V4 Development Hub s.r.o.
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BINARIUM, CAMPUS Mlyny

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V4 DEVELOPMENT HUB

Aerial thermovision inspection
of a flat roof by drone (UAV)

Non-invasive inspection of the roof or facade

- Detection of waterproofing and insulation defects with no-entering the roof
- Precise localization of the problem
- Smart report of measured data

Advantages of Deployment

- Quickness of the inspection - min. 100.000 m2 / day
- Accuracy of measured data - geodetic data processing knowledge about condition of the insulation in the entire area of the roof

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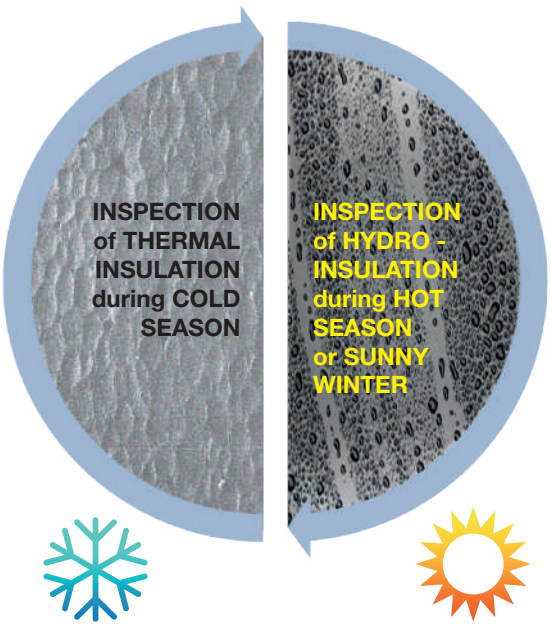
Seasonal Application - Optimum Meteorological Conditions



Summer vs Winter

The application can be carried out in two main seasons.

The SUMMER season helps revealing:

- mechanical defects of hydro-insulation
- water seepage inside the roof coverage or
- defected areas of the inner insulation

The whole principle is based on the accumulation of heat by thermal radiation of the sun.

The winter season is a time to detect thermal bridges and heat penetrations through the insulation of the building. By proper timing of the data collection, it can be detected: Inadequate structure of the insulation defected insulation due to sublimation or inadequate insulation of building openings

Technology - Aerial Fleet

DJI Mavic 2 pro enterprise advanced

- Onboard IR + RGB camera
- RTK receiver
- Small - Compact - Powerful

DJI Matrice 300

- An industrial drone for all weather conditions
- RTK receiver
- Exchangeable sensors for all types of inspections

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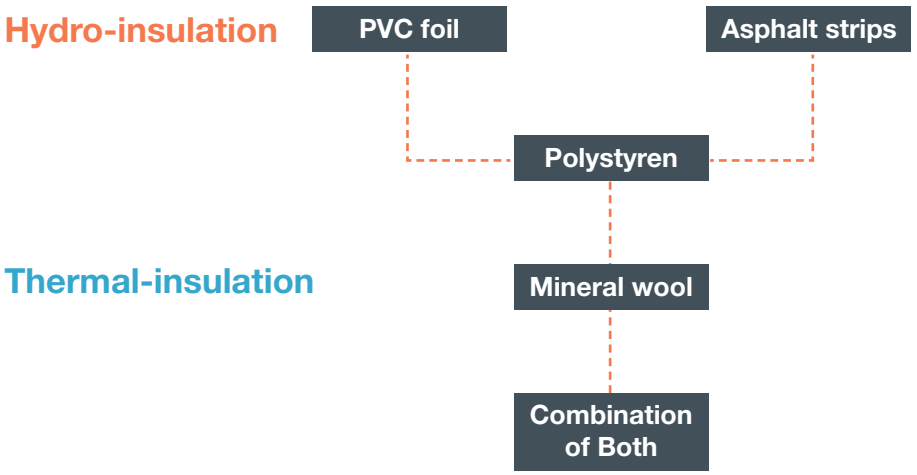
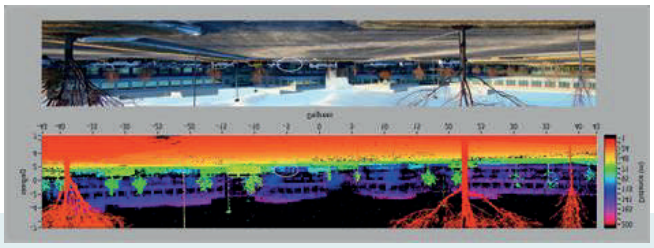
Types of flat roofs

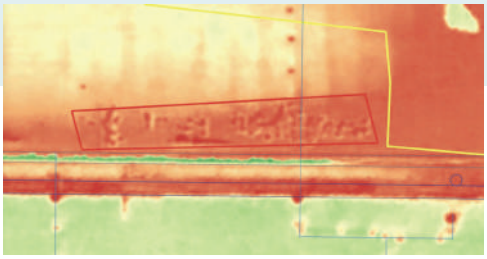
The optimum composition of the roof for inspection

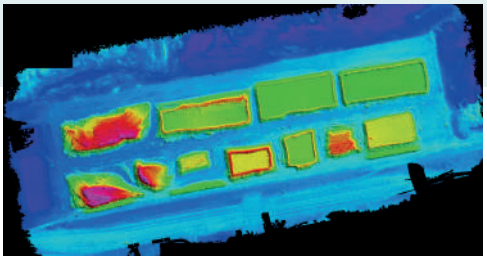


Green or load-bearing roofs with a layer of gravel are not suitable for thermovision inspection.

Roof management platform - Smart Report of measured Data







Outputs of inspection

- Digital orthophoto of the roof RGB + IR
- Measurement of most important thermal anomalies
- Project documentation and Drawings in PDF, DWG

Advantages of the portal

- Web App - access by a web browser
- Centralized data - all roofs in 1 online site
- The possibility of measuring and planning of reparations with no need to enter the roof

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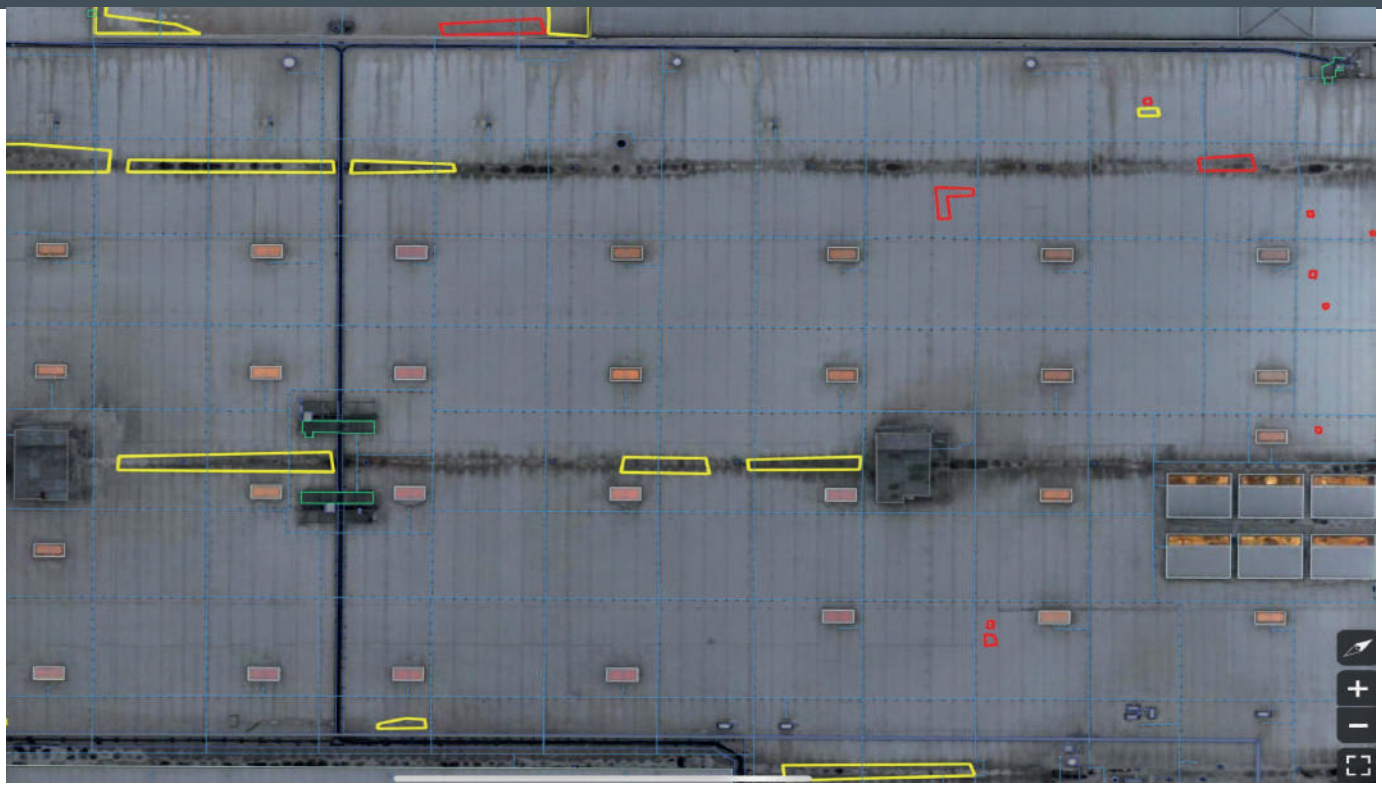
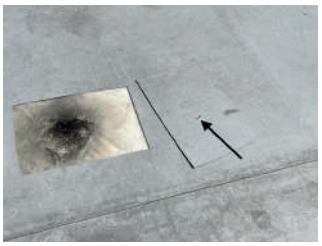
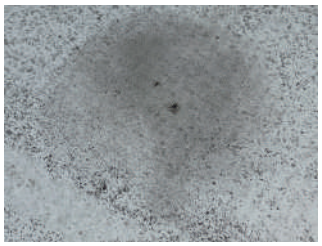
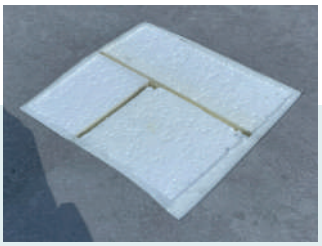


Detected Defects - Local treatment and troubleshooting





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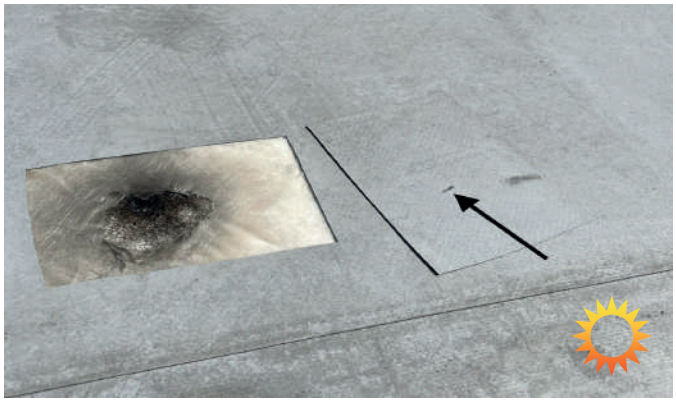
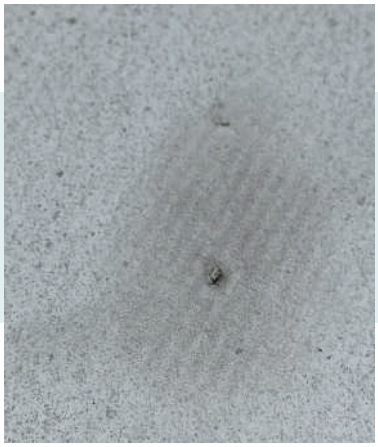


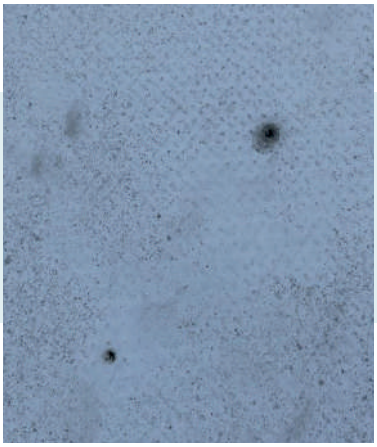
Local thermal anomaly
Mechanical failure of 1 cm and defected insulation by water seepage

Flat thermal anomaly
A mouse's nest. With no mechanical defect on hydro-insulation

Flat thermal anomaly
Linear thermal bridges
Due to the sublimation of polystyrene, the insulation boards shrank.

Mechanical defect of hydro-insulation





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Optimum time for inspection

1. Long-term problems

In case of persistent problems with water flow into the building. When local repairs do not solve the significance of the problem.

2. Installation PVE

Effective documentation of the actual status before installing the PV system on the roof of the building. Elimination of the risk of dismantling the PV plant due to defects on the roof coverage.

3. The end of warranty

Verification of the actual status of roof coverage before sale of the building or expiring warranty period.

4. Increase of energy consumption

Increase of costs on heating, due to “heat Leak” or “thermal bridges”, at least during cold season.

5. Prevention

Safety and service life-time during building operation, due to long-term water leakage or degradation of the insulation layer. Monitoring of defects in time, thanks to prevention services and inspection.

Portfolio of Services

Contemporary Geodesy

- Drones - Thermovision - Inspection
- 3D laser scanning
- As-build documentation

Controlled Aging of Buildings

- Chimneys & cooling towers
- Industry technologies
- Steel - Concrete structures

Digital Twins

- BIM
- Technology Lines
- Construction

Innovation Projects

- R&D projects
- New Technologies
- Customized Application

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Types of flat roofs

1. Documentation of STATUS QUO

Digital orthophoto of the roof
TIR - thermovision map
RGB - visual map
Drawing documentation download

2. PASSPORT of the OBJECT

Evidence of the roof components
Measurement realization
Skylights
Lightning rods Ventilation system Media management

3. DATA ANALYSIS

Categories & Numbers
Analysis of detected defects
Drawings in a Digital map
Calculation of the exact area

4. VERIFICATION

Map with layers for verification
Exact measurement of lengths and areas
Evidence of the roof management of a digital map

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