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SAMPLE THERMOGRAPHIC REPORT AND STUDY

Prepared by:

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#####, 2005

THERMOGRAPHIC STUDY REPORT

Executive Summary

Site Location:
Date Performed: May 25-26, 2005 (8:00 am to 16:00 pm)
Performed by: Marc A. Belanger, P.Eng.
Scope of Work: All distribution hardware.

Approximately 225 infrared scans were taken as part of this investigation. Various types of electrical distribution hardware throughout the facility were investigated. The complete list of the electrical hardware scanned is located in appendix A of this study. The list includes the equipment scanned during this study, it's location, and anomaly status at the time of the thermographic scan. Of the facility connections and components that were scanned, only three pieces of equipment listed in the report were found to contain a thermal anomaly. Please refer to the appropriate section of the report for details (appendix B).

In general, the equipment that was scanned appeared to be in good condition and good working order. It was noted that most of the equipment scanned at this facility requires cleaning.

Details of three recorded anomalies can be found in appendix B of this report.

Location	Equipment	Anomaly Status
Room D-003	Starter B004-EF	intermediate
Room 256-2	Panel PUB2	intermediate
Room 140-1	Panel PSA1	minor

Table of Content

Appendixes

1.0 Inspection Identification

Site Location:
Date Performed: May 25-26, 2005 (8:00 am to 16:00 pm)
Performed by: Marc A. Belanger, P.Eng.
Scope of Work: All distribution hardware.

2.0 Thermal Imager Specifications

The following equipment was used to perform this study.

Type: Fluke Ti30 ser. No. 2446580201-00011(2005.02.17)

Specifications:

Temperature Range: -10° to 250°C (14° to 482°F)
Detector type: 120 x160 thermal element focal plane array (FPA) uncooled microbolometer
Accuracy: ±2% or ±2ºC
Accuracy (from -10 to 0 C): +/- 3ºC
Repeatability: ±1% or ±1ºC (±2ºF), whichever is greater
Spectral Range: 7-14 microns
Temperature Indication Resolution: 0.1 (ºF or ºC)

3.0 Introduction

In order to classify the severity of the thermal anomalies recorded, the temperature difference between similar components was used. Please note that with electrical equipment, the measured temperature in degrees centigrade is likely to vary based on the electrical load (amperes) on the equipment at that time, the surrounding ambient temperature, and it's emissivity value. It was beyond the scope of this study to determine operating load levels at the time of our thermographic analysis.

The following criteria have been used to determine the priority of the corrective maintenance scheduling required, based upon the temperature difference of like components.

Classification of Severity of Anomalies Identified

Classification	Temperature Rise	Remarks
Minor	0 to 10 degree C rise	Repair during regular ma intenance
Intermediate	10 – 20 degree C rise	Repair 2 - 4 weeks
Serious	20 – 30 degree C rise	Repair 1 - 2 days
CRITICAL	30 degree C rise or a bove	Repair immediately

Decisions on the priority, timing, and importance of repairing the thermal anomalies found in the equipment that was scanned, is the responsibility of the end user and/or his designated maintenance contractor. It is recommended that not only the temperature rise be considered, in determining the prioritization of repairing the thermal anomalies found, but also the criticality of the equipment/process.

4.0 Summary of Scanned Equipment

In appendix A is a table of the equipment scanned during this study, it's location and anomaly status at the time of the infrared scan.

The appendix B section of this report contains the actual thermographic images of the anomalies. Only the thermographic scans of the anomalies have been included. Thermographic scans that were judged normal have not been included in this report. For all anomalies, we have included a control photograph identifying the equipment (regular photograph) and a thermographic image (thermal image) of the equipment where the anomaly was found.

5.0 General Recommendations and Comments

In general, the equipment that was scanned appeared to be in good condition and good working order. Most of the equipment and panel boards require general cleaning. Of the facility connections and components that were scanned (approx 225), only three pieces of equipment listed in the report were found to contain thermal anomalies.

The infrared inspection was performed with the electrical system in the "as found" condition. It was beyond the scope of this study to determine operating load levels at the time of our thermographic analysis however; it was noted that almost all equipment found at the site was lightly loaded. It is recommended that an annual infrared scan be performed as part of an ongoing predictive maintenance program.

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THERMOGRAPHIC REPORT AND STUDY

Appendix A

Verified Equipment List and Infrared Status

Infrared Report Equipment List and Status

Location	Identification	Description	Infrared Status
Room B-018			
Panel PPD-A-B	Panel PDAB	Fused Disconnect	OK
Panel PPD-A-B	Main Breaker	Fused Disconnect	OK
Panel PPD-A-B	MCC #4	Fused Disconnect	OK
Panel PPD-A-B	MCC #2	Fused Disconnect	OK
Panel PPD-A-B	PP7	Fused Disconnect	OK
Panel PPD-A-B	300 kva xfmr	Fused Disconnect	OK
Panel PPD-A-B	MCC #3	Fused Disconnect	OK
Panel PPD-A-B	Panel PP6	Fused Disconnect	OK
Panel PDAB	PSA3	Fused Disconnect	OK
Panel PDAB	PSA2	Fused Disconnect	OK
Panel PDAB	PSA4	Fused Disconnect	OK
Panel PDAB	PEA1	Fused Disconnect	OK
Panel PDAB	PSA1	Fused Disconnect	OK
Panel PDAB	PEAB	Fused Disconnect	OK
Panel PDAB	PCA2	Fused Disconnect	OK
Panel PDAB	PEAC	Fused Disconnect	OK
Panel PDAB	PSAB	Fused Disconnect	OK
	Panel PEAB	Panel Board	OK
	Panel PEAC	Panel Board	OK
	PDC	Non Fused Disconnect	OK
	PP1	Non Fused Disconnect	OK
	Kitchen	Contactor/starter	OK
	PPDU-AB	Panel Board	OK
	PUAB	Panel Board	OK
	XFMR 300 kva	120/208 3 phase	OK
	XFMR 75 kva	120/208 3 phase	OK
	XFMR 50 kva	120/240 1 phase	OK
	XFMR 50 kva	120/240 1 phase	OK
	XFMR 25 kva	120/240 10	OK
Room 031-1			
	A-007 EF	Starter	OK
Room 031-2			
MCC No. 3	Main Disc.	Main 100A Disc.	OK
MCC No. 3	A-004 SF	Starter - Kitchen	OK
MCC No. 3	A-004 EF	Starter - Kitchen	OK
MCC No. 3	A-005 SF	Starter - Kitchen	OK
MCC No. 3	A-005 EF	Starter - Kitchen	OK

	A-006 EF	Starter	OK
	A-006 SF	Starter	OK
	A-005 SF	Disconnect	OK
Room 031-5	A-006 SF	Disconnect	OK
	A-007 SF	Starter	OK
	A-004 EF	Disconnect	OK
Room A-001			
	Elevator #2	Fused Disc.	OK
	Elevator #1	Fused Disc.	OK
	Sump Pum	Starter	OK
Room A-011			
	Panel PSAB	Panel Board	OK
	Panel PUAA1	Panel Board	OK
Room B-004			
	Panel AUPP7	Panel Board	OK
Room 003-1			
Panel PPD-B-B	Main Disc.	Non Fused Disconnect	OK
Panel PPD-B-B	PDBB	Fused Disconnect	OK
Panel PPD-B-B	PDBB-1	Fused Disconnect	OK
Panel PPD-B-B	PP1	Fused Disconnect	OK
Panel PPD-B-B	PDC	Fused Disconnect	OK
Panel PPD-B-B	PPBP	Fused Disconnect	OK
Panel PPD-B-B	B001-SF	Fused Disconnect	OK
Panel PPD-B-B	Depoussierage	Fused Disconnect	OK
Panel PPD-B-B	Monte Charge	Fused Disconnect	OK
	75 kva XFMR	120/140 1 phase	OK
	PD BB-1	Panel Board	OK
	300 kva XFMR	120/208 3 phase	OK
Panel PD B-B	PSB4	Fused Disconnect	OK
Panel PD B-B	PSB1	Fused Disconnect	OK
Panel PD B-B	PSB3	Fused Disconnect	OK
Panel PD B-B	PSB2	Fused Disconnect	OK
Panel PD B-B	PSBB	Fused Disconnect	OK
Panel PD B-B	PEBB	Fused Disconnect	OK
Panel PD B-B	PDBB-A	Fused Disconnect	OK
Panel PD B-B	Neutral Bus	Bus	OK
	Panel PE-B-B	Panel Board	OK
	PD-B-B-A	Panel Board	OK
	Panel PPDU-B-B	Neutral on Load Side, should be removed PPU BB-1	OK
	Panel PU B-B	Panel Board	OK

	30 kva XFMR	120/208 3 phase	OK
Room C006			
	Elevator Disc	Fused Disconnect	OK
	Panel PSBB	Panel Board	OK
Room COO1			
	Workshop Panel	Panel Board	OK
Boiler Room D001			
	Cir. Pum #6	Disconnect	OK
	Ventilateur B005-SF	Starter	OK
	Ventilateur B001-SF	Starter	OK
	Ventilateur B005-EF	Starter	OK
Room 001-3	PPDUBB	Fused Disconnect	OK
	MOC #1	Fused Disconnect	OK
	Panel P-13	Fused Disconnect	OK
	PPDUAB	Circuit Breaker	OK
	Splitter	Splitter	OK
	15 kva xfmr EP4	120/240	OK
	Panel EP4	Old Panel Board	OK
	Panel P13	Old Panel Board	OK
	Panel P17	Old Panel Board	OK
Room D-003			
	Ventilateur B004-EF	Starter	OK
	Pump B004-EF #3	Starter	Intermediate
Room 003-1			
Panel MPP-B-B	PEM	Fused Disconnect	OK
Panel MPP-B-B	Pompe Gigleur	Fused Disconnect	OK
Panel MPP-B-B	Refroidisseur #3	Fused Disconnect	OK
Panel MPP-B-B	Condensseur #2	Fused Disconnect	OK
Panel MPP-B-B	Condensseur #3	Fused Disconnect	OK
Panel MPP-B-B	Condensseur #1	Fused Disconnect	OK
Panel MPP-B-B	MCC #1	Fused Disconnect	OK
Panel MPP-B-B	Pompe de Circulation #1	Fused Disconnect	OK
Panel MPP-B-B	Pompe de Circulation #2	Fused Disconnect	OK
Panel MPP-B-B	15 kva XFMR	Fused Disconnect	OK
Panel MPP-B-B	Pompe de Circulation #3	Fused Disconnect	OK
	Generator Panel	Panel Board	OK
	15 kva XFMR	Feeds Generator Panel	OK
Panel AU MPP-B-B	AU PPD-B-B	Fused Disconnect	OK
Panel AU MPP-B-B	AU PPD-A-B	Fused Disconnect	OK
Panel AU MPP-B-B	Chiller #2	Fused Disconnect	OK

Panel AU MPP-B-B	Chiller #1	Fused Disconnect	OK
	Main Bus	Bus	OK
	Main Brk	Main Breaker	OK
	Main Bus	Main Incoming Bus	OK
	Transfer Switch	Module	OK
Room 003-2			
	B004-SF	Starter	OK
Room 140-1			
	Panel Disconnect	Non Fused Disconnect	OK
	Panel PEA1	Panel Board	OK
	Panel PLA1	Panel Board	OK
	Panel Disconnect	Non Fused Disconnect	OK
	Panel PSA1	Panel Board	minor
	Panel PUA1	Panel Board	OK
	Panel Disconnect	Non Fused Disconnect	OK
Room 105-3			
	Panel PP6	Panel Board	OK
	Panel PDC	Panel Board	OK
	Panel P14	Panel Board	OK
	Panel PP1	Panel Board	OK
	Panel PKA1	Panel Board	OK
	Panel PUAK	Panel Board	OK
Room C103			
	Panel PRB1	Panel Board	OK
Room C153			
	Panel PSB1A	Panel Board	OK
	Panel PSB1A	Panel Board	OK
	Disconnect	Cannot Open Unless Shut Down	na
Room A-103			
	Panel PRA1	Panel Board	OK
	Panel PRA1-A	Panel Board	OK
Room A-215			
	Panel PRA2	Panel Board	OK
Room A-244			
	Panel PSA2	Panel Board	OK

	Disconnect	Cannot Open Unless Shut Down	na
	Panel PSA	Panel Board	OK
	Disconnect	Non Fused Disconnect	OK
Room 256-2			
	Disconnect	Non Fused Disconnect	OK
	Panel PSB2	Panel Board	OK
	Panel PUB2	Panel Board - hot neutral	intermediate
	Disconnect	Non Fused Disconnect	OK
Room C205			
	Panel PRB2	Panel Board	OK
Room C454			
	Disconnect	Cannot Open Unless Shut Down	OK
	Panel PSB4	Panel Board	OK
	Panel PUB4	Panel Board	OK
	Disconnect	Non Fused Disconnect	OK
Room C409			
	Panel PRB4	Panel Board	OK
Room A425			
	Disconnect	Non Fused Disconnect	OK
	Panel PSA4	Panel Board	OK
	Panel PUA4	Panel Board	OK
	Disconnect	Non Fused Disconnect	OK
Room A409			
	Panel PRA4	Panel Board	OK
Penthouse East			
	Panel PSBP	Panel Board	OK
	Starter B-502	Starter	OK
	Panel PPB-P	Panel Board	OK
	Dis PP-B-P	Non Fused Disconnect	OK
	XFMR 10 kva	xfmr	OK
	Starter B501-EF	Starter	OK
	Starter B-502-SF	Starter	OK
	Pump Starter	Starter	OK
	B501-SF	Starter	OK
	Disconnect	Fused Disconnect for B501 SF	OK
Penthouse West			
	E-502 EP	Starter	OK
	Pump	Starter	OK

	A-501-SF	Non Fused Disconnect	OK
	A-504-SF	Starter	OK
	A-504-EF	Starter	OK
MCC #4	A-401-AF	Cirkt. Brks.	OK
MCC #4	PSAP	Cirkt. Brks.	OK
MCC #4	Main Disconnect	Cirkt. Brks.	OK
MCC #4	A-501-SF	Starter	OK
MCC #4	A-501-EF	Starter	OK
MCC #4	Hand A-503-EF	Starter	OK
	Panel PSAP	Panel Board	OK
	XFMR 10 kva	xfmr	OK
Room C-360			
	Disc.	Non Fused Disconnect	OK
	Panel PSB3	Panel Board	OK
Room C-305			
	Panel PRB3	Panel Board	OK
			OK
Room A-346			
	Panel PSA3	Panel Board	OK
	Disc.	Non Fused Disconnect	OK
Room A-315			
	Panel PRA3	Panel Board	OK
Chapel 260-2			
	Panel PCA2	Panel Board	OK

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THERMOGRAPHIC REPORT AND STUDY

Appendix B

Infrared Anomalies

THERMOGRAPHIC REPORT

Company	Tremblay Electrique
Problem #	

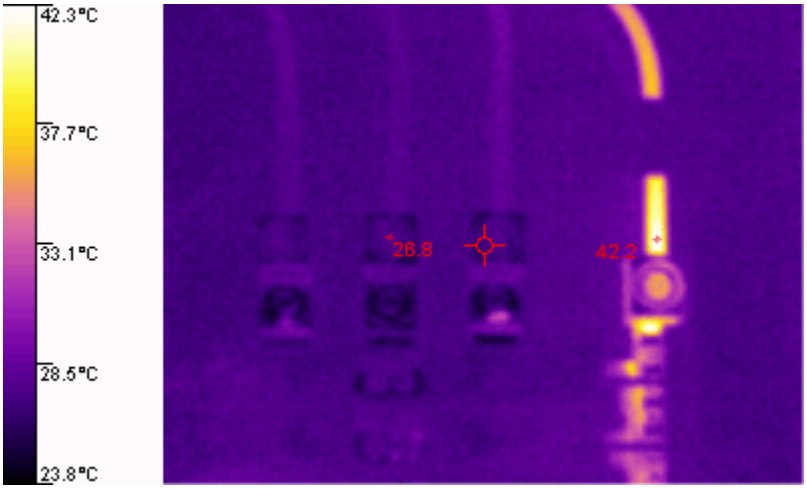
IDENTIFICATION

Location Name	Room 256-2 Panel PUB2
Equipment	Panel PUB2 Neutral

PROBLEM DESCRIPTION

Hot Neutral Conductor - Check loads- torque - Investigate possible faults.

THERMOGRAM



TEMPERATURE MEASUREMENTS

Image Date	26/05/2005 11:18:33 AM
Target Temperature	26.5 °C
Emissivity	0.85
Reflected Temp	OFF

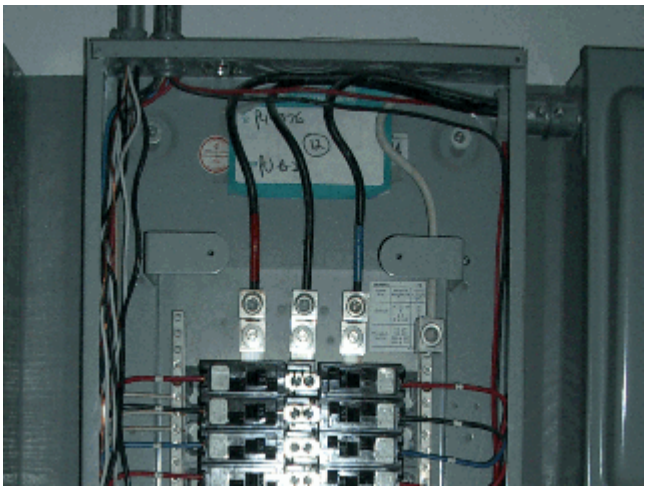
WEATHER

Air Temp	na
Sky	na
Wind Speed	na
From	na

Distance	Rated Load	Meas. Load	% Load
na	na	na	na

MAINTENANCE ACTION

Description	Repaired by
Hot Neutral. Check loads- torque - Investigate.	



REPAIR PRIORITY

Subj. Rating	high
Temp. Rating	

REINSPECTION

Reinspected by	
Date	

Comments

Check loads- torque - Investigate possible faults.

THERMOGRAPHIC REPORT

Company	Tremblay Electrique
Problem #	

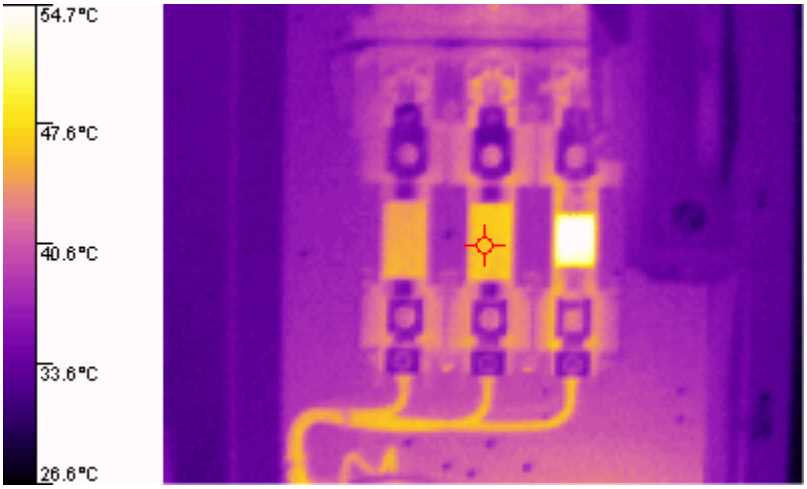
IDENTIFICATION

Location Name	Room D-003, pump B004-EF
Equipment	B004-EF starter

PROBLEM DESCRIPTION

One fuse (right) is rated at 20 amps while the others are 30 amps

THERMOGRAM



TEMPERATURE MEASUREMENTS

Image Date	25/05/2005 3:17:10 PM
Target Temperature	45.5 °C
Emissivity	0.85
Reflected Temp	OFF

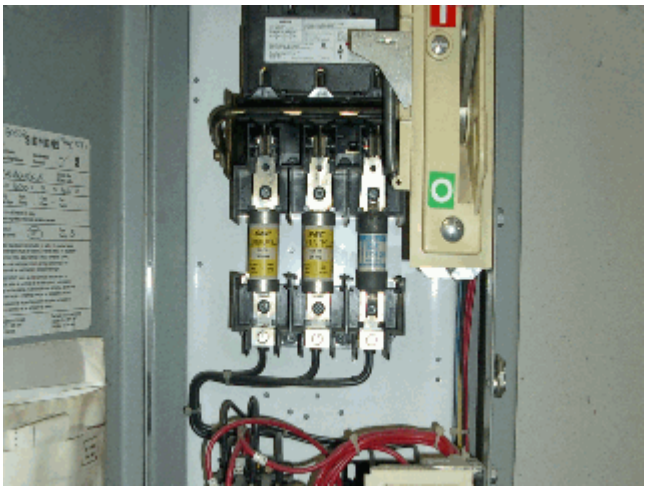
WEATHER

Air Temp	na
Sky	na
Wind Speed	na
From	na

Distance	Rated Load	Meas. Load	% Load
na	na	na	na

MAINTENANCE ACTION

Description	Repaired by
Ensure fuses are properly installed and rated.	



REPAIR PRIORITY

Subj. Rating	high
Temp. Rating	

REINSPECTION

Reinspected by	
Date	

Comments

Ensure fuses are properly installed and rated.

THERMOGRAPHIC REPORT

Company	Tremblay Electrique
Problem #	

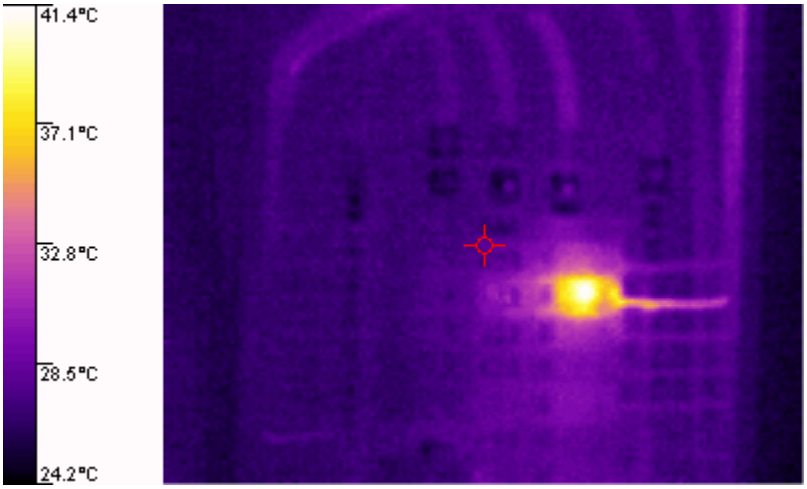
IDENTIFICATION

Location Name	Room 140-1 Panel PSA1
Equipment	Panel PSA1

PROBLEM DESCRIPTION

Warm Circuit Breaker

THERMOGRAM



TEMPERATURE MEASUREMENTS

Image Date	26/05/2005 9:10:19 AM
Target Temperature	28.0 °C
Emissivity	0.85
Reflected Temp	OFF

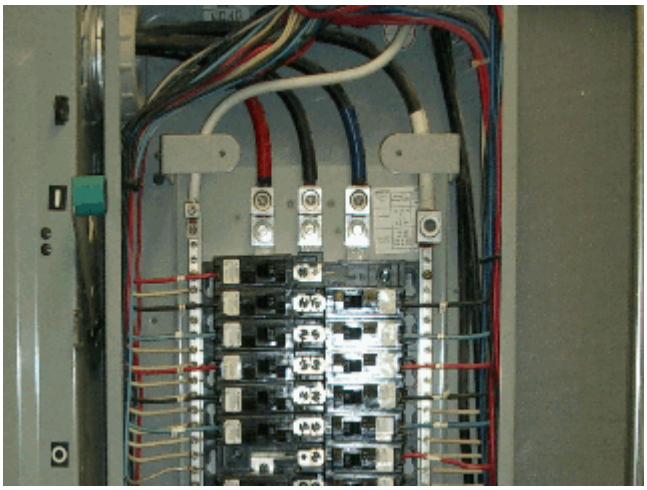
WEATHER

Air Temp	na
Sky	na
Wind Speed	na
From	na

Distance	Rated Load	Meas. Load	% Load
na	na	na	na

MAINTENANCE ACTION

Description	Repaired by
Check load - torque - Investigate.	



REPAIR PRIORITY

Subj. Rating	low
Temp. Rating	

REINSPECTION

Reinspected by	
Date	

Comments

Check load- torque - Investigate.