

— NXS-02 · THERMAL ENVELOPE DIAGNOSTICS

Thermal Envelope Inspection

Building Envelope Defect Register & Severity Assessment

REPORT ID	NXS-02-SAMPLE-001	LOCATION	Calgary, AB
SITE CLASSIFICATION	Commercial — low-rise office / light-industrial · 3 storeys · ~48,000 ft ² roof	INSPECTION DATE	[SAMPLE]
FLIGHT CONDITIONS	-8 °C ambient · clear · wind < 15 km/h	PREPARED BY	Nexus Analytics
REVIEWED BY	Building Envelope Specialist	THERMAL ACCURACY	± 2 °C radiometric

■ SAMPLE REPORT · ILLUSTRATIVE · NOT A CLIENT PROJECT

This document does not represent a real building, client, or inspection. It demonstrates report format and methodology only.

— SECTION 01

Executive Summary

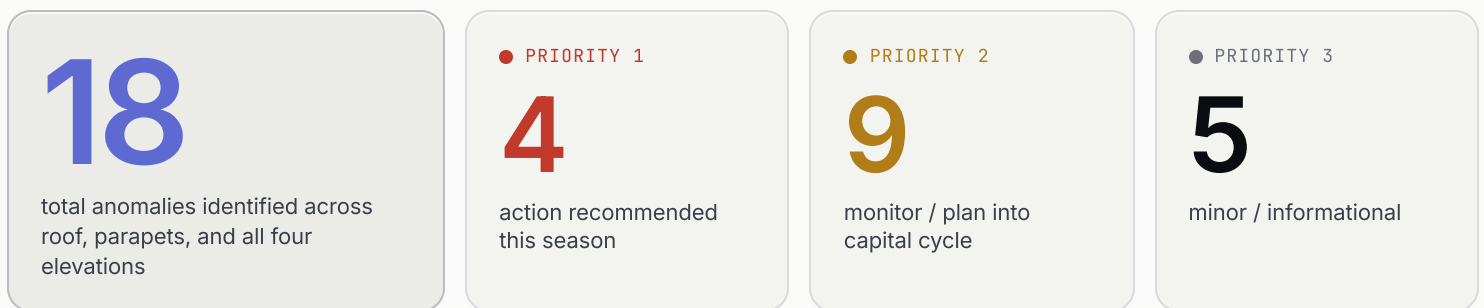
P. 02 / 10

This report presents the results of an aerial thermal envelope inspection conducted on the subject building. The inspection used radiometric infrared imaging captured by drone, paired with high-resolution visible-light imagery on the same flight. The objective was to identify, classify, and prioritize envelope defects affecting thermal performance, moisture risk, and long-term capital planning.

— WHAT WAS ASSESSED

The inspection covered the full building envelope visible from the exterior: the low-slope roof field, parapets, all four façade elevations, window and curtain-wall perimeters, mechanical penetrations, and the roof-to-wall interface. Thermal anomalies were captured under cold-weather conditions to maximize the temperature differential between conditioned interior space and the exterior surface.

— HEADLINE FINDINGS



The most significant findings relate to suspected moisture accumulation in the low-slope roof field and thermal bridging at the roof-to-wall interface. For a commercial building of this type, the roof is typically the highest-value envelope component to protect — sub-membrane moisture, left undetected, is the leading driver of premature full-roof replacement. These findings do not indicate structural concern on their own, but they represent measurable energy loss and elevated moisture risk that warrant prioritized follow-up. Specific findings, locations, and recommended actions are detailed in the Defect Register that follows.

— SECTION 02

Methodology

Thermal imaging detects differences in surface temperature. On a building envelope under cold-weather conditions, areas of heat loss — missing insulation, thermal bridging, air leakage — appear as warmer signatures on the exterior surface. Moisture-laden materials retain and release heat differently than dry materials, producing distinct thermal patterns. Interpreting these patterns correctly requires controlling for capture conditions and understanding how envelope assemblies are built.

— CAPTURE CONDITIONS

EQUIPMENT	Radiometric IR camera + 20 MP visible-light sensor — dual payload, single pass
CALIBRATION	Blackbody reference verified each flight
THERMAL ACCURACY	± 2 °C radiometric
INT.-EXT. DIFFERENTIAL	≥ 18 °C at capture (required minimum for reliable envelope reads)
FAÇADE CAPTURE ANGLE	~30° pitch for full-surface coverage
GROUND SAMPLE DISTANCE	Sub-centimetre at inspection altitude

— CLASSIFICATION APPROACH

Every thermal anomaly is reviewed against the corresponding visible-light image to rule out non-defect causes — solar loading, recent occupancy, mechanical exhaust, or surface staining. Confirmed anomalies are typed by defect category and assigned a severity rating.

No anomaly is reported on thermal signature alone; each is corroborated against the visible-light frame and envelope context.

— SEVERITY SCALE

RATING	DEFINITION	TYPICAL RESPONSE
● PRIORITY 1	Active or imminent performance / moisture issue	Action recommended this season
● PRIORITY 2	Confirmed defect, not yet critical	Monitor and plan into capital cycle
● PRIORITY 3	Minor or cosmetic anomaly	Informational; no immediate action

What thermal imaging does not assess

Thermal imaging is a diagnostic screening tool, not a substitute for invasive investigation. It identifies **where** envelope problems are occurring and **how severe** the surface signature is, but it does not measure interior conditions behind finishes, confirm the exact assembly composition, or replace a destructive test where one is warranted. Where a Priority 1 finding may require a stamped engineering opinion, that is noted in the register and available as a separate scope through our partner Professional Engineer.

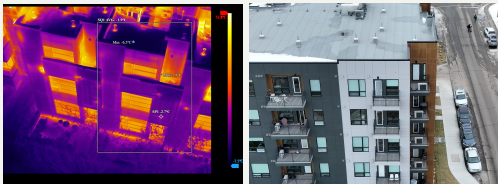
SECTION 03

Defect Register

Each confirmed anomaly is listed below with its location, defect type, severity rating, thermal observation, and recommended action. Thermal and visible-light image pairs for each defect are referenced by figure number.

FIG. D-01 **D-01** Wet insulation (suspected, sub-membrane)

PRIORITY 1



[Thermal / RGB image pair - D-01]

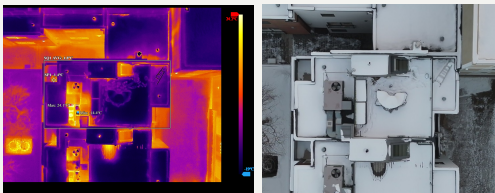
LOCATION	Low-slope roof field, southeast quadrant
DEFECT TYPE	Wet insulation (suspected, sub-membrane)
THERMAL OBSERVATION	Irregular warm mass in the roof field, ~14 m ² , retaining heat after the surrounding membrane has cooled — the classic signature of saturated insulation below the membrane.
VISIBLE-LIGHT	No surface ponding visible at capture; defect is sub-membrane and not detectable visually.

— RECOMMENDED ACTION

Priority verification before next freeze cycle. Sub-membrane moisture is invisible from the surface and is one of the highest-value findings thermal imaging provides — it directly informs the roof repair-vs-replace decision. Recommend core sampling to confirm extent.

FIG. D-02 **D-02** Moisture accumulation (suspected)

PRIORITY 1



[Thermal / RGB image pair - D-02]

LOCATION	Parapet, northwest corner
DEFECT TYPE	Moisture accumulation (suspected)
THERMAL OBSERVATION	Distinct cool-then-slow-warming signature across a 2.3 m parapet section, characteristic of moisture retention in the assembly. Differential thermal-mass behaviour observed across the capture sequence.
VISIBLE-LIGHT	Minor membrane lifting visible at the parapet cap; consistent with a water-entry path.

— RECOMMENDED ACTION

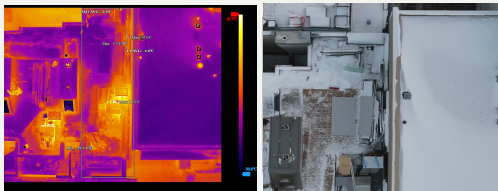
Priority investigation. Suspected moisture in a parapet assembly is a freeze-thaw risk in Calgary's climate and can accelerate membrane and substrate deterioration. Recommend moisture verification and review of parapet cap flashing.

SECTION 03 · CONT'D

Defect Register

FIG. D-03 **D-03** Thermal bridging (continuous)

PRIORITY 1



[Thermal / RGB image pair - D-03]

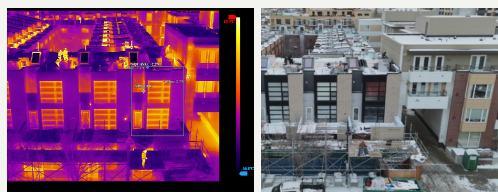
LOCATION	Roof-to-wall interface, north elevation, between grids 2-4
DEFECT TYPE	Thermal bridging (continuous)
THERMAL OBSERVATION	Continuous warm signature along the roof-to-wall junction, 4.8 °C above adjacent wall surface, extending approximately 9 metres. Pattern consistent with absent or compressed insulation at the perimeter detail where the roof assembly meets the wall.
VISIBLE-LIGHT	No surface staining or mechanical source present; thermal signature is structural to the assembly, not occupancy-driven.

RECOMMENDED ACTION

Prioritize for envelope review this season. Continuous perimeter thermal bridging at this scale represents persistent heat loss and elevated condensation risk at the interior junction. Recommend targeted investigation of the perimeter insulation detail.

FIG. D-04 **D-04** Air leakage (perimeter)

PRIORITY 1



[Thermal / RGB image pair - D-04]

LOCATION	Curtain-wall / window perimeters, west elevation, floors 2-3
DEFECT TYPE	Air leakage (perimeter)
THERMAL OBSERVATION	Repeating warm plumes at window head and jamb perimeters across multiple bays, 3.2-4.1 °C above field wall temperature, with the characteristic fan-shaped pattern of air exfiltration.
VISIBLE-LIGHT	Aged perimeter sealant visible at several bays; consistent with a degraded air seal.

RECOMMENDED ACTION

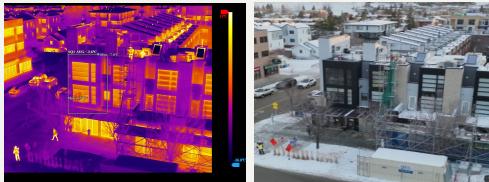
Plan a perimeter sealant renewal program for the west elevation. The repeating pattern across bays indicates a systemic detailing/aging issue rather than isolated failures, which makes a coordinated program more cost-effective than bay-by-bay repair.

SECTION 03 · CONT'D

Defect Register

FIG. D-05 **D-05** Insulation gap / settling (localized)

PRIORITY 2



[Thermal / RGB image pair - D-05]

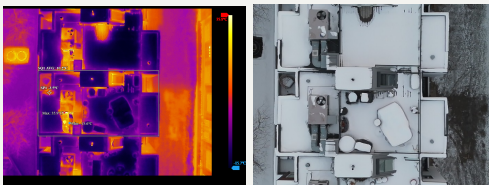
LOCATION	South elevation, field wall, floors 1-2
DEFECT TYPE	Insulation gap / settling (localized)
THERMAL OBSERVATION	Vertical warm bands at regular intervals consistent with insulation settling between framing members, 2.4 °C above adjacent field.
VISIBLE-LIGHT	No exterior indication; signature is internal to the wall assembly.

— RECOMMENDED ACTION

Monitor and plan. Indicative of settled insulation — common in commercial wall assemblies of this apparent vintage. Not critical, but worth factoring into any future re-cladding or deep-energy-retrofit planning.

FIG. D-06 **D-06** Penetration sealing (minor)

PRIORITY 2



[Thermal / RGB image pair - D-06]

LOCATION	East elevation, mechanical penetration cluster
DEFECT TYPE	Penetration sealing (minor)
THERMAL OBSERVATION	Localized warm points at three exterior penetrations, 2.0-2.6 °C above field, consistent with minor air leakage at the seal.
VISIBLE-LIGHT	Penetration seals visibly aged but intact.

— RECOMMENDED ACTION

Address opportunistically during the next maintenance cycle. Low-cost seal renewal; not urgent.

Defects D-07 through D-18 (Priority 2 and Priority 3) are documented in the complete register. This sample shows representative entries.

SECTION 04

Summary — All Findings

Consolidated register of all eighteen anomalies, ordered by severity. Priority 1 findings appear first; representative entries are detailed in the Defect Register on the preceding pages.

ID	LOCATION	TYPE	SEVERITY
D-01	Roof field, SE quadrant	Wet insulation (suspected)	P1
D-02	Parapet, NW corner	Moisture (suspected)	P1
D-03	Roof-to-wall, N elevation	Thermal bridging	P1
D-04	Curtain-wall perimeters, W elevation	Air leakage	P1
D-05	Field wall, S elevation	Insulation gap	P2
D-06	Penetrations, E elevation	Penetration sealing	P2
D-07 - D-15	Various	Mixed P2 findings	P2
D-16 - D-18	Various	Minor / cosmetic	P3

4
Priority 1 — action this season

9
Priority 2 — monitor / plan

5
Priority 3 — informational

SECTION 05

Why Early Detection Pays

P. 08 / 10

Thermal envelope inspection is a screening tool, but its value is economic: it surfaces problems while they are still small, localized, and inexpensive to fix — before they become full-system failures. The data below is drawn from published industry and government sources on infrared building diagnostics. It is provided as general context, not a projection specific to this building.

~30%¹

Share of energy consumed by commercial buildings attributable to the building envelope — walls, windows, roof, and foundation.

Up to 50%²

Proportion of a building's heating and cooling load that can be lost through an envelope when insulation, air-sealing, and roof assemblies underperform.

Targeted vs. full replacement³

Infrared moisture detection allows wet roof sections to be repaired surgically rather than triggering a full tear-off — the single largest cost lever in roof capital planning.

Before it's visible⁴

Sub-membrane roof moisture and in-assembly air leakage are typically invisible to the naked eye and to ground-level inspection — infrared surfaces them months or years before interior damage appears.

The economic logic is consistent across the literature: the cost of an inspection is a small fraction of the cost of the failures it surfaces early. A localized roof repair guided by a moisture map is a fraction of a full-roof replacement. A perimeter sealant program planned across a single elevation is a fraction of remediating water-damaged interiors. The role of this report is to put those decisions in front of you while they are still inexpensive.

1. U.S. Department of Energy, Better Buildings program — building envelope accounts for approximately 30% of energy consumed in commercial buildings.
2. U.S. Department of Energy, Thermographic Inspections guidance; building-envelope thermal research literature.
3. Industry-consistent finding across infrared roof-moisture survey practice; targeted repair versus full replacement.
4. U.S. Department of Energy thermographic inspection guidance; infrared building-diagnostics literature.

SECTION 06

Recommended Action Plan

P. 09 / 10

Findings are grouped below by recommended timeframe to support capital planning and maintenance budgeting. This is a screening-level prioritization, not a remediation specification.

PRIORITY 1

This season
4 findings

Four findings warrant attention before the next freeze cycle: suspected wet roof insulation (D-01), suspected parapet moisture (D-02), roof-to-wall thermal bridging (D-03), and west-elevation perimeter air leakage (D-04). D-01 and D-02 in particular benefit from verification before freeze-thaw cycling can accelerate deterioration.

PRIORITY 2

Plan into capital cycle
9 findings

Nine findings are confirmed but not yet critical. These are best folded into existing capital planning — particularly any planned re-cladding, roof work, or energy-retrofit scope, where addressing them becomes incremental rather than standalone cost.

PRIORITY 3

Informational
5 findings

Five minor findings are documented for completeness and require no immediate action.

Where engineering sign-off applies

Two findings (D-01, D-02) may require confirmation through invasive testing, and any resulting remediation affecting the building envelope assembly may warrant a stamped engineering opinion. Nexus Analytics provides this through a partner Professional Engineer registered with APEGA, available as a separate scope.

Scope & Limitations

SCOPE

This inspection assessed the exterior building envelope using aerial radiometric thermal imaging and visible-light photography. It is a non-invasive, screening-level diagnostic intended to identify and prioritize areas of thermal and moisture concern for follow-up.

LIMITATIONS

Thermal imaging identifies surface temperature anomalies and their likely causes; it does not confirm assembly composition, measure conditions behind interior finishes, or replace destructive testing where warranted. Suspected-moisture findings are based on thermal-mass behaviour and require physical verification. Capture was limited to envelope surfaces visible from the exterior, and reflects conditions at the time of capture under the stated weather conditions.

CREDENTIALS & COVERAGE

PILOT CERTIFICATION	Transport Canada RPAS — Advanced
LIABILITY	\$5M commercial drone liability
WORKERS' COVERAGE	WCB Alberta
THERMAL INTERPRETATION	Experienced building envelope specialist
ENGINEERING SIGN-OFF	Available via partner P.Eng. (APEGA)
REFERENCE STANDARD	ASTM E1186 (air-leakage detection by infrared)

This is a sample report prepared for illustrative purposes only. It does not represent an actual client project, building, or inspection. Data, findings, and locations are illustrative and intended to demonstrate report format and methodology. Project-specific reports are tailored to each client's building and requirements.

— BEFORE IT BECOMES A CAPITAL SURPRISE

Know what your envelope is doing before it becomes a capital surprise.

Nexus Analytics delivers engineering-grade thermal envelope diagnostics for property managers, building owners, and acquisition teams across Alberta. Every report is interpreted by a building envelope specialist — not handed off as raw imagery.

Request a quote | nexusanalytics.ca

■ SAMPLE REPORT · ILLUSTRATIVE · NOT A CLIENT PROJECT

This document does not represent a real building, client, or inspection. It demonstrates report format and methodology only.