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Uncovering Hidden Issues:
How Thermal Drone Technology is Revolutionizing Roof Inspections

A recent warehouse roofing project highlights how drones equipped with infrared thermal cameras can revolutionize traditional roofing inspections.


Erik Gronneberg operates a drone on the jobsite for Columbia.

The Challenge

The client had been grappling with persistent roof leaks for several years. These leaks caused thousands of dollars of damage to product stored within the warehouse. Despite multiple patch jobs, the leaks continued. **This indicated that the physical locations of the leaks in the building did not come from directly above each leak but from another location on the roof.** It was clear that a comprehensive assessment of the roof's condition was required to determine the source of the leaks and to help the client determine if the entire roof needed to be replaced. The original roofing system, dating back to the 1970s, was comprised of metal decking, tar and gravel, fiberglass insulation, OSB and EPDM. Traditional inspection methods failed to pinpoint the root causes of these leaks, resulting in continued water intrusion and escalating repair costs.

The Solution

Columbia's Reality Capture Department deployed an infrared equipped drone to scan the entire roof of the warehouse. To fly and scan the entire roof took roughly 45 minutes. This high-tech approach allowed for the creation of a detailed thermal map of the roof. Allowing Columbia and the roofing contractor to pinpoint multiple areas of concern that were invisible to the naked eye. A plan based off the thermal data and active leak reports was developed to do physical roof openings in 4 locations across the roof.
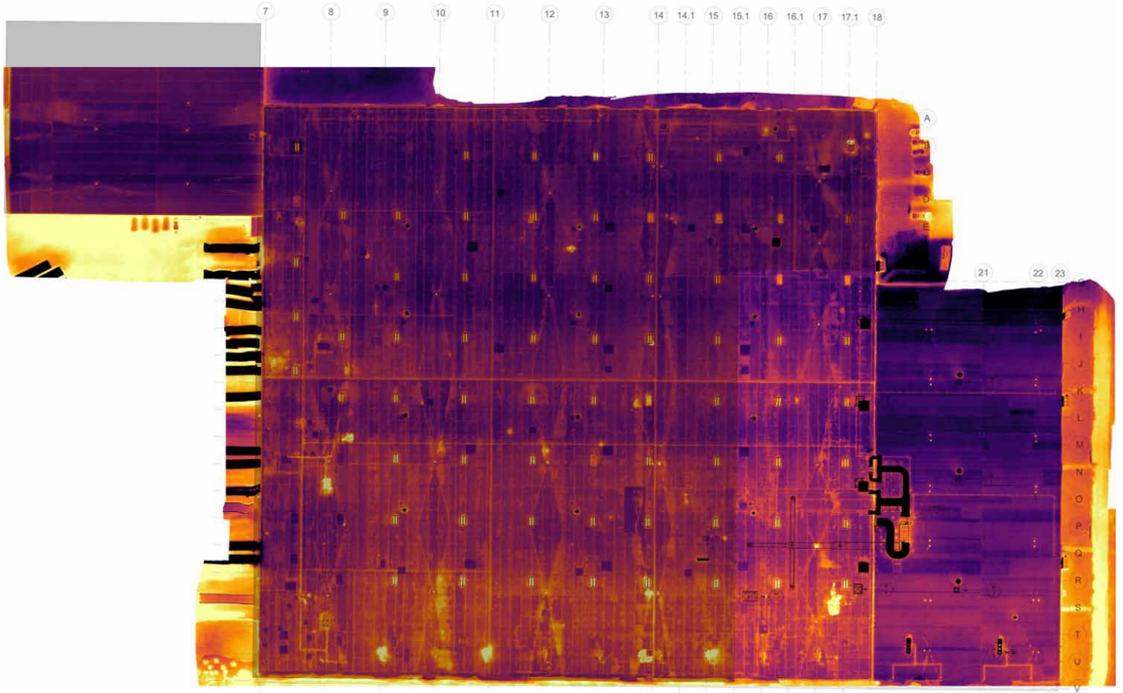
Roof: Overall Thermal Image
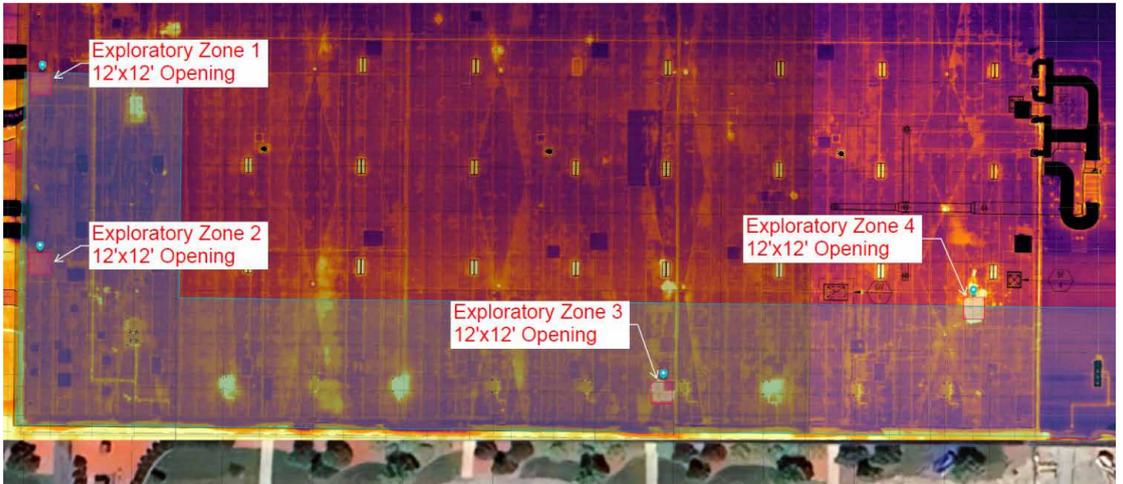
Roof: Exploratory Openings

- **Zone 1 & Zone 2:** Identified due to existing leaks inside the facility.
- **Zone 3 & Zone 4:** Marked by distinct thermal abnormalities on the infrared map.

Detailed Findings

The physical testing of these zones confirmed the drone's findings:

- **Zone 1:** This area showed signs of past water damage but no current wet conditions.
- **Zone 2:** Like Zone 1, this area had acceptable conditions.
- **Zone 3:** Thermal anomaly. Revealed saturated OSB and waterlogged insulation, with ice found in the decking flutes.
- **Zone 4:** Thermal anomaly. The worst-affected area, with wet insulation and a visibly compromised original deck.

Data Validation

The physical testing of the roof at the locations identified by the drone confirmed the thermal data provided by the drone. The comprehensive assessment led to the decision to replace the entire roofing system rather than continue with ineffective patch repairs.
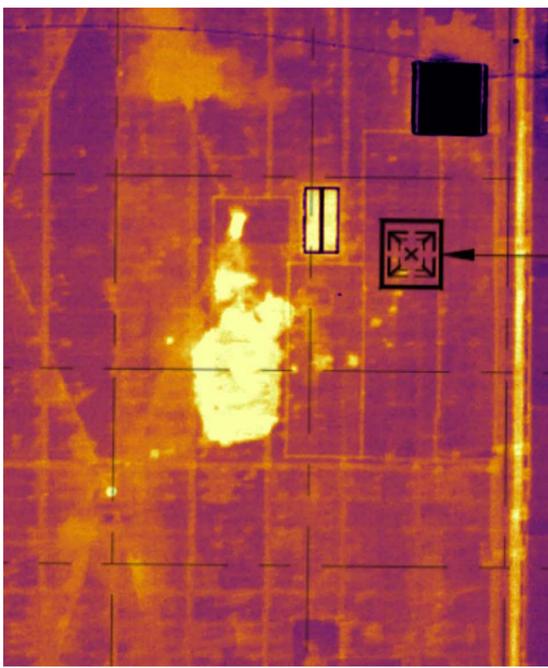
Zone #4
Image of thermal anomaly clearly shows the problem area in yellow.
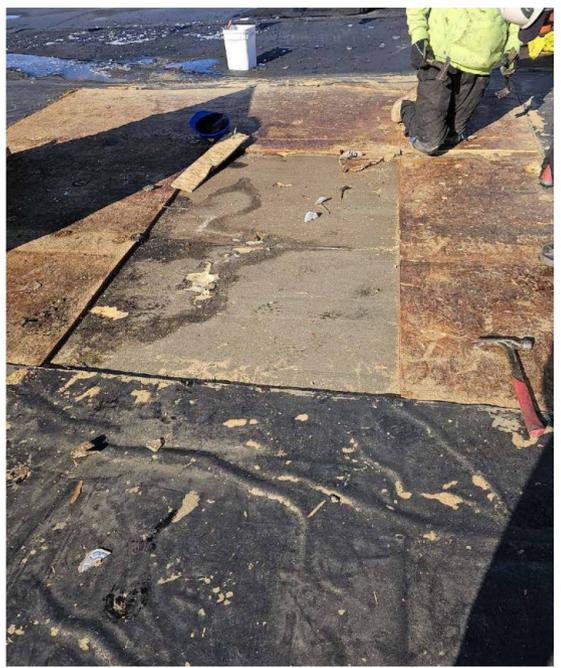
Zone #4
The OSB was removed to reveal wet insulation in areas that matched the infrared scan abnormality shape.

Impact

- **Saved Time:** The thermal scan quickly identified problem areas, reducing the need for extensive and costly manual inspections.
- **Reduced Costs:** By preventing further damage and avoiding repeated repairs, the drone technology helped avoid escalating maintenance costs.
- **Increased Accuracy:** Provided a precise and reliable assessment of the roof's condition, ensuring targeted interventions.

Conclusion

This case study underscores the transformative impact of using drones with thermal imaging for roof inspections. It not only highlighted unseen issues but also facilitated a strategic decision that ultimately saved significant resources.