Thermal Fault Report – Author: Geoff Hunter

Commissioning Body

Charity: Bricks, Bristol

Charity Number: 1183118

Website: https://bricksbristol.org/

Commissioned Body

Social franchise company: First Thermal Ltd, 28 Seawalls Rd, Bristol BS9 1PG

Company number: 13303102

Location

St Anne's House, St Anne's Rd, Brislington, Bristol, BS4 4AB

Commissioning

Bricks have intentions for improving the thermal efficiency of the envelope of St Anne's House. In order to advance these aims, a survey of the fabric of the building under scrutiny of IR imaging, both internally and externally has been commissioned to assess heat-loss throughout the fabric of the building. This report intends to summarise the findings of Heatview surveyors who assessed the site and present possible improvements. It is important to note that advice given should be taken as such. The expertise of a Heatview surveyor is in assessing thermal faults within the fabric of a building and not in carrying out retrofit of commercial property. Any remedial works are therefore not covered by the liability insurance of First Thermal Ltd and expert advice should be sought before carrying out these works.

1.0 Executive Summary

1.1 Key Findings – Survey carried out 8/3/2023

The building has been constructed primarily from large, concrete columns, aluminium framed, single-glazed windows, un-insulated cavity wall construction of blockwork with brick façade, concrete intermediate floors, tiled cladding, and a flat roof with parapet walls. The direct conduction of each of these elements is strong, i.e. heat energy can pass easily from the internal space of the building through each and every one of these elements to the external air and away with relative ease, via the process of conduction. Radiators, placed against these strongly conducting building elements are transferring a significant proportion of their heat, desired to be used internally to the outside.

The building has numerous services that pass through both skins of the walls, out of the roof, beneath the ground, through windows, etc. and allow air ingress around their edges and through them directly. Air ingress through windows, a number of which can't close, all are not draught proofed, and most also allow ingress around the edges of their frames. This ingress of air is excessive and allows for the passage of large amounts of heat to be transferred to the incoming air, cooling the internal spaces in the building, via the process of convection.

Finally, it is worth noting that the conductive thermal issues highlighted here not only pose a strong challenge when attempting to heat the property in winter. They will pose a similar challenge to cooling the property in summer, also.

2.0 Overview of Direct Thermal Conduction

Figure 1 shows an overview of several of our findings from the internal surveys, annotated upon an external view of the structure. This is followed by thermographic imagery that provided the evidence for the claims made in the overview.

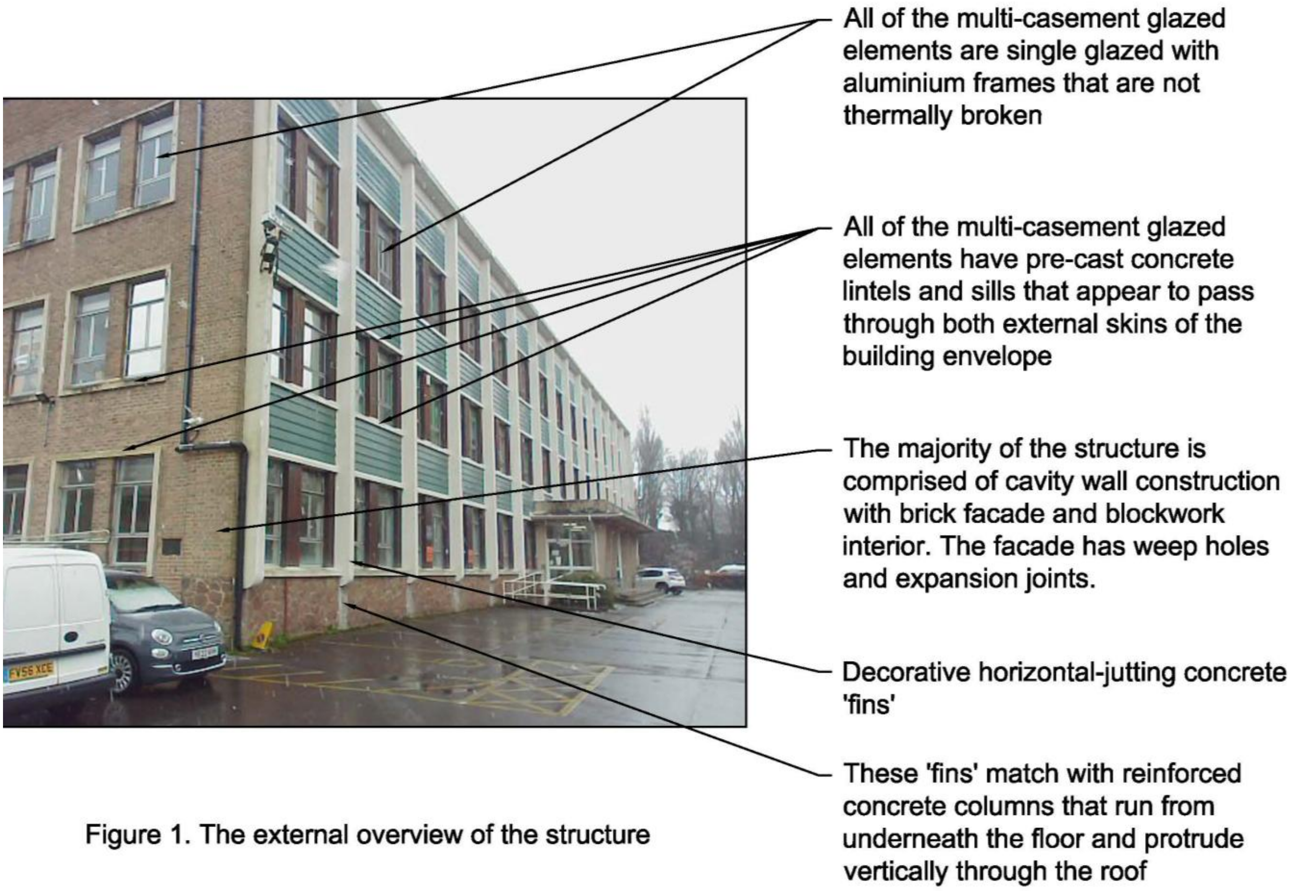

Figure 1. The external overview of the structure

The important aspect to understand about this overview of the building is that it is focussed upon thermal conductivity and thermal bridging through the structure. The structure was built in the 1950s and it appears that there has been insufficent care taken, during the design phase, to combat thermal conductivity and thermal bridging at the exterior envelope of the structure by contemporary standards.

Thermal conductivity – the passage of heat through single skin or one-phased elements, such as the glazing and floor.

Thermal bridging – conduction of heat through elements that pass through both skins at interfaces with the cavity, effectively providing a route or 'bridge' for conduction through the cavity, such as lintels and sills.

2.1 Evidence from the Thermographic Analysis for the Above Conclusions

Figure 2 (overleaf) shows an internal thermographic image taken on the ground floor, to the right of the entranceway. These images show contrast in levels of emittance only and so one image that shows a black area may be completely different to another that shows black. They have each been calibrated to the location. The lighter, whiter, areas are warmer and emitting comparatively more infrared radiation. The bluer, darker areas are emitting less, in comparison. The annotations show interpretation of key areas of the images.

Figure 2. Thermographic image of the ground floor area to the right as you enter the hallway

Figures 3 (below) shows evidence of conductive transfer of heat out of the building envelope, through the concrete columns that support the structure. The left image shows conduction through these pillars and out of the building to the ground below and the image to the right shows evidence of conduction of heat through the pillar and out of the building at roof level.

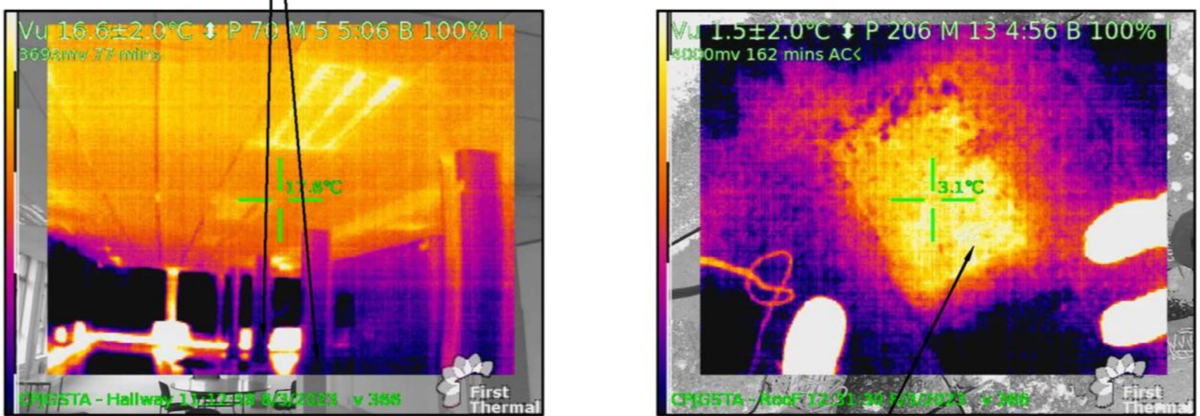

Figure 3. Conductive tranfer through internal columns

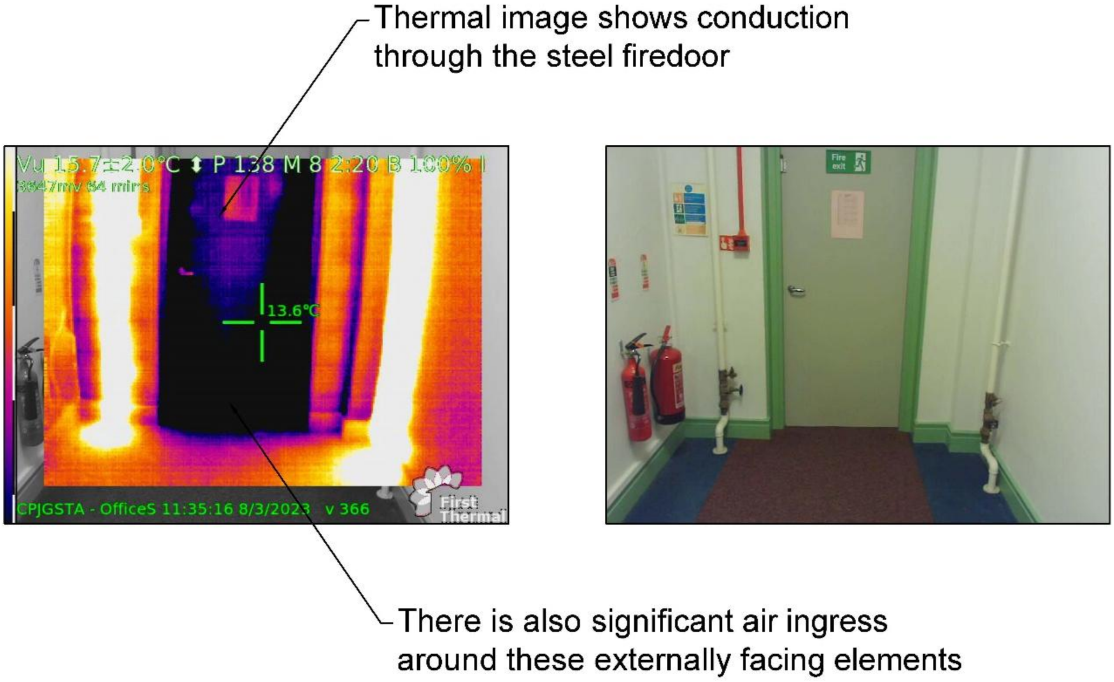

Figure 4: Conductive losses and air ingress around door

Figure 4 (above) illustrates that there are also significant conductive losses through other elements, such as the steel fire doors and also leads us to talk about the other major factor causing thermal losses in the fabric of the building: air tightness.

3.0 Overview of Air Tightness

The second aspect of heat loss from the fabric of the building is air ingress. Several sources of ingress were observed during the survey and are shown in images below. Visible light range photos are left next to IR for reference. These are likely to be even more affecting to perceived temperature and have other implications, such as the potential for water ingress and localised cooling that can be damageing to the fabric of the building or cause condensation.

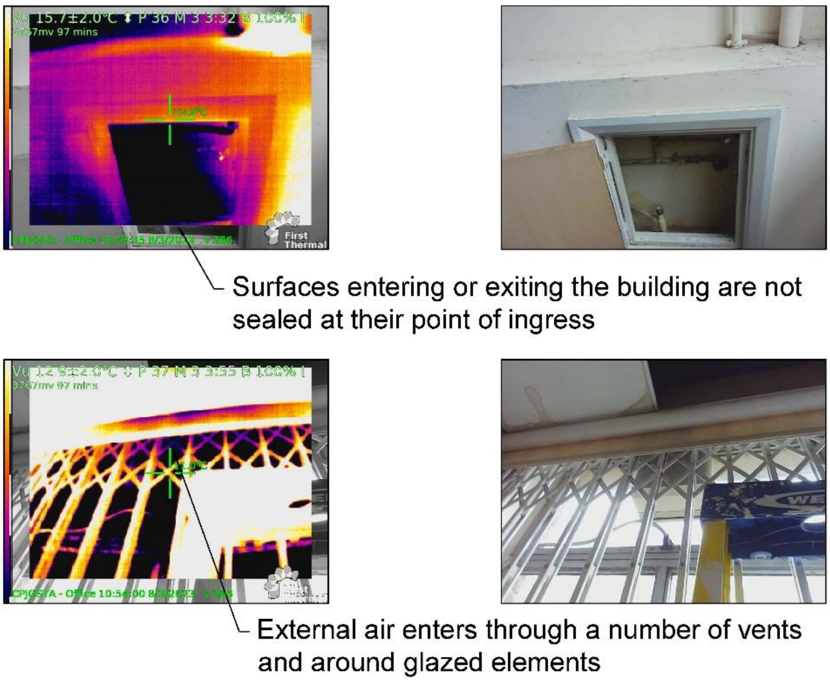

Figure 5: Examples of opportunities for air ingress

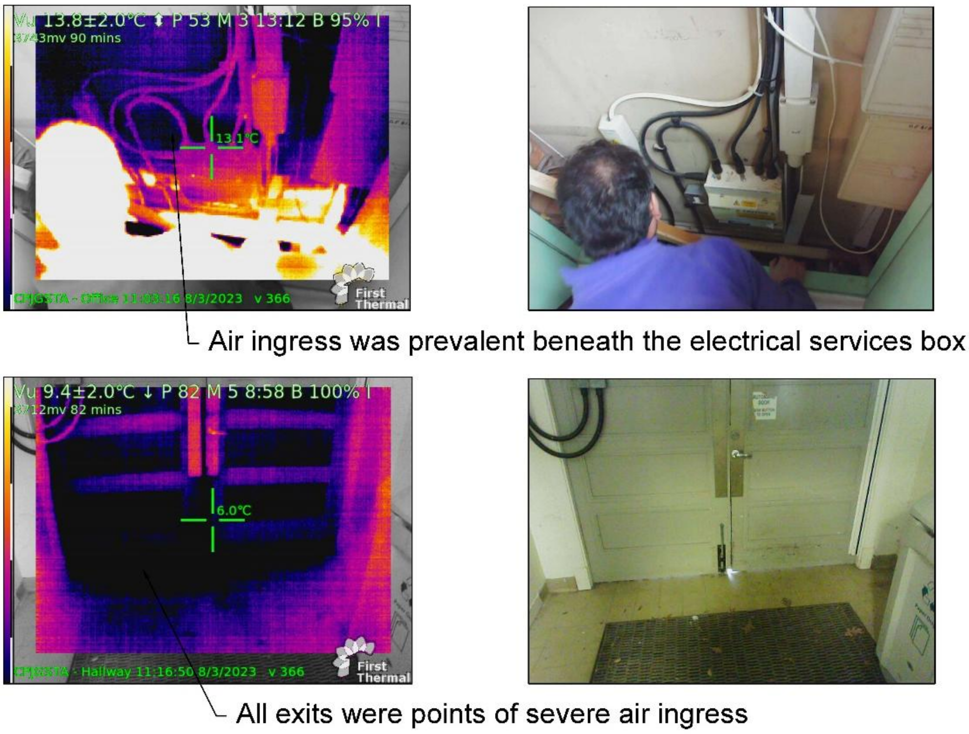

Figure 6: Air ingress around exits and electrical services

There were several external doors that were ill fitting and hadn't been designed as barriers to air ingress. Several windows were stuck open. Numerous vents that appeared to have been used at one time but were perhaps less well used were present. Services entered the building without grommets, gaskets, or sealant and allowed air ingress. The suspended ceiling posed spaces where many pipes and other amenities exited the building externally and allowed cold air to enter the building and encircle heating pipes that were clearly not insulated to the point where they wouldn't show up on the IR camera. Window frames and casements were allowing air to ingress through small cracks where the external sealant isn't present or has perished due to UV radiation and weathering.

The building requires careful, room-by-room examination from floor to ceiling, looking for points where air can ingress. These can be as small as hairline cracks.

4.0 Remediation works

As expressed on page 1, these must be taken as advice and further professional consultation with experts will be required to confirm the validity of these suggestions in context of other building factors, such as condensation.

The most cost-effective way to make savings on heating requirements in buildings is often to at first deal with air ingress:

Air ingress around non-opening elements

For non-opening building elements, closing gaps that lead to the external environment and allow air to pass into the building envelope involves external and/or internal sealing with appropriate mastics. In the case of larger gaps, the void should be filled with a solid material that works well with materials around it, such as cement where blockwork is penetrated, or polystyrene around plastic waste pipes. Although, you should check building regulations for more flammable materials, such as polystyrene. The general rule is to have a material that doesn't degrade easily, is not a deleterious material, flexes and expand/contracts a similar amount to surrounding materials, and will be able to hold a bead of mastic sealant. Then, these void filling materials must be sealed with mastic/a proprietary grommet, etc. Anything that can make an airtight seal. This way, relatively low-cost solutions can reduce air ingress and improve the thermal performance of the building through cost-effective means.

Air ingress around opening elements

For opening elements, such as doors and windows, the surrounding frame or the opening element should be altered or replaced to fit as closely as doesn't fowl. Rubber or brushed draft exclusion strips can be added at the correct thickness to create airtight seals. Or secondary elements such as secondary glazing or curtains should be placed at a suitable distance from the opener, in order to limit the amount of air ingress from these elements.

Making more efficient use of current heating system

Convective heaters and their associated pipework are largely situated against conductive heat losing elements. A great deal of energy can be saved by insulating the pipework and insulating behind the heaters with foil coated insulating materials. This is another cost-effective method of heat-reduction in this particular property.

Conductive thermal losses

The largest component of heat loss in this building, although not the most cost effective to deal with, is the conductive elements:

The ground floor could be improved through insulation, rescreeding and possibly adding underfloor heating.

The structural columns of this building protrude through the floor, roof, and even walls. Insulating these elements internally with insulating plasterboard and at roof level with an appropriate external system will remove the effect of having large heatsinks in the building. Cold water appeared to be running beneath the insulation of the roof. The roofing issues will have to be detailed by a commercial roofing company if the thermal losses at roof level are to be effectively reduced.

The external walls could have cavity wall insulation but as the structural elements appear to thermally bridge through the cavity, it is suggested by this report that the best way to deal with thermal losses through this significantly large area would be through internally insulating.

Glazed elements of low U-value, high thermal bridging, and low air tightness cover a significant proportion of the external envelope of the building. These should certainly be repaired and cleaned if it is not deemed cost effective to replace them. They would benefit greatly from secondary glazing, or, if the budget can support, the building would benefit greatly from their replacement with more airtight, better insulating versions.