PRECISION
AERIAL OPTICS

Leak Source Investigation

Thermal Roof Survey · Conduit Penetration Area

CLIENT	Commercial roofing contractor (name removed)
PROPERTY	Commercial building, Central Texas (address removed)
SURVEY DATE	October 6, 2026 · Evening flight, 7:36 – 7:42 PM
ROOF SIZE	~4,800 sq ft
ROOF TYPE	Metal / TPO mix
PLATFORM	DJI Mavic 3T · paired RGB + thermal frame sets
SCOPE	Investigate and report any anomalies that indicate where water has been penetrating the roof

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SAMPLE REPORT · CLIENT NAME AND ADDRESS REMOVED

LIKELY SOURCE IDENTIFIED — ELECTRICAL CONDUIT PENETRATIONS

One moisture signature, repeated in every frame set that covers it. The parapet wall line and the patched areas read clean.

1	CLEAR	CLEAR	13
Primary Signature	**Wall Line**	**Patched Areas**	**Frame Sets Reviewed**
Conduit penetration cluster	No discrete signature	Thermally neutral	Paired RGB + thermal

BACKGROUND

The roof has an active leak. Repair efforts to date have focused on re-coating the parapet wall line, where the leak was believed to originate, and the leak has persisted. PAO was engaged for a focused, reduced-scope investigation to locate the entry point rather than a full roof inspection.

FINDINGS

- A distinct warm (moisture-consistent) signature begins at the row of electrical conduit penetrations and extends diagonally across the TPO field toward the roof drains. It appears in every frame set that covers this area, from multiple heights and headings, which rules out a single-angle reflection artifact.
- Surface staining visible in the RGB frames (marked S1–S3) falls along the same path as the thermal signature, between the penetrations and the drains.
- The parapet wall line shows only the smooth, uniform perimeter gradient expected from wall thermal mass. There are no discrete or irregular signatures originating at the wall.
- The numerous patches on this roof, including the long patch strip, the round patch clusters, and patches on the adjacent roof section, read thermally neutral except where the moisture path passes beneath the strip.
- Rooftop mechanical equipment, ductwork, drains, and the metal standing-seam roof show expected thermal behavior and were excluded from anomaly review.

RECOMMENDED NEXT STEP

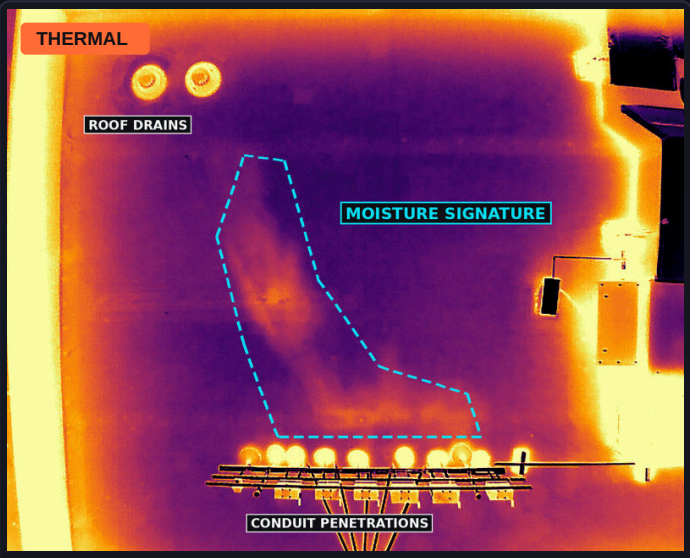
Verify with a moisture probe or core cut at the conduit penetrations and along the signature path, then inspect and reseal the penetration flashings and sealant pockets. Full recommendations are on page 8.

Primary Finding — Conduit Penetration Area

Overhead view of the main TPO roof section · Frame 0049



RGB · Frame 0049 · S1–S3 = surface staining



Thermal · Frame 0049 · dashed = moisture signature

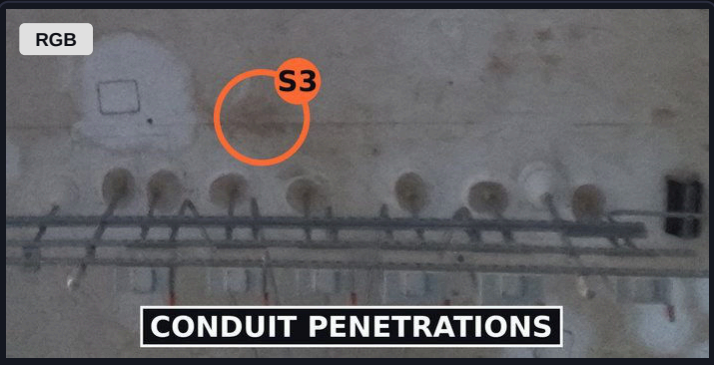
WHAT THE THERMAL SHOWS

The flight was made shortly after sunset, when wet insulation gives up stored daytime heat more slowly than dry insulation and reads warmer than the surrounding field. The outlined signature has an irregular, diffuse shape with no straight edges, which is typical of water migrating beneath the membrane. Its widest and warmest portion sits directly against the conduit penetrations, and it narrows as it extends away from them toward the drains. Water following the roof slope from an entry point at the penetrations would produce exactly this pattern.

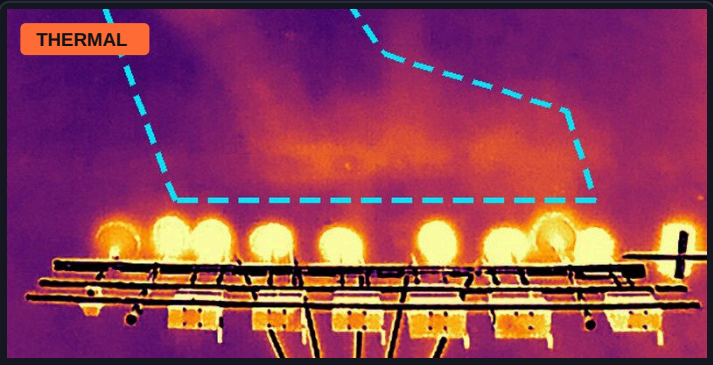
RGB CORRELATION

Three areas of rust-colored surface staining (S1 near the drains, S2 on the long patch strip, S3 just above the penetrations) line up with the path of the thermal signature. Staining along a drainage path is consistent with repeated water movement, but staining alone does not confirm subsurface moisture.

DETAIL — CONDUIT PENETRATION ROW



RGB detail



Thermal detail

Reading the thermal images

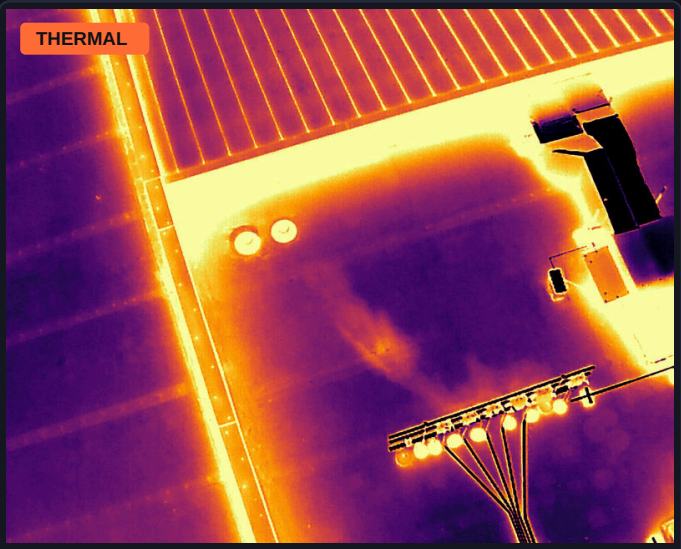
Lighter / yellow = warmer, darker / purple = cooler. The bright band around the roof perimeter, the drain bowls, and the conduit stubs are expected: walls, metal, and penetrations radiate heat differently from the membrane. Temperatures are relative, not radiometric. The RGB and thermal cameras have slightly different fields of view, so features do not line up pixel for pixel.

Confirmation From Multiple Angles

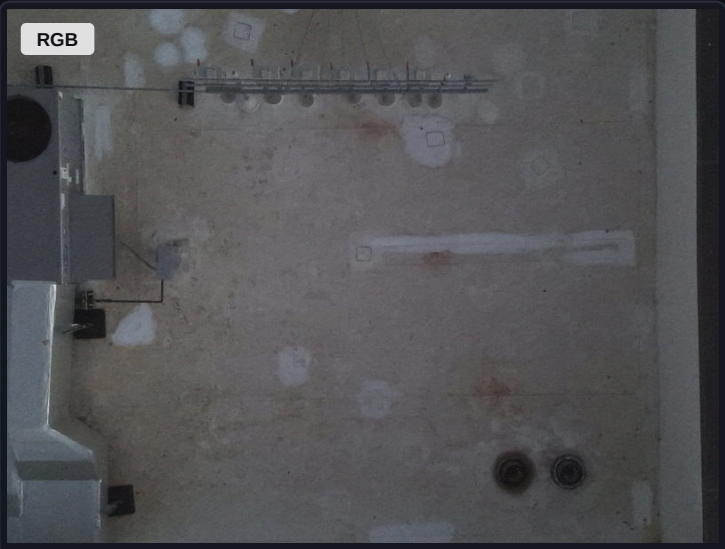
The same signature appears from different headings and heights · Frames 0039 and 0084



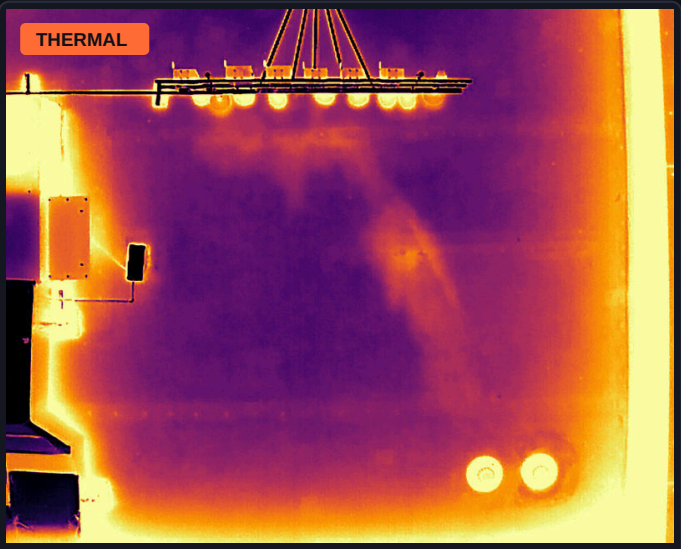
RGB · Frame 0039 · oblique view



Thermal · Frame 0039



RGB · Frame 0084 · reverse heading



Thermal · Frame 0084

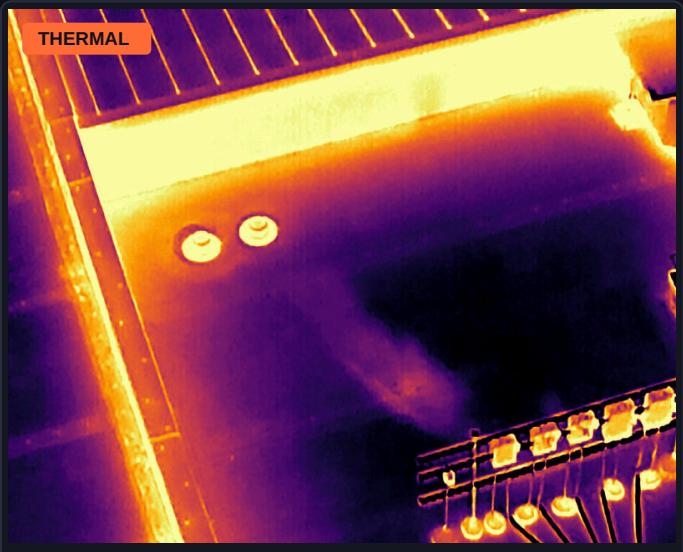
Frame 0039 is an oblique view with the metal roof and parapet in the background. Frame 0084 is shot on a reverse heading, so the image is rotated, with the drains at the bottom right and the conduit rack at the top. In both, the same warm path runs from the conduit penetrations toward the drains. A reflection or sky artifact would shift or disappear as the camera angle changes. This signature stays fixed to the same location on the roof, which is strong evidence that it is a real subsurface condition.

Parapet Wall Line — No Discrete Signature

Area of previous re-coating work · Frames 0032 and 0026



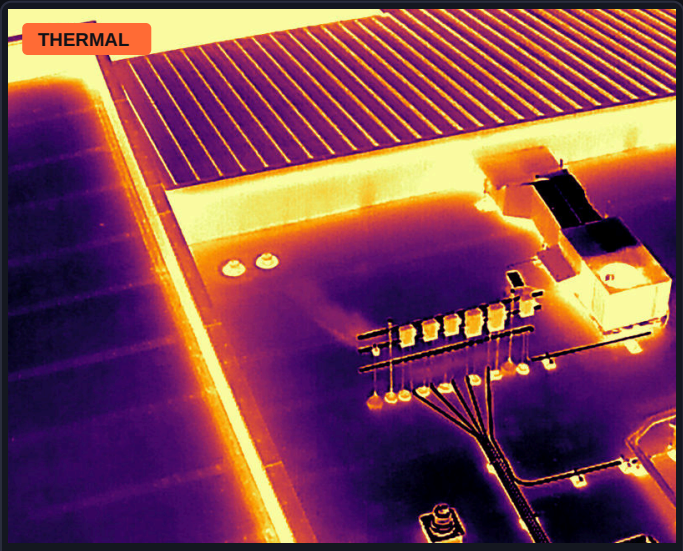
RGB · Frame 0032



Thermal · Frame 0032



RGB · Frame 0026



Thermal · Frame 0026

The parapet wall and the membrane immediately next to it read warmer than the open field. This is the normal result of the wall's thermal mass and its vertical face radiating toward the roof. The gradient is smooth and consistent along the full length of every wall on this roof, including walls nowhere near the leak, and it fades evenly with distance. A leak at the wall would typically show as an irregular warm area or fingers extending into the field from a specific point. No such pattern was found. The only discrete signature on this roof section is the one at the conduit penetrations.

Note

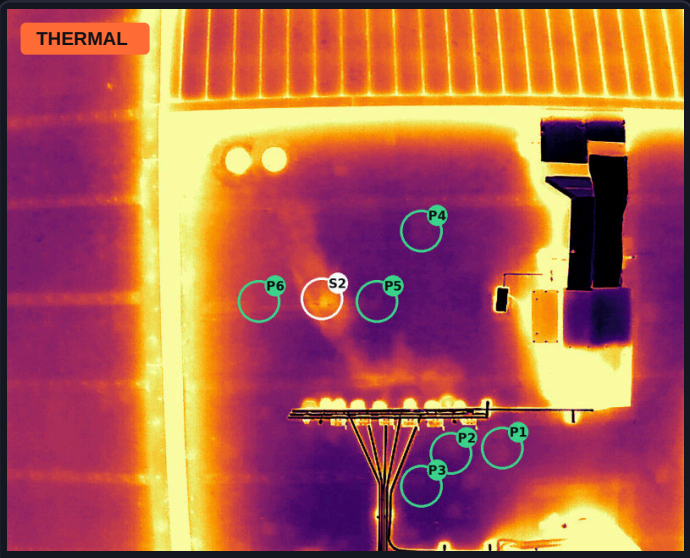
Because this is where repair work has already been done, PAO recommends one moisture-probe reading along the wall line during verification to formally close it out as a source.

Patched Areas — Main Roof

Patches reviewed for active moisture · Frame 0044



RGB · Frame 0044 · P1–P6 = patches reviewed



Thermal · Frame 0044 · matching locations

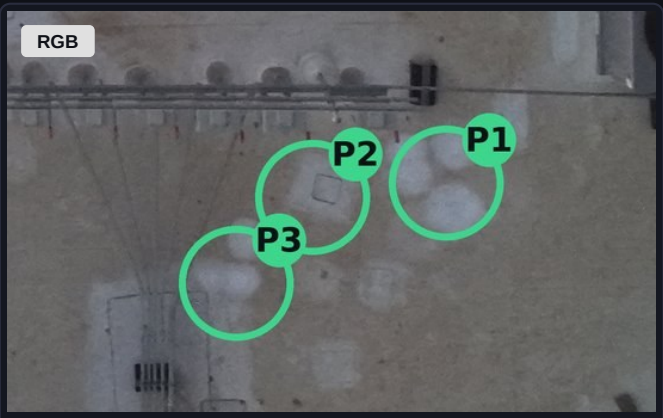
OBSERVATIONS

- For new construction, this roof carries an unusually high number of patches: round patches, square patches, a dense cluster just south of the conduit rack, and a long patch strip across the middle of the field.
- P1–P3 (the cluster below the conduit rack), P4 (open field), and P5–P6 (both ends of the long strip) all read at the same temperature as the surrounding membrane. None shows a moisture signature.
- The only warm reading along the long strip is at S2, where the moisture path from the conduit penetrations passes beneath it. This is the same signature documented on page 3, not a separate leak at the patch.
- The metal standing-seam roof (top of frame) shows its normal seam-line pattern, and the adjacent roof section (left) reads uniform.

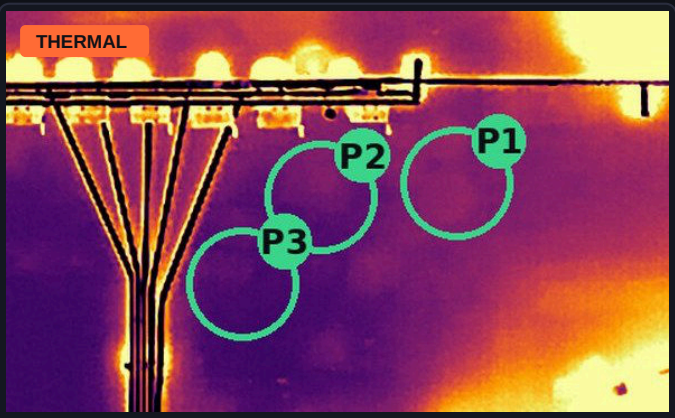
Conclusion

The patches are not contributing to the current leak. They do not need to be part of the immediate repair scope, though the number of patches on a new roof may be worth noting for the owner.

DETAIL — PATCH CLUSTER BELOW THE CONDUIT RACK (P1–P3)



RGB detail



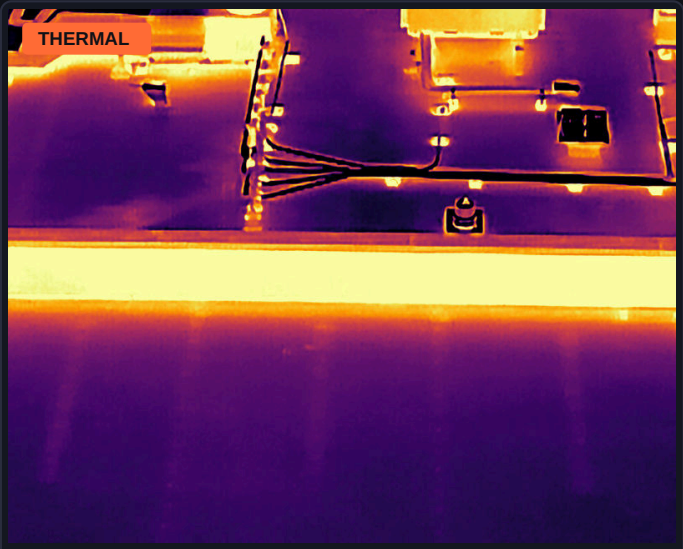
Thermal detail

Patched Areas — Adjacent Roof & Equipment Zone

Frames 0018 and 0023



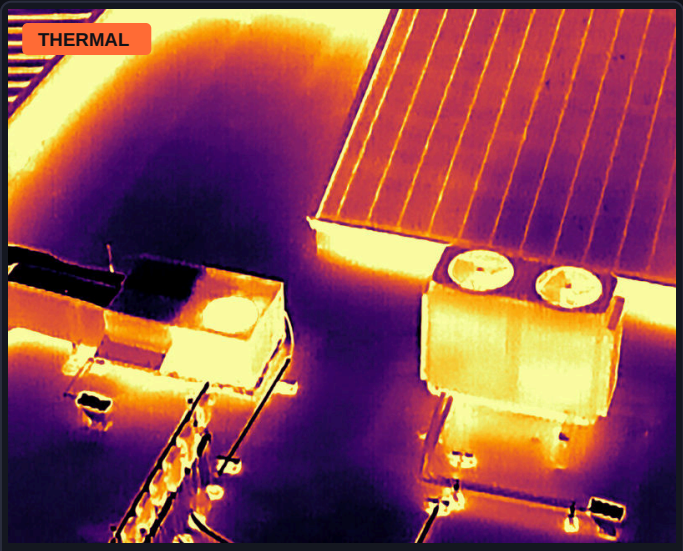
RGB · Frame 0018 · adjacent roof section (foreground)



Thermal · Frame 0018



RGB · Frame 0023 · rooftop unit & condenser



Thermal · Frame 0023

Frame 0018 looks across the parapet onto the adjacent roof section. The membrane there, including the patches in the foreground, reads uniform. The faint evenly spaced lines follow the membrane seams and are normal construction texture. Frame 0023 covers the rooftop unit and the condenser, where the RGB shows a ring of patches around the equipment. The units themselves read hot as expected and were excluded. The patched membrane around their supports shows no moisture signature. Together these frames confirm that the conduit penetration signature is isolated, not a roof-wide condition.

Recommendations & Methodology

Next steps for the roofing contractor

RECOMMENDATIONS

1. **Verify before repair**
   Take moisture-probe readings or a core cut at the conduit penetrations and at two or three points along the signature path to confirm wet insulation and its extent.

2. **Inspect the conduit penetrations**
   Check each penetration's flashing, sealant pocket or pitch pan, and boot for voids, shrinkage, or separation. Also confirm the conduits themselves are sealed: water can enter an open or unsealed conduit and exit at the deck.

3. **Address wet insulation**
   Replace saturated insulation along the confirmed path. Leaving it in place will keep the area wet and can show up as a recurring leak even after the entry point is sealed.

4. **Close out the wall line**
   Take one probe reading along the previously re-coated parapet wall during verification to formally rule it out.

5. **Re-scan after repair**
   A follow-up thermal flight after the next significant rain, or after a flood test, will confirm the repair held.

METHODOLOGY & LIMITATIONS

Survey flown October 6, 2026, from approximately 7:36 to 7:42 PM with a DJI Mavic 3T, capturing paired RGB and thermal frames from multiple heights and headings. Thermal frames are shown in the inferno palette with relative contrast; temperatures are not radiometrically calibrated. The RGB and thermal cameras have different fields of view, so paired frames are approximate rather than pixel-aligned. Infrared thermography identifies conditions consistent with moisture, and findings should be confirmed by invasive or moisture-meter testing before repair. This was a reduced-scope leak source investigation focused on the affected area, not a full roof condition inspection.

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