CAPITALinfrared
Thermal Imaging Solutions

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ITI Electrical-Mechanical Survey

Prepared For:
Sample Client
839 17th St NW Washington, DC 20004

Prepared By:
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INFRASPECTION INSTITUTE
CERTIFIED
Level III
Kevin A. Richardson
No: 7493
INFRARED THERMOGRAPHER

Infrared Maintenance Program

Whether a commercial or industrial facility is large or small, routine maintenance can consume many man-hours. Although many hours may be devoted towards maintenance, many problems lie undetected without the use of proper equipment. By using infrared technology, the efficiency and overall effectiveness of plant maintenance can be vastly improved.

Infrared maintenance has many applications in addition to the inspection of electrical equipment for defective system components and connections. Steam distribution systems are prime candidates for thermographic evaluations, as steam traps can be inspected to insure they are functioning properly, as well as inspecting the condition of insulated steam lines. Mechanical applications include examining bearings for signs of overheating and checking electric motors for potential bearing or winding problems. Kilns and furnaces can be examined for the possibility of refractory breakdown, while boilers are evaluated for wall deterioration. These applications represent only a few of the many potential uses related to infrared Thermography.

With the many advantages of infrared scanning, there are also advantages of a thermal survey to a quality maintenance program.

- All thermographic inspections are conducted while systems are running or under full load; therefore, no downtime is necessary to conduct the survey.
- A thermographic survey provides positive identification or problem location, thus maintenance can be performed on facts rather than guesswork.
- Unexpected downtime and the associated costs can be reduced to a minimum by scheduling periodic surveys.
- Thermographic surveys are non-contact and non-destructive, thus representing a safe and reliable method to survey high voltage equipment or processes with highly elevated temperatures or corrosive gases.

Our goal at Capital Infrared is to provide a quality infrared maintenance program, so that your facility can benefit from the many related advantages. Capital Infrared stresses the importance of working closely with your maintenance staff, insuring that our thermographic report will be an essential tool leading to effective maintenance procedures. By working together, Capital Infrared can save your company money in wasted energy, reduction of downtime, and by making your facility a safer workplace. With such potential advantages, infrared scanning proves to be a cost effective method of insuring a quality maintenance program.

A Commitment to our Clients

Infrared scanning has proven to be an effective means of performing electrical-mechanical maintenance in an efficient manner. Scheduling infrared inspections on a regular basis leads to better productivity, less down-time, and an overall safer working environment. One of the major keys leading to a successful infrared maintenance program, though, proves to be the infrared consultant. Knowledge of equipment and processes leads to better infrared inspection reports. To ensure the quality of our work, we adhere to the Standards set forth by The Infraspection Institute's "Standard for Infrared Inspection of Electrical Systems and Rotating Equipment."

These Standards set the industry standard for quality infrared inspections. By following these standards, Capital Infrared provides an infrared inspection report that proves to be an easy and effective tool in electrical and mechanical system maintenance. This commitment also extends to continued education, as Capital Infrared believes in staying abreast of new innovations in the field of infrared technology. Commitment proves to be a simple key to insuring a quality service.

Forward

This Report of Infrared Inspection provides complete documentation of thermal patterns detected in your equipment, structure or system. It uses a ***subjective*** evaluation to help you prioritize repairs to provide the greatest return from this inspection and your maintenance.

This Report of Infrared Inspection meets the documentation requirements of the Infraspection Institute ***Standard for Infrared Inspection of Electrical Systems and Rotating Equipment***, as well as standards, practices and specifications published by ASTM, NFPA, and NETA.

How Infrared Thermography Works

Infrared Thermography is the technique that uses an infrared imaging and measurement camera to "see" and "measure" invisible infrared energy being emitted from an object.

Thermal, or infrared energy, is energy not visible because its wavelength is too long for the sensors in our eyes to detect. It is the part of the electromagnetic spectrum that we perceive as heat. Unlike visible light, in the infrared spectrum, everything with a temperature above absolute zero emits infrared electromagnetic energy. Even cold objects such as ice cubes, emit infrared radiation. The higher the temperature of the object, the greater the infrared radiation emitted. Infrared imagers allow us to see what our eyes cannot!

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 on the right side of the image. Colors appearing closer to the top of the reference bar indicate higher temperatures. Colors appearing closer to the bottom of the reference bar indicate lower temperatures.

Repair Priority Ratings

Each Thermogram is given a ***Subjective Repair Priority Rating*** which is based upon the Thermographers and/or Qualified Assistant’s opinion of how critical the subject item is to the safe and profitable operation of your overall system.

The ***Priority Level Explanation*** section of this Report explains how to use this ***Subjective Priority Rating System*** 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 electrical or mechanical components will never get better. In fact, the temperature and rate of deterioration will increase with time.

No one can predict when a failure will occur. As a result, we suggest that you use the ***Subjective Priority Rating System*** as a guide but that you investigate and take appropriate corrective measures as soon as possible.

Priority Level Explanations

PRIORITY LEVEL 1: SEVERE

Electrical Equipment: The connection or component has a temperature rise that is >40° C above the ambient temperature or adjacent phase. This is an **IMMEDIATE ACTION** issue. Maintenance actions are recommended prior to further equipment operation. ***Repairs are typically costly and usually require replacement of parts or portions of the equipment to achieve proper repair and operation***.

Mechanical Equipment: Equipment at this level requires **IMMEDIATE ACTION**. The actual temperature at this level will vary. This temperature variance is due to equipment type, operating speed, equipment size, and the proximity of the temperature reading to the actual heating source. ***Repairs are typically costly and usually require replacement of parts or portions of the equipment to achieve proper repair and operation***.

PRIORITY LEVEL 2: MODERATE

Electrical Equipment: The connection or component has a temperature rise that is 20° to 40° C above the ambient temperature or adjacent phase. This is a serious to moderate issue. At this level, maintenance actions should be performed at the earliest available opportunity, within the given time guidelines. ***Repairs may require replacing the associated parts. Extended operation at this level will increase the potential of a rapid increase in the temperature, if environmental or operational conditions change.***

Mechanical Equipment: Maintenance actions on equipment at this level should be performed at the earliest opportunity, within the given time guidelines. The actual temperature at this level will vary. This temperature variance is due to equipment type, operating speed, equipment size, and the proximity of the temperature reading to the actual heating source. Prolonged operation at this level will greatly reduce the equipment life span (generally in the term of years). Some circumstances will require further evaluation with another reliability technology to determine the exact issue and proper repair recommendations. ***At this level, most maintenance actions are generally corrective and less expensive.***

PRIORITY LEVEL 3: CAUTION

Electrical Equipment: The connection or component has a temperature rise that is 10° to 20° C above the ambient temperature or adjacent phase. This is the earliest sign of a potential fault. ***Maintenance actions on these faults are required for low voltage equipment and at the regular preventative maintenance internals for higher voltage equipment***.

Mechanical Equipment: This is an early warning for increases in temperature. The allowed difference above ambient temperature varies greatly due to equipment type, operating speed, equipment size, and the proximity of the temperature reading to the actual heating source. ***This level does not require repairs, but the equipment needs increased observation. Changes in vibration, noise, or temperature will require the appropriate maintenance action***.

PRIORITY LEVEL 4: OBSERVE

Electrical and Mechanical Equipment: The connection or component has a temperature rise that is 1° to 10° C above the ambient temperature or adjacent phase. This typically means that the levels are within acceptable parameters for the associated test results. No action or repairs are necessary at this stage. Continue to monitor the equipment on a routine basis to watch for any new faults that may develop.

Report Summary

Job Number:	20141229-Sample
Type of Inspection:	Electrical (Qualitative)
Purpose of Inspection:	Preventive/Predictive Maintenance
Date of Inspection:	December 29, 2014 at 8:30am to 1:45pm
End User:	Sample Client
Project Location:	Sample Client 839 17th St NW Washington, DC 20004
Thermographer:	Kevin A. Richardson
Certification Number:	Infraspection Institute #7493
Certification Level:	Infraspection Institute Level III Certified Infrared Thermographer®
Qualified Assistant(s):	Scott C. Richardson, CEM®, CEA®, FMA® Service Technician - Mona Electric
Equipment Used:	FLIR SYSTEMS™ FLIR® ThermaCAM® T400, Serial #345001345
Weather Data:	Outside Temp: 35-40° F Inside Temp: 70-75° F RH: 40-45% Winds: < 5 mph Skies: Overcast Dew Point: 25-30° F
Last Precipitation:	24-72 Hours
General Summary:	Capital Infrared was contracted by (Client Name) to conduct an ITI Electrical-Mechanical Survey of the (Clients Building) Electrical Systems. Our inspection route was derived from the component list provided to us from (Clients Name), which is attached to this report as "Exhibit A." Our primary goal was to evaluate electrical components identified by (Clients Name) and detect thermal anomalies associated with equipment under normal loads. All panel covers were removed by representatives from Mona Electric. This action Report only includes thermal anomalies (Exceptions) that were detected during our site visit on December 29, 2014.

Summary of Exceptions

Location	Equipment	Fault	Page Number
Penthouse Mechanical Room	Panel ME-PH / 100 amp Circuit Breaker (Condenser Pump P4)	(3)	7
4th Floor Hallway	Panel LR4 / Circuit Breaker #11	(4)	8

Priority Reference

4	OBSERVE	Normal Operation - Monitor
3	CAUTION	Minor Issues - Repair as Necessary
2	MODERATE	Intermediate Issues - Schedule Repair ASAP
1	SEVERE	Emergency Issues - IMMEDIATE ACTION

CAPITALinfrared
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Photo and Identification

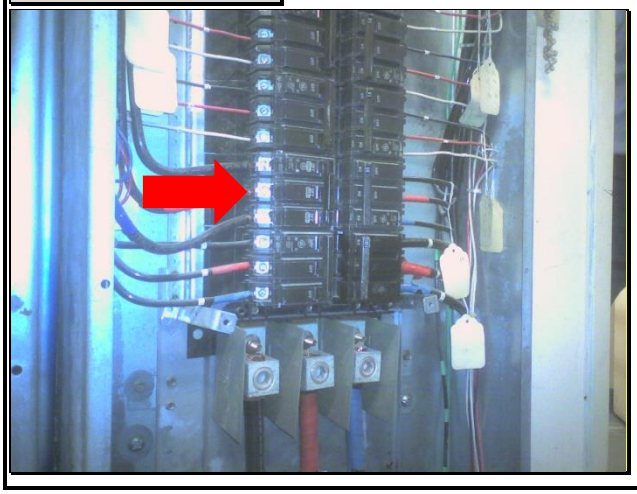


Image Date	12/29/2014
Image Time	8:43:16 AM
Image Camera Type	ThermaCAM T-400
Image Camera Lens	FOL10
Object Distance	3.0 feet
Location	Penthouse Mechanical Room
Equipment	Panel ME-PH (Condenser Pump P4)
Type	3 Phase Circuit Breaker
Nom load	100 amps
Actual load	#31=52 amps, #33=51 amps, #35=50 amps

Thermogram

Filename	IR_3435.jpg
Atmospheric Temperature	21.7 °C
Dt1 Value	**19.0 °C**
Emissivity	1.00
Ar1 Max. Temperature	42.9 °C
Sp1 Temperature	23.9 °C

OBSERVE	4
CAUTION	3
MODERATE	2
SEVERE	1

Priority Rating 3

Analysis & Recommended Action:

The load on this circuit was within acceptable parameters, but the temperature rise over ambient was elevated. Recommend monitoring and trending temperature rise over ambient. Corrective measures required as scheduling permits.

Corrective Action:

Has this problem been corrected? _____Yes _____No

Date Corrected: _____ Corrected By: _____

Action Taken: _____

Photo and Identification

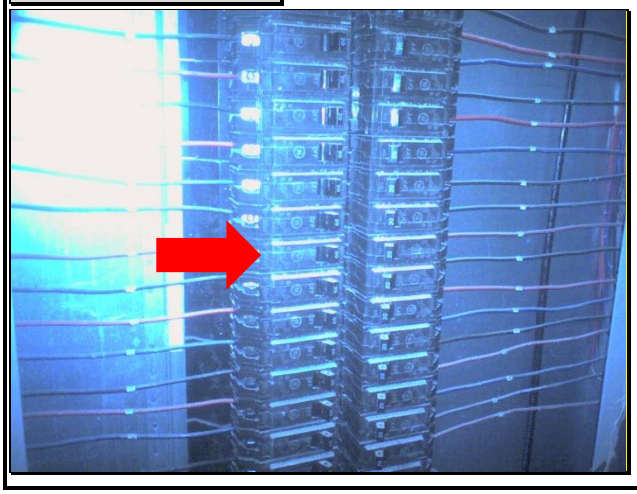
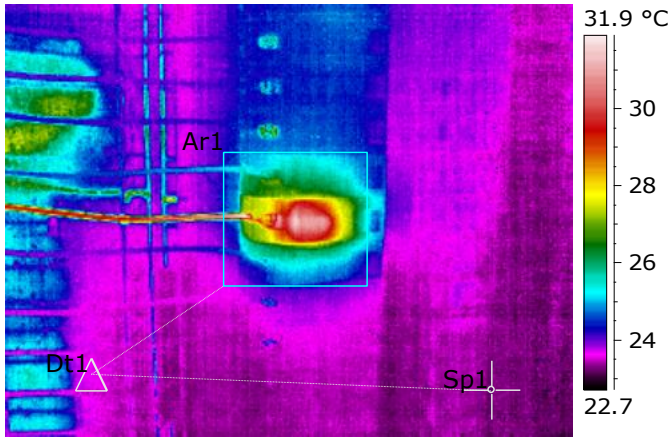


Image Date	12/29/2014
Image Time	11:53:51 AM
Image Camera Type	ThermaCAM T-400
Image Camera Lens	FOL10
Object Distance	3.0 feet
Location	4th Floor Hallway
Equipment	Panel LR4
Type	Circuit Breaker #1
Nom load	20 amp
Actual load	1.2 amps

Thermogram



Filename	IR_3437.jpg
Atmospheric Temperature	21.7 °C
Dt1 Value	**8.7 °C**
Emissivity	1.00
Ar1 Max. Temperature	31.9 °C
Sp1 Temperature	23.3 °C

OBSERVE	4
CAUTION	3
MODERATE	2
SEVERE	1

Priority Rating 4

Analysis & Recommended Action:

The load on this circuit was within acceptable parameters. Recommend monitoring and trending temperature rise over ambient. Consider replacing circuit breaker at the next scheduled maintenance interval.

Corrective Action:

Has this problem been corrected? _____Yes _____No

Date Corrected: _____ Corrected By: _____

Action Taken: _____

"EXIBIT A"

Inspection Route | Equipment List

Penthouse Mechanical Room

- Panel ME-PH
- Panel EPP-PH
- Panel ELPC EPPC
- Elevator ATS
- Fire pump ATS

Elevator Machine Room

- Disconnects #1 & #2
- Cab lights #1 & #2
- ATS
- Elevator Controllers #1 & #2

11th Floor

- Panel LR11

10th Floor

- Panel HP10
- Panel LR10

9th Floor

- Panel LR9

8th Floor

- Panel LR8
- HP8

7th Floor

- Panel LR7

6th Floor

- Panel LR6
- Panel HP6

5th Floor

- Panel LR5

4th Floor

- Panel LR4
- Panel HP4

3rd Floor

- Panel LR3

2nd Floor

- Panel LR2
- Panel HP2

Lower Lever Maintenance Shop/Main Electrical Room

- ENL-TPC Disconnect
- Panel ELPC
- Panel EPPC
- LRC Section #1
- LRC Section #2
- Panel EPPC-ELPC Emergency Lighting/Power
- Fire Pump
- Restaurant Disconnect
- Main Switchboard

Lower Level Kitchen

- Panel #1
- Panel #2
- Panel #3