

## Infrared Thermographic Survey of (-----) housing estates Conducted between (-----) 2006

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## 1 Brief

1.1 This work was commissioned by (-----), Planned Maintenance Manager, (-----)

1.2 Where reasonably possible, the roof, external walls, bell cast (if applicable) of front, rear and sides (if applicable) of each dwelling to be inspected for the purposes outlined below.

- To highlight defective build quality within building envelope
- To detect sunken blown fibre cavity wall insulation
- Detect excessive heat loss in Cornish Units with Mansard roofing and pre-cast concrete ground floor walls
- Provide thermal reference data of 3 buildings inspected, one from each estate respectively, having shown NO anomalies present to be used as a reference for all buildings of similar type
- To highlight damp/moisture ingress
- To highlight air leakage around window/door frames and at wall/roof join
- To establish insulation efficiency of inspected buildings to justify installation of Ground Source Heat Pumps
- Confirm effectiveness of existing cavity wall and loft insulation in dwellings
- To serve as a familiarisation exercise demonstrating the capabilities of a thermographic survey

1.3 The survey was to apply to dwellings of the following description:

- All Council built dwellings constructed between 1945 and 2006
- **(-----) estate-** terraced buildings with cavity wall and loft insulation. Double glazed.

- (-----) **estate**- Cornish Unit properties, Mansard area of roof and loft (insulated) pre-cast concrete ground floor walls (no external cladding or internal insulation). Double glazed.
  - (-----) **estate**- terraced houses and apartment blocks, with cavity wall and loft insulation. Double glazed.
- 1.4 It was agreed by both parties that images would only be included in the report if anomalies were found to be present.

## 2 Work carried out

### ***Survey equipment specifications***

2.1 Details of the equipment used are as follows:

- FLUKE Ti30 Thermal Imager (19200 pixel FPA)
- Last calibrated for accuracy on: 22.02.06
- Calibration Reference: 620296
- Traceable to PTB (German calibration lab) 1910-PTB-05

### ***Environmental conditions***

2.2 The survey was conducted no less than 3 hours after sunset between the dates shown with no significant wind or moisture present to influence the results. Internal building air temperature could not be confirmed as access into the buildings was not feasible. The stated conditions were appropriate to ensure environmental factors did not affect the survey results. See *Technical Data* for full weather conditions.

2.3 The thermal images were captured between (-----) 2006.

### ***Procedure***

2.4 Step 1 - daytime

- Assess building and note structural details;

- Record internal and external temperatures (if possible);
- Record environmental conditions;

#### 2.5 Step 1 - night

- Record environmental conditions- internal temperatures if possible.
- External IR photos
- If necessary, and possible, internal IR photos of any anomalies.

#### 2.6 Step 2

- Digital photos of areas on building where any anomalies were observed (daytime)
- Visual inspection of highlighted areas

#### 2.7 Step 3

- Analysis of results
- Results evaluation

#### 2.8 Step 4 – reporting.

### 3 Analysis of results

#### ***Background***

- 3.1 This survey was commissioned both as demonstration of what thermal imaging is capable of as well as a functional survey. The objective was to assist (-----) with familiarisation of the techniques of infra red imaging and to assess its future possibilities and limitations.
- 3.2 To satisfy this requirement, a camera of lesser resolution was used, and all buildings were scanned for major anomalies only with the emphasis on inspecting as many properties as possible within the allocated time and budget.

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- 3.3 A full and comprehensive thermographic survey would entail a higher level of detail in planning and execution which would increase the timescale and financial cost of the survey.
- 3.4 The results of this survey should now allow decisions to be made on the most effective use of future thermographic surveys. For example highlighting moisture ingress, heat loss at window frames, thermal/cold bridging, missing/defective insulation etc. Once these objectives have been specified subsequent surveys can be planned and timescales given more accurately. This would also aid decisions on the most suitable camera trading off budget and image resolution.
- 3.5 Results are influenced by a great many environmental and material factors and thus are not definitive and no defects can be diagnosed on this survey alone. This method is designed to be used in conjunction with existing maintenance inspection methods.
- 3.6 However Infrared Thermography has been proven to be effective for spotting otherwise invisible problems, dramatically cutting times for manual inspections and vastly reducing energy consumption.

### ***Limitations***

- 3.7 As no entry into the buildings was feasible the following points which can effect the results are important to note:
- Internal temperatures could not be confirmed.
  - No assessment of internal building layout and structure could be made .i.e. whereabouts of boilers, hot water pipes, radiators, heaters, which rooms were occupied and if heating was on or off.
- 3.8 Reference data was requested, and supplied, of various types of building inspected. Accuracy here is difficult due to the large number of environmental and material factors affecting surface temperatures .i.e. emissivity, weather and even angle of the camera etc. For an accurate comparison of buildings against reference data, surveys would have to be carried out under **exactly** the same conditions, which in practice often proves too difficult to replicate. Comparisons

which **can** be achieved, however, are feasible for: establishing DPC levels, major damp ingress, heat loss under eaves and at wall to roof join, heat loss around window and door frames, under floor heating system layout and blockages, missing and defective wall and loft insulation for general energy audits. These all provide obvious anomalies which can be identified even when environmental conditions are not exact and when buildings differ in design.

- 3.9 When studying the images it is important to remember that they show HEAT and not light. Sometimes it can be confusing when comparing the photo with the IR image. The photo is there only to aid the viewer in identification of the property, as the IR image is of a lower resolution
- 3.10 Technical data is included solely as a reference for any thermographer conducting future surveys so as to replicate conditions as accurately as possible.
- 3.11 DPC level for the (-----) properties has been confirmed as being at top of bell cast, therefore all IR images of elevated temperature within the bell cast can be disregarded as being possible anomalies, providing the existence of a DPC can be confirmed.
- 3.12 With regard to (-----) as a property due to receive GSHP, it did show numerous anomalies which may need investigating. If proven to be defects these may have a negative effect on the overall insulation of the building envelope. *See individual results sheet*

## 4 Evaluation

- 4.1 Weather conditions during the survey were favourable and the images were correspondingly clear. As planned, an effective demonstration of an Infrared Thermographic survey has been achieved.
- 4.2 As stated in the **Results** section, findings will have to be discussed by both parties in order to clarify any particulars which may have bearing on the results e.g. DPC levels, entry into buildings, internal layout etc. The purpose of this survey was to aid the identification of major defects **only**, being major heat losses and moisture ingress. Smaller anomalies which would be indicative of negligible

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effects should be disregarded. These need to be discussed with the thermographer to clarify their meaning.

- 4.3 The majority of properties in the report showed numerous anomalies of the same kind and as hundreds of images of the same anomaly would be confusing, a single sample has been included in this report.

## **5 Recommendations**

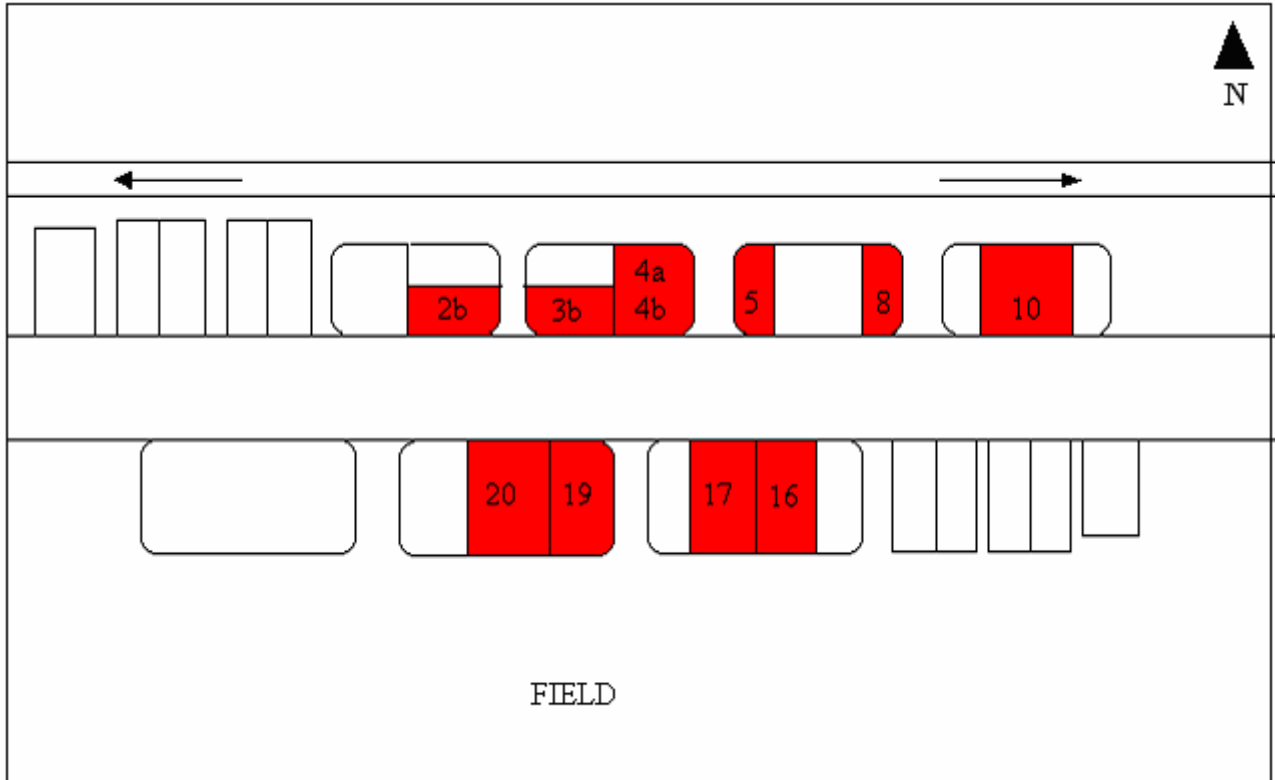
- 5.1 That a qualified engineer or surveyor investigates any anomalies observed where necessary.
- 5.2 When any defects have been rectified it is recommended that a repeat IR survey be carried out to ensure effectiveness of repairs.
- 5.3 If any external cladding or other insulation is added to (-----) dwellings it is recommended that a repeat survey should be performed in order to highlight any possible defective work and highlight effectiveness of installation.
- 5.4 That careful consideration is given to determine the most valuable aspects of the results they would like to highlight in future surveys

Thermal Inspections Ltd  
Thermal Imaging Services  
(-----) 2006

## TECHNICAL DATA

	(-----)	(-----)	(-----)
<b>Date</b>	2006	2006	2006
<b>Time</b>	04:17	05:05	04:19
<b>Internal Temp</b>	Min 17 Celsius	Min 17 Celsius	Min 17 Celsius
<b>External Temp</b>	7 Celsius	7 Celsius	7 Celsius
<b>Wind speed/ Direction</b>	1mph from NW	0mph n/a	0mph n/a
<b>Angle and distance of camera</b>	Refer to image sheet	Refer to image sheet	Refer to image sheet
<b>Emissivity of surface</b>	0.9	0.9	0.9
<b>Reflected radiation present</b>	5 Celsius (average)	5 Celsius (average)	5 Celsius (average)
<b>Moisture present</b>	55% (atmospheric)	57% (atmospheric)	52% (atmospheric)
<b>Insulation</b>	Cavity wall and loft insulation	Loft/Mansard area of roof only	Cavity wall and loft insulation

# Maps



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