plume running down from a ceiling or window	Water tracking downward by gravity, wetting the wall as it falls.
Cool tide line with a defined edge	The boundary of a wetted area, or the level standing water reached. Useful for marking extent.
Warm irregular area on a low-slope roof at night	Wet insulation holding the day's heat — the classic ASTM C1153 signature. Confirm by core.
Cool patch or blob mid-wall (heating season)	Missing, settled, or compressed insulation in that cavity.
Cool feathered plume at outlets, plates, penetrations	Air leakage. Pronounced under blower-door depressurization.
Uniform surface temperature	Sound and dry — or moisture that has equalized. Do not assume dry without a meter check.



04 / DIRECTION OF HEAT

Read the mechanism, not just the color

SAME DEFECT, OPPOSITE SIGNATURE

Whether a problem reads cool or warm depends on which way heat is moving. A fresh interior leak reads **cool** as active evaporation pulls heat from the surface; wet roof insulation at night reads **warm** because it stored the day's heat. An insulation void reads **cool** in heating season and **warm** in cooling season. Before you interpret a color, decide which mechanism you are looking at and confirm you still have a real temperature difference to work with.

05 / FALSE POSITIVES

Rule these out first

A thermal anomaly is a clue, not a verdict. Before calling a cool or warm spot a defect, rule out the everyday things that mimic one:

- ✓ **Reflections.** Glossy paint, glass, and metal mirror other temperatures. Change your angle and set reflected temperature.
- ✓ **Thermal mass that isn't water.** Tile, stone, concrete, and masonry hold and release heat differently and can read like a wet zone.
- ✓ **Solar loading.** Sun-warmed roofs and walls hold heat unrelated to the defect. Follow the C1153 nighttime window; scan shaded elevations indoors.
- ✓ **HVAC and plumbing runs.** Supply lines, drain stacks, ducts, and recessed lights make their own hot and cool patterns.
- ✓ **Benign moisture.** A mopped floor, condensation, or a cold-water line can mimic a leak. Note what is wet for an ordinary reason.
- ✓ **Furniture and wall hangings.** Anything against a wall shifts its surface temperature and blocks airflow. Move it, or note it.

06 / THE VERDICT

Where thermal fits, and where it stops

- ✓ **Define the real extent.** Map how far water traveled, or where coverage drops off, so the scope covers the whole problem — not just the visible stain.
- ✓ **Confirm every time.** A moisture meter or a roof core turns a suspect area into a documented reading. Never call moisture on the image alone.
- ✓ **Aim the invasive checks.** Let the camera pick the few spots worth opening, coring, or probing, instead of cutting blind.
- ✓ **Build a before-and-after record.** Rescan under similar conditions after drying or retrofit to prove the assembly came back.

THE GOVERNING RULE

Infrared is a screening and targeting tool, not a moisture meter and not an X-ray. It needs a thermal difference to work, it does not read moisture content or R-value directly, and by itself it does not prove a surface is wet or name a point of entry. Used inside those limits — consistent emissivity and reflected temperature, confirmed with a meter or core — it turns a whole assembly into a fast, documented survey that holds up.