Thermal Imaging Infrared Survey Report Sample.

Thermography Inspection at ABC Company.

Vancouver, BC

Date:

Rick Turdubay, Certified Infrared Investigator, B.S. in Electrical Engineering.
Thermography Inspection at
ABC Company.

Address:

By Rick Turdubay, Certified Infrared Investigator
B.S. in Electrical Engineering.

Date:

E:mail:  info@aiturgroup.com

Phone:604-496-4212
How Infrared Thermography Works

Infrared imagers “see” the heat radiated from your equipment in real time, just like a video camera sees visible light. In black/white thermograms (pictures of heat), white is hot and black is cold unless stated otherwise. When thermograms are in color, colors in the scene are matched to the reference bar. Colors appearing closer to the top or right of the reference bar indicate higher temperatures. Colors appearing closer to the bottom or left of the reference bar indicate lower temperatures.

<table>
<thead>
<tr>
<th>Inspection Site Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer</td>
</tr>
<tr>
<td>Address</td>
</tr>
<tr>
<td>Contact person</td>
</tr>
<tr>
<td>Phone number</td>
</tr>
<tr>
<td>E-mail address</td>
</tr>
<tr>
<td>Thermographer</td>
</tr>
</tbody>
</table>

**Limited Liability, Errors & Omission.**

It is client's responsibility to have the recommended 60% or more of a rated electrical load during the 3-4 hours before inspection. Service provider does not warrant or guarantee the accuracy and/or completeness of the inspection information provided. All conclusions and recommendations are based on the data taken at the time of the inspection and no guarantee regarding additional issues of any anomalies found as a result of any other source present or not present at the time of the investigation are made.

As a result, we suggest that you use our report and the Report Subjective Repair Priority Ratings as a guide but that you investigate and take appropriate corrective actions as soon as possible. No one can predict when a failure will occur. It is agreed that the service provider will not accept any claim from the client and/or third party.

**Repair Priority Ratings**

Each thermogram is given a Subjective Repair Priority Rating which is based upon your qualified assistant’s opinion of how critical the subject item is to the safe and profitable operation of your overall system. The Inspection Summary section of this report explains how to use this Subjective Repair Priority Rating to help you determine how quickly you need to investigate and correct the potential problem.

Overheating can cause premature deterioration and costly, unplanned failure of your equipment. Overheating connectors, conductors and components will never get better. In fact, the temperature and rate of deterioration will increase with time.

**Overview of Fault Rating:**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal</td>
<td>Temp rise (ΔT) 0-5 °C</td>
</tr>
<tr>
<td>1</td>
<td>Low grade</td>
<td>Temp rise (ΔT) 5-10 °C</td>
</tr>
<tr>
<td>2</td>
<td>Medium grade</td>
<td>Temp rise (ΔT) 10-35 °C</td>
</tr>
<tr>
<td>3</td>
<td>Severe</td>
<td>Temp rise (ΔT) &gt;35 °C</td>
</tr>
</tbody>
</table>
## Summary of Inspection

<table>
<thead>
<tr>
<th>Location</th>
<th>Equipment</th>
<th>Fault</th>
<th>Recommendation</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Where)</td>
<td>(What)</td>
<td>( )</td>
<td>()</td>
<td></td>
</tr>
</tbody>
</table>

Qimaging.

1. Electrical Room, House Panel  
   Incoming lugs: 120/208V -  
   Load < 3%, not possible to analyze, another survey required  
   4

2. Electrical Room, House Panel  
   Incoming lugs: 347/600V -  
   Load =0, not possible to analyze, another survey required  
   5

3. Main Building, Panel –4A  
   3 Phase breaker 1  
   To be monitored  
   6

4. Main Building, Panel –4B  
   Circuit breakers 1  
   To be monitored  
   7

5. Main Building, Panel –2C  
   Circuit breakers 1  
   To be monitored  
   8

6. Main Building, Panel –2A  
   Circuit breakers 1  
   To be monitored  
   9

7. Main Building, Panel –6A  
   Circuit breakers 1  
   To be monitored  
   10

8. Main Building, Panel –2B  
   Circuit breakers 2  
   Repair at scheduled shut down  
   11
   Circuit breakers 1  
   To be monitored  
   11
**Photo and Identification:**

<table>
<thead>
<tr>
<th>Location</th>
<th>Electrical Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>House Panel, 120/208V, 225A</td>
</tr>
<tr>
<td>Type</td>
<td>Incoming lugs: 120/208V</td>
</tr>
<tr>
<td>Nom/Rated Load</td>
<td>225A</td>
</tr>
<tr>
<td>Actual Load</td>
<td>Phase: A=0.3A; B=0; C=0.6A, Load is under 3%,</td>
</tr>
<tr>
<td>Fault</td>
<td>Fault Rating: Loads = under 3%, <strong>Not possible to analyze.</strong></td>
</tr>
<tr>
<td></td>
<td>Room Temp. C = 19.7; Reflect Temp. = 18.2</td>
</tr>
<tr>
<td></td>
<td>Rel. Humidity = 53%</td>
</tr>
<tr>
<td></td>
<td>Emissivity = 0.95; Distance = 2m</td>
</tr>
<tr>
<td></td>
<td>See IR picture.</td>
</tr>
</tbody>
</table>

**Thermogram**

**Analysis and Recommended Action:**

All phases' loads are too small, under 3% of the nominal/rated load. **Not possible to analyze.**

**Recommendation:** Book another survey when an acceptable (at least 50% of the normal rate) load is available.

**Inspected By:** (Rick Turdubay)  
**Signature:**  
**Date:**

**Repaired By:**

**Comment:**
Thermography Inspection at:
ABC Company

Photo and Identification:

<table>
<thead>
<tr>
<th>Location</th>
<th>Electrical Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>House Panel, 347/600V, 125A</td>
</tr>
<tr>
<td>Type</td>
<td>Incoming lugs, 347/600V</td>
</tr>
<tr>
<td>Nom/Rated Load</td>
<td>125A</td>
</tr>
<tr>
<td>Actual Load</td>
<td>Phase: A=0; B=0; C=0</td>
</tr>
<tr>
<td>Fault</td>
<td>Loads =0; Not possible to analyze.</td>
</tr>
<tr>
<td></td>
<td>Room Temp. C =19.7;</td>
</tr>
<tr>
<td></td>
<td>Reflected Temp. =18.2</td>
</tr>
<tr>
<td></td>
<td>Rel. Humidity = 53%</td>
</tr>
<tr>
<td></td>
<td>Emissivity = 0.95;</td>
</tr>
<tr>
<td></td>
<td>Distance=2m</td>
</tr>
</tbody>
</table>

Thermogram

RESERVED FOR THERMOGRAM
AFTER COMPONENT REPAIR

Analysis and Recommended Action:
All phases’ loads are equal 0 (zero). Not possible to analyze.
Recommendation: Book another survey when an acceptable (at least 50% of the normal rate) load is available.

Inspected By: (Rick Turdubay)
Signature:  
Date:  
Repaired By:  
Comment:

Doc #  
Page 5 of 12  

<table>
<thead>
<tr>
<th>Location</th>
<th>Main Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>Panel 4A, 120/208V, 400A</td>
</tr>
<tr>
<td>Type</td>
<td>Incoming lugs: 120/208V</td>
</tr>
<tr>
<td>Nom/Rated Load</td>
<td>400 A</td>
</tr>
<tr>
<td>Actual Load</td>
<td>A=42; B=61; C=42</td>
</tr>
<tr>
<td>Type</td>
<td>Circuit Breakers:</td>
</tr>
<tr>
<td>Nom/Rated Load</td>
<td>CB # 38-40-42 3Phase; 100A</td>
</tr>
<tr>
<td>Actual Load</td>
<td>A=44A; Load %= 44</td>
</tr>
<tr>
<td></td>
<td>B=46A; Load %= 46</td>
</tr>
<tr>
<td></td>
<td>C=40A; Load %= 40</td>
</tr>
<tr>
<td>Room Temp.</td>
<td>C=23.5; Reflected Temp.=23.1</td>
</tr>
<tr>
<td>Rel. Humidity</td>
<td>48.7%</td>
</tr>
<tr>
<td>Emissivity</td>
<td>0.95; Distance=2m</td>
</tr>
<tr>
<td>Fault</td>
<td>Fault Rating: 1: <strong>Low grade</strong></td>
</tr>
<tr>
<td></td>
<td>Spot1.Temp =32.1, Spot2=27.5; Tem. rise ΔT 4.6 °C, See IR picture.</td>
</tr>
</tbody>
</table>

**Fault Suggestion:** The ΔT < 5 °C. However, the corrected maximum allowable temperature for the circuit breaker # 38-40-42 at the existing actual phase loads and room t °C is 29-30°C. The operating t°C =32.1

See calculation formula on the last page of the report.

**Analysis and Recommended Action:**

3Phase CB # 38-40-42; Nominal rate: 100A. Actuals: A= 44A; Load %= 44; B =46A; Load %= 46; C= 40A; Load %= 40
Spot1.Phase B, Temp =32.1, Spot2=27.5; Tem. rise ΔT= 4.6 °C. **Fault Rating:** 1: **Low grade**. See the suggestion above.

**Recommendation:** The CB to be monitored.
**Photo and Identification:**

<table>
<thead>
<tr>
<th>Location</th>
<th>Main Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>Panel 4B, 120/208V, Rated: 225A</td>
</tr>
<tr>
<td></td>
<td>Incoming lugs loads:</td>
</tr>
<tr>
<td></td>
<td>A=35A, Load %=15</td>
</tr>
<tr>
<td></td>
<td>B=45A, Load %=20</td>
</tr>
<tr>
<td></td>
<td>C=41A, Load %=18</td>
</tr>
<tr>
<td>Type</td>
<td>Circuit breakers</td>
</tr>
<tr>
<td>Nom/Rated Load</td>
<td>15 A</td>
</tr>
<tr>
<td>Actual Load</td>
<td>Max. load on the CB # 8</td>
</tr>
<tr>
<td></td>
<td>Load =10 A; Load %=66</td>
</tr>
<tr>
<td></td>
<td>CB# 39; Load= 9A; Load %=60</td>
</tr>
<tr>
<td></td>
<td>Tem. Rise $\Delta T = 4^\circ C$</td>
</tr>
<tr>
<td></td>
<td>Room Temp. C =23.5;</td>
</tr>
<tr>
<td></td>
<td>Reflected Temp.=23.1</td>
</tr>
<tr>
<td></td>
<td>Rel. Humidity= 48.7%</td>
</tr>
<tr>
<td></td>
<td>Emissivity= 0.95; Distance=2m</td>
</tr>
<tr>
<td>Fault on the CB# 8</td>
<td>Fault Rating: 1: Low grade</td>
</tr>
<tr>
<td></td>
<td>Spot1.Temp =37.5, Spot2=30.7;</td>
</tr>
<tr>
<td></td>
<td>Tem. rise $\Delta T = 6.8^\circ C$</td>
</tr>
<tr>
<td></td>
<td>See IR picture.</td>
</tr>
</tbody>
</table>

**Thermogram**

**RESERVED FOR THERMOGRAM AFTER COMPONENT REPAIR**

**Analysis and Recommended Action:**

CB # 8: Spot1.Temp =37.5, Spot2=30.7; Tem. Rise $\Delta T = 6.8^\circ C$. Fault Rating: 1: Low grade.

Recommendation: the CB # 8 to be monitored.

**Inspected By:** (Rick Turdubay)  
**Signature:**  
**Date:**

**Comment:**

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Doc # | Page 7 of 12
**Location** | Main Building  
---|---  
**Equipment** | Panel 2C, 120/208V, 225A  
**Type/Nom. Load** | Main lugs-225 A  
**Actual Load:** | A=1A; B=21A; C=23A  
Load unbalanced  
**Type** | Circuit breakers  
**Nom/Rated Load** | 15 A  
**Actual Load** | CB #3, Load=1A; Load %=6  
CB #6, Load=4A; Load %=26  
Room Temp. C =23.5;  
Reflected Temp.=23.1  
Rel. Humidity= 48.7%  
Emissivity= 0.95; Distance=2m  
**Fault** | Fault Rating: 1: Low grade.  
CB #3; Spot1 t°C =31.3,  
Spot2=27.8; Tem. rise ΔT= 3.5 °C,  
CB #6; Spot3 t°C =28.6,  
Spot4=26.3°C; ΔT= 2.3 °C,  
**Fault Suggestion:** CB# 3, the ΔT < 5 °C. However, the corrected maximum allowable temperature for the circuit breaker # 3 at the existing actual load =1A and room t °C is 23-24°C. The operating t°C=31.3  
See calculation formula on the last page of the report.

**Thermogram**

**Analysis and Recommended Action:**

**Fault Rating: 1: Low grade.** See the fault suggestion above.  
Incoming lugs phases loads somewhat **unbalanced** at A=1A; B=21A; C=23A  
**Recommendation:** the CB # 3 to be monitored.

**Inspected By:** (Rick Turdubay)  
**Repaired By:**  
**Comment:**

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**Reserved for Thermogram after component repair**
**Photo and Identification:**

- Location: Main Building
- Equipment: Panel 2A, 120/208V, Rated: 400A
- Actual load: A=80A; B=50A; C=60A
- Type: Circuit breakers
- Nom/Rated Load: 20 A
- Actual Load: Circuit Breaker #29
  - Load = 15 A; Load %= 75
  - Spot1 t°C =37.5, Spot2=28.8; Tem. rise ΔT= 8.7 °C,
  - Circuit Breakers # 21 and 25
  - Load jumping between 4÷17A;
  - Room Temp. C =23.5;
  - Reflected Temp.=23.1
  - Rel. Humidity= 48.7%
  - Emissivity= 0.95; Distance=2m
- Fault on the CB#29 Fault Rating: 1 Low grade
  - See IR picture.

**Thermogram**

- Circuit Breaker #29; Load = 15 A; Load %= 75, Spot1 t°C =37.5, Spot2=28.8; Tem. rise ΔT= 8.7 °C,
- Fault Rating: 1 Low grade
- Recommendation: the CB # 29 to be monitored.

**Analysis and Recommended Action:**

- Inspected By: (Rick Turdubay)
- Repaired By: Comment:

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**Thermography Inspection at:**

ABC Company

**Date:**

**Doc #** | **Page 9 of 12**
### Thermography Inspection at: ABC Company

**Photo and Identification:**

- **Location:** Main Building
- **Equipment:** Panel 6A, 347/600V, Rated: 250A
  - Actuals: A=66A; B=73A; C=70A
- **Type:** Circuit breakers
- **Nom/Rated Load:** 15 A
- **Actual Load**
  - Circuit Breaker #15
    - Load = 11A; Load % = 73
    - Spot1 t°C = 40.5, Spot2 = 32.0
    - Tem. rise ΔT = 8.5 °C
  - Circuit Breaker #17
    - Load = 11A; Load % = 73
    - Spot1 t°C = 38.8, Spot2 = 32.1
    - Tem. rise ΔT = 6.7 °C
- **Fault on:** CB# 15 and CB#17
  - Fault Rating: 1 Low grade
  - Room Temp. C = 23.5°
  - Reflected Temp. = 23.1°
  - Rel. Humidity = 48.7%
  - Emissivity = 0.95; Distance = 2m
  - See IR picture.

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### Analysis and Recommended Action:

Circuit Breaker #15, Tem. rise ΔT = 8.5 °C; Circuit Breaker #17 Tem. rise ΔT = 6.7 °C. Fault Rating: 1 Low grade.

**Recommendation:** the CB # 15 and CB# 17 to be monitored.

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### Inspected By:

(Rick Turdubay)

**Repaired By:**

Comment:

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Doc #

Page 10 of 12
**Photo and Identification:**

<table>
<thead>
<tr>
<th>Location</th>
<th>Main Building</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equipment</strong></td>
<td><strong>Panel 2B, 120/208V, Rated :225A</strong></td>
</tr>
<tr>
<td></td>
<td>Actual load: A=48A; B=20A; C=17A</td>
</tr>
<tr>
<td></td>
<td>Neutral=20A. <strong>Load unbalanced</strong></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Circuit breakers</td>
</tr>
<tr>
<td><strong>Nom/Rated Load</strong></td>
<td>20 A</td>
</tr>
<tr>
<td><strong>Actual Load</strong></td>
<td>CB#37, Load=17A, Load %=85; Spot1 t°C =46.6, Spot2=35.6; <strong>Tem. rise ΔT= 11 °C</strong></td>
</tr>
<tr>
<td></td>
<td>Circuit Breaker #39</td>
</tr>
<tr>
<td></td>
<td>Load = 10A; Load %= 50</td>
</tr>
<tr>
<td></td>
<td>Spot1 t°C =40.8, Spot2=35.0; <strong>Tem. rise ΔT= 5.8 °C</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault on the CB#37</th>
<th>Fault on the CB#39</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fault Rating: 2; <strong>Medium grade</strong></td>
<td>Fault Rating: 1; <strong>Low grade</strong></td>
</tr>
</tbody>
</table>

**Room Temp. C =23.5; Reflected Temp.=23.1**

**Rel. Humidity= 48.7%**

**Emissivity= 0.95; Distance=2m**

See IR picture.

**Fault Suggestion:**

a) **Incoming lugs phases loads somewhat unbalanced** at A=48A; B=20A; C=17A; Neutral= 20A.

b) **CB # 37, Load %=85 overloaded. Tem. rise ΔT= 11 °C. Fault Rate: 2; Medium grade.**

c) **CB # 39, Load = 10A; Load %= 50Tem. rise ΔT= 5.8 °C. Fault Rate: 1; Low grade.**

**Reserved for Thermogram after component repair**

**Analysis and Recommended Action:**

**Recommendation:**

| CB# 37, Fault Rate: 2; **Medium Grade.** Repair at scheduled shut down. |
| CB# 39 Fault Rate: 1; **Low grade—to be monitored** |

**Inspected By:** (Rick Turdubay)  | **Signature:** | **Date:**

**Repairs By:**

**Comment:**
11.6 Unless noted otherwise, these absolute temperature criteria are based on equipment operating at the stated ambient temperature and at 100% of their rated load. The following formula below can be applied to these absolute temperature criteria to give a corrected maximum allowable temperature (Tmaxcorr) for the reduced operating load and actual ambient temperature of the exception:

\[
T_{\text{maxcorr}} = \left(\frac{A_{\text{meas}}}{A_{\text{rated}}}\right)^2 \times (T_{\text{rated rise}}) + T_{\text{ambient meas}}
\]

Ameas = measured load, in amperes  
Arated = rated load, in amperes  
Trated rise = rated temperature rise (from standard), in this case = 30.  
Tambmeas = measured ambient temperature

Example: See the report Page # 6. (Spot1.Temp = 32.1, Spot2 = 27.5; Tem. rise 4.6 °C)  
The 3Phase CB # 38-40-42 of the Panel 4A is found to be operating at a temperature of 32.1°C.  
The measured ambient temperature (Tambmeas) = 23.5°C. The circuit breaker (CB) is rated at 100 amps (Arated) but its actual average load is measured at only 43.33 amps.

1. What is the Tmaxcorr for the CB?
2. Is the temperature of the CB an exception?

\[
T_{\text{maxcorr}} = \left(\frac{44.33}{100}\right)^2 \times (30) + 23.5 = \left(0.44\right)^2 \times (30) + 23.5 = (0.20) \times (30) + 23.5 = 29.5
\]

Tmaxcorr = 29.5°C  
The actual operating temperature of the CB (32.1°C) is greater than the Tmaxcorr of 29.5°C.  
This is an exception!
Key Words: