

Thermal Imaging of Detached House Belonging to

Mr and Mrs Runge

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1 INTRODUCTION TO THERMAL IMAGING

1.1 Aim of Thermal Imaging

The infrared camera is a display and measuring tool which is used to reveal weak points in the insulation or tightness of a building.

1.2 Building Insulation

The infrared camera makes it possible to locate the areas of a building (or any of its facades) where the insulation may be deficient, in other words, the places where heat is lost from buildings by transmission through the internal and external walls, windows, doors, etc.

This information is displayed by means of different coloured zones indicating areas of the same temperature. Each colour represents a temperature and the colour varies according to the temperature variations.

2 PURPOSE

The purpose of this exercise is to locate any thermal bridges and heat losses through the facades with the aid of thermal imaging at the detached house belong to Mr and Mrs Runge in Luxembourg - Cessange.

3 SCOPE

- Supply of an inspector with an infrared camera to carry out thermal imaging of the external facades of the house
- Ambient temperature measurements inside the house and measurement of ambient exterior temperature
- Measurement of interior wall, glass and window frame temperatures
- Measurement of exterior relative humidity



4 EQUIPMENT

The measurements were made with the aid of a ThermaCAM™ B2 infrared camera comprising:

- Autonomous camera with a 9.2 mm integrated lens, equipped with a 160 x 120 pixel microbolometer detector and an interchangeable non-conventional lens for location of infrared radiation within the 7.5 to 13 μm wavelength range.
- Built-in display unit equipped with a 2.5" LCD colour monitor which scans as a conventional black-and-white image or in colour.
- Internal memory unit.

5 Method

The investigative method comprises measurement supplemented by remote recording of the thermal radiation (infrared) emitted by the area under investigation.

The images are recorded directly into the camera's internal memory and subsequently computer-processed using a specific program (ThermaCAM Reporter 7.0).

6 TEMPERATURE MEASUREMENTS

The detached house belonging to Mr and Mrs Runge at Luxembourg-Cessange was measured on Friday 26 January 2007 between 8.15 and 8.45 a.m.

Exterior temperature: -5°C
Exterior relative humidity: \pm 75%
Light wind

Indoor temperature inside the house: \pm 20°C

Inspection of the house revealed that a homogeneous, uniform temperature of approximately 20°C prevailed throughout the building. The temperature differential between the inside and the outside of the building was thus approximately 25K, in other words, good conditions for carrying out thermal imaging.



7 NOTE

As the emissivity factor is different for each type of material, a mean emissivity factor was chosen for the purposes of the thermal imaging. The thermal images attached to this report (Appendices 1/5 to 5/5) therefore provide an approximate indication of the surface temperatures (tolerance with respect to absolute value $\pm 2^\circ\text{C}$).

8 COMMENTS

The temperature measurements made inside the building showed that the ambient temperature was homogeneous and we considered the difference (ΔT) between the interior and exterior temperatures sufficient to guarantee the infrared display of any thermal bridges and/or heat losses.

Roof

Thermal imaging did not reveal any thermal bridges or heat loss in the roof area.

Facades

Thermal imaging did not reveal any thermal bridges or heat loss in the area of the floor tiles between the floors. The temperature is entirely homogeneous throughout all the facades of the building.

Windows

Higher temperatures were observed in the area of the window frames. This is due to the fact that the window frames are slightly glossy and their emissivity is different to the other parts of the façade, thus causing reflection of the horizon. The camera shooting angle also plays a significant part.



DETAILS OF FACADES

Main frontage, Appendices 1 and 2/5

No visible thermal bridge or heat loss. The temperature is homogeneous across the whole of the façade.

The temperature of the window glass and window frames is higher on the thermal images, due to the reflection of the horizon, and also to the fact that the window frames are always the least efficient part of the skin of a building.

Right side, Appendix 3/5

No deficiencies apparent. The temperature is homogeneous across the whole of the façade.

For the same reasons as mentioned above, higher temperatures were noted in the window frame areas.

Rear, Appendices 4 and 5/5

Once again, no problems to be mentioned and the same comments as above apply regarding the window glass and frames.



9 CONCLUSION

Following inspection of the facades of the detached house belonging to Mr and Mrs Runge at Luxembourg - Cessange, we did not find any deficiencies.

No heat loss or thermal bridges are evident in the area of the floor tiles between the floors. A homogeneous temperature of about -4 to -3°C prevails across all the facades of the building.

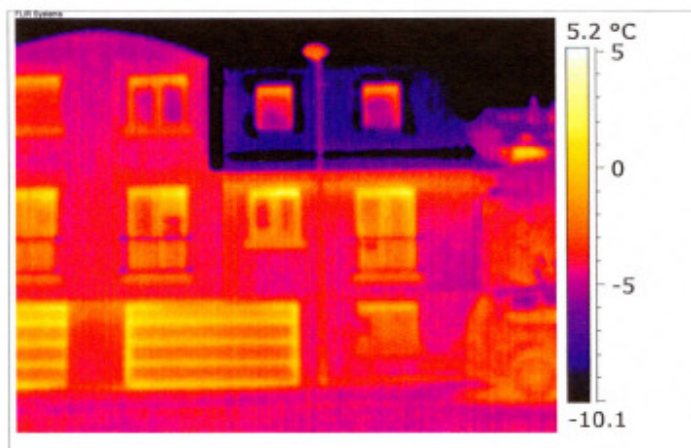
The façade surface temperatures and the surface temperatures of the window frames and glass were measured with the aid of a contact sensor:

Facade temperature approx. -4 to -3°C
Window frame temperature approx. -2°C
Glass temperature = approx. -3°C

From the measurements made with the contact sensor it was found that the actual temperature differential between the facades and the glass is approximately 1K, which is very slight.

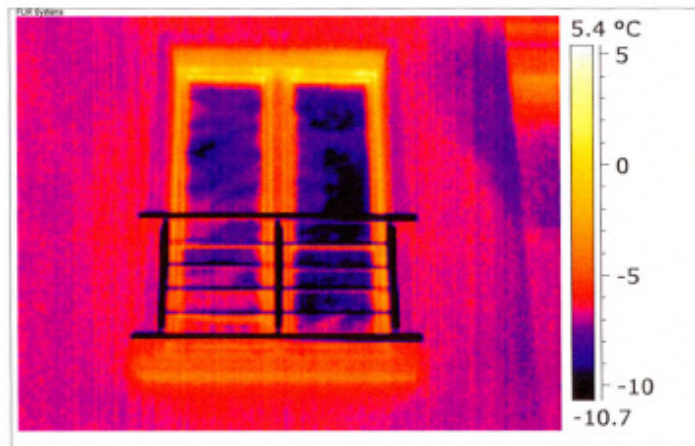
Main frontage

Appendix 1/5



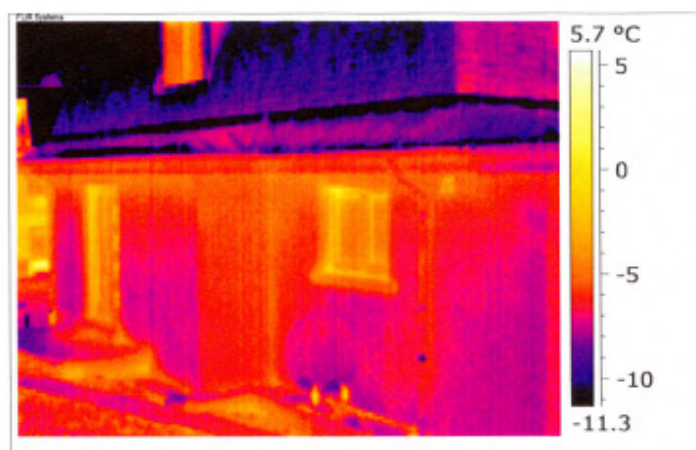
Window glass on main frontage

Appendix 2/5



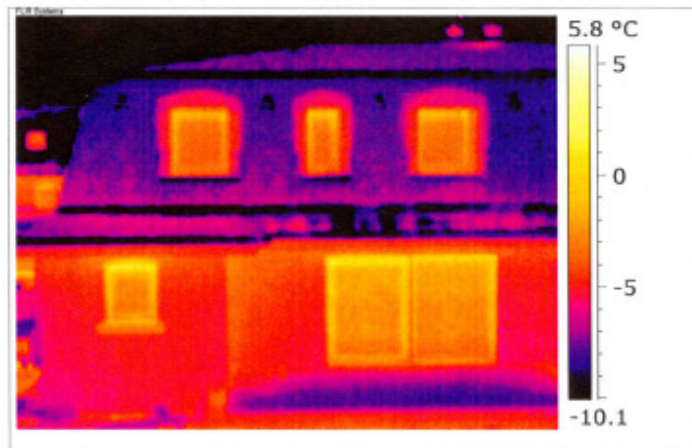
Right side

Appendix 3/5



Rear

Appendix 4/5



Window glass at rear

Appendix 5/5

