LITHOS-SKYLINE
AERIAL PHOTOGRAPHY AND ROOF SURVEYS
PROFESSIONAL DRONE PHOTOGRAPHY

Case Study 4: Drone Roof Survey on an Industrial Unit with Trapezoidal Insulated Roofing Sheets.

30th September 2024

1. Introduction

Figure 1. Nadir image of industrial unit with trapezoidal roof on portal framed building with 6 valley gutters. Yorkshire, UK.

This case study presents a drone roof survey carried out on an industrial unit featuring trapezoidal insulated roofing sheets. The unit had significant issues including the presence of lichen, moss, and seagull guano across the roof, as well as corroded valley gutters. The roof was also leaking water into the building, causing concern for the building's structural integrity. Traditional roof surveys were considered too time-consuming, expensive, and risky, especially given the poor condition of the roof and the presence of hazardous contaminants like guano.

By leveraging advanced drone technology, the property owner was able to obtain a comprehensive overview of the roof's condition, while minimising risk, cost, and disruption to operations. This survey provided actionable data to support maintenance and repair decisions.

2. Project Overview

The property in question was a large industrial unit with a roof made from trapezoidal insulated roofing sheets. Over time, the roof had accumulated a significant amount of moss, lichen, and vegetation, as well as bird droppings, particularly from seagulls. The valley gutters, which were galvanized, had started to corrode and were showing visible signs of rust. Water was leaking into the building, indicating that the roof had lost its ability to fully protect the structure from the elements. The property owner was concerned that ongoing water ingress would cause further structural damage and lead to costly repairs if not addressed promptly.

Given the size and condition of the roof, as well as the logistical difficulties posed by the contaminants, traditional inspection methods like scaffolding or cherry pickers were not considered viable. The property owner turned to drone technology as a solution to conduct a safe, efficient, and detailed roof survey.

Figure 2. Low oblique image of a factory industrial unit from a drone roof survey and roof inspection in Yorkshire, UK.

3. Objectives

The primary objectives of the drone roof survey were as follows:

- **Assess Roof Condition**: To obtain high-resolution images and video footage of the roof to assess the overall condition, focusing on areas affected by moss, lichen, vegetation, and guano.
- **Inspect Corroded Valley Gutters:** To closely inspect the valley gutters, which had shown signs of rust and corrosion, in order to determine the extent of the damage.
- **Locate Water Leaks:** To identify potential sources of water ingress into the building and provide detailed information to support targeted repairs.
- **Minimise Disruption:** To carry out the survey with minimal disruption to the operations of the industrial unit, ensuring no interference with the surrounding environment.
- **Deliver Actionable Data:** To provide the property owner with a detailed report, including recommendations for maintenance and repair, supported by high-resolution imagery and data.

4. Challenges

The drone roof survey presented a number of challenges:

- **Contaminants on the Roof:** The roof was heavily affected by lichen, moss, vegetation, and seagull guano. These contaminants could obscure certain areas of the roof and complicate visual inspection.
- **Corroded Valley Gutters:** The valley gutters were showing signs of rust and corrosion. Inspecting these areas closely without causing further damage was crucial for assessing the extent of the corrosion.
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- **Water Leaks:** The exact source of the water ingress was unknown, requiring a thorough examination of potential weak points, including roof seams, joints, and corroded gutters.
- **Large Roof Area:** The size of the industrial unit and the complexity of the roof layout made a comprehensive inspection more challenging, especially in hard-to-reach areas.

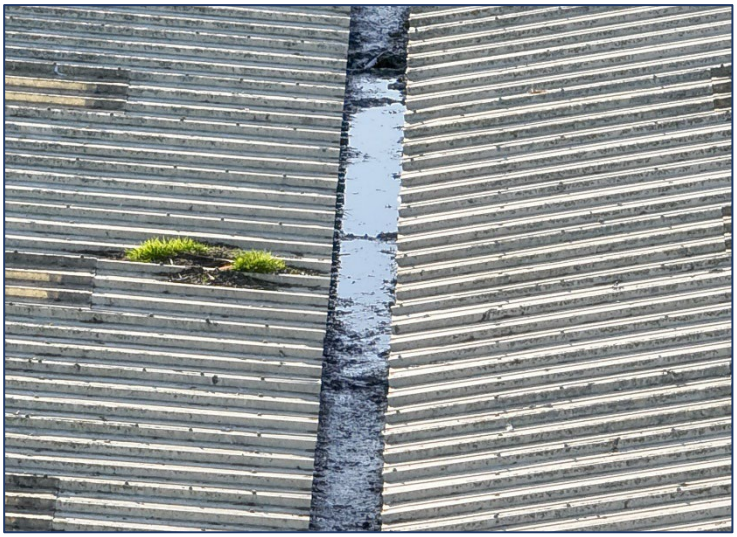

Figure 3. Valley gutter inspection, showing standing water, seagull guano buildup and vegetation on trapezoidal factory roof, from a roof survey in Yorkshire, UK.

5. Solution: Drone Roof Survey

To address these challenges, a drone roof survey was conducted using an unmanned aerial vehicle (UAV) equipped with high-resolution cameras and thermal imaging technology. The survey was conducted in several stages, ensuring that each area of the roof was thoroughly inspected.

Key Features of the Drone Survey:

- High-Resolution Imaging: The drone captured detailed images of the roof, allowing for a close inspection of areas affected by lichen, moss, and guano. The high-quality visuals were crucial for identifying damaged or deteriorating sections of the roof.
- Real-Time Data Monitoring: The drone survey provided real-time data that could be reviewed and analysed on the ground. This allowed the team to make adjustments during the survey to ensure all key areas were covered.
- Non-Invasive Inspection: The drone's non-invasive nature was essential in inspecting the roof without causing further damage, particularly in the rusted valley gutters.
- Health and Safety: As the survey was completed from the ground no operatives were working at height during the survey, helping to keep staff safe, while helping to reduce cost in terms of plant and access equipment.

6. Execution

The drone roof survey was carried out in the following steps:

1. **Pre-Survey Assessment:** A site visit was conducted to assess the environment around the industrial unit. Potential obstacles like nearby buildings, overhead wires, and the condition of the roof were reviewed to ensure the survey could be safely conducted.

2. **Flight Plan Development:** A comprehensive flight plan was developed to cover all areas of the roof, including hard-to-reach sections around the gutters and the edges of the roof. The drone operator ensured that all angles of the roof would be captured during the flight.

Figure 4. A close up of the a valley gutter showing signs of corrosion and seagull guano, requiring maintenance.

3. **Survey Execution:** The drone was deployed to fly over the industrial unit's roof, capturing high-resolution images and 4K video footage. The drone operator made multiple passes over the roof to ensure that every section was covered. Real-time footage was reviewed on-site to ensure that no critical areas were missed.

4. **Data Analysis and Reporting:** Once the drone survey was completed, the data was analysed by a team of roofing specialists. The high-resolution images were reviewed for signs of damage, corrosion, and areas affected by contaminants. The thermal data was used to identify potential leaks. A detailed report was prepared for the property owner, including recommendations for repairs and maintenance.

7. Findings

The drone roof survey revealed several critical issues:

- **Moss, Lichen, and Vegetation Growth:** Large portions of the roof were covered in moss and lichen, which were trapping moisture against the roofing sheets. This was contributing to the corrosion of the galvanized gutters and increasing the risk of leaks.
- **Seagull Guano:** The seagull guano present on the roof posed a health hazard and had accelerated the degradation of certain roof sections. The drone captured clear images of the areas most affected by the guano, allowing for targeted cleaning and repair.
- **Corroded Valley Gutters:** The survey identified significant corrosion in the valley gutters, particularly in areas where water had been pooling. Rust was visible in several A close up of the a valley gutter showing signs of corrosion and seagull guano, requiring

maintenance.locations, and the thermal imaging data confirmed that these areas were likely the source of water leaks into the building.

- **Water Ingress:** The imagery data revealed several areas where water was penetrating the roof, and this was most prevalent around the corroded valley gutters.

Figure 5. Corner detail of industrial roof with valley gutters showing slight sign of corrosion from a roof survey and inspection, in Yorkshire, UK.

8. Recommendations

Based on the findings of the drone survey, the following recommendations were made:

- **Roof Cleaning:** The roof required thorough cleaning to remove moss, lichen, vegetation, and seagull guano. This would prevent further damage and restore the roof's ability to shed water effectively.
- **Gutter Repair or Replacement:** The corroded valley gutters needed immediate attention. In some areas, repairs could be made, but in others, the gutters would need to be replaced entirely to prevent future leaks.
- **Waterproofing and Sealing:** Sections of the roof where water ingress was detected should be resealed or treated with a waterproofing solution to prevent further leaks.
- **Regular Maintenance:** Ongoing maintenance, including periodic cleaning and inspections, was recommended to prevent the buildup of contaminants and ensure the longevity of the roof.

9. Benefits of Using Drone Technology

The use of drone technology for this roof survey provided several key benefits:

- **Safety:** The drone survey allowed the inspection to be carried out without putting any personnel at risk, particularly given the contaminants on the roof and the corroded gutters.
- **Efficiency:** The drone was able to cover the entire roof quickly and efficiently, capturing detailed images in a fraction of the time it would have taken using traditional methods like scaffolding.
- **Cost-Effectiveness:** By avoiding the need for scaffolding, ladders, or cherry pickers, the drone survey was more cost-effective. Additionally, the data collected allowed for targeted repairs, potentially saving the property owner money in the long run.

- **Comprehensive Data:** The high-resolution images and thermal imaging provided a detailed overview of the roof's condition, allowing for accurate assessments and informed decision-making.

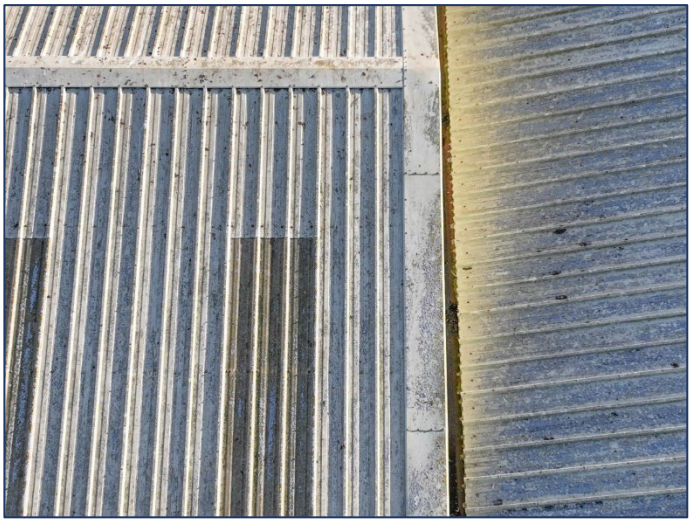

Figure 6. Image showing valley gutter on industrial roof with signs of corrosion.

10. Conclusion

The drone roof survey on the industrial unit with trapezoidal insulated roofing sheets successfully provided a comprehensive assessment of the roof's condition. The detailed data collected enabled the property owner to take swift action to address the moss, lichen, guano, and corroded gutters. By utilising drone technology, the property owner was able to avoid the risks and costs associated with traditional roof inspection methods, while still obtaining high-quality, actionable data to support repair and maintenance decisions.

This case study demonstrates the value of drone roof surveys for industrial properties, especially when faced with challenging environmental conditions and difficult-to-reach areas. Drone roof survey and roof inspections of commercial properties assist with regular pre-planned maintenance, as well as reactive maintenance, these roof surveys also feed into schedules of conditions carried out by Chartered Surveyors and are also a record of property condition for insurance companies.

I hope you have found this case study and informative and should you have any questions please feel free to email me.