Customer Name

Site Address
Site Address

Thermographic Survey of Electrical Systems

May 14, 2019

Customer Contact:
John Smith
610-555-2121
John.smith@customer.com

G Technology, Inc. Contact:
P: 610-393-3590
info@gtechnology-pa.com

Thermographic Survey of Electrical Systems

Customer Name:
Customer Contact:
Contact Phone Number:
Site Address:

Electrical Contractor: G Technology, Inc.
Site Thermographer: John Walton, Miguel Guerrero
Date of Survey: May 14, 2019
Time of Survey: 7:00 am
Test Equipment: Flir E75

The Electrical Systems of site address was the subject of an infrared (IR) survey on May 14, 2019. Equipment designated by the client for this survey is listed in the report.

Report includes:
Section A – Data Log, a list of all equipment surveyed
Section B – Repair Guide, a list of all equipment with thermal anomalies
Section C – Thermographic Reports, individual report pages of all equipment with thermal anomalies

G Technology, Inc. was retained for a qualitative infrared thermographic survey of electrical switchgear in an effort to identify areas of thermal anomalies and to document them for further review and repair. Further investigations of these areas may reveal additional conditions that were not readily visible at time of inspection. We document our findings with infrared thermograms and visual photographs of the areas. Our inspection is designed to comply with accepted industrial standards and this report is for the exclusive use of our client and is not intended for any other purpose. This report is based on information obtained at the site at the given date and time as described in the report. Should additional information become available at a later date, we reserve the right to determine the impact, if any, that the new information may have on our discovery and recommendations and to revise the report if necessary and warranted.

Analysis and Recommendations:
We recommend that your maintenance team carefully review this report. Items listed on the Repair Guide should be checked by qualified personnel. We use the Delta-T temperature Criteria method of rating anomalies on the electrical equipment. Below, see the temperature ratings, however, your criteria for rating a problem will include not only temperature, but criticality of the equipment and other factors.

Our reports are designed to be clear, concise and useful. Please review this report carefully. If there is anything you would like us to explain, or if there is other information you would like, please feel free to call us as we would be happy to answer any questions.

Sincerely,

Miguel Guerrero
Certified Level II Thermographer

Thermographic Survey of Electrical Systems

Customer Name:
Customer Contact:
Contact Phone Number:
Site Address:

Electrical Contractor: G Technology, Inc.
Site Thermographer: John Walton, Miguel Guerrero
Date of Survey: May 14, 2019
Time of Survey: 7:00 am
Test Equipment: Flir E75

Recap of Findings:

(M) Minor = 7
(A) Alert = 0
(S) Serious = 0
(C) Critical = 0
TOTAL = 7

Understanding Infrared Imagery:

Infrared imagery is often a picture or "thermograph" whose scales (or shades of color) represent the differences in emitted energy from the surface of an object. As a general rule, patterns in the image that are lighter in shade are warmer and darker patterns cooler. Unlike visible light imagery (0.4-0.7 micrometer wavelengths), objects observed using infrared imagers capture infrared wavelengths in the 3-5 and/or 8-14 micrometer range.

When an image is taken with an infrared camera, it is often recorded onto videotape and/or digitally saved to an on-board storage device. The image may be then modified in a number of ways to enhance its value to the end user. Image files are digitized, saved, then adjusted for color, contrast and brightness before being scaled and placed into a report file. The report is then printed in high quality and/or saved to a CD-ROM for the clients use.

Rating	Temp. Rise in Fahrenheit	Recommendation:
Minor	1-18	Routine repair during regular maintenance, little chance of physical damage.
Alert	19-36	Repair within 30 days with load and inspect for physical damage.
Serious	37-54	Repair or Replace ASAP and inspect surrounding components for physical damage.
Critical	55+	Immediate Repair or Replace. Danger Exists!

Survey Begins: Tuesday, May 14, 2019 7:00:00 AM

Location	Electrical Equipment	Notes	Picture	Rating
Main Warehouse	ARU-2, 480V, 3Ph, Category 0 Heating Unit	Not operating during time of inspection		
Main Warehouse	Panel RP-5, BCP-026/TRD-004			
Main Warehouse	Panel RP-2, BCP-025/TRD-003			
Main Warehouse	Exhaust Fan #1B, CMS-043			
Main Warehouse	Supply Fan #1, CMS-044			
Main Warehouse	Exhaust Fan #1A, CMS-045			
Main Warehouse	Air Compressor, Disc-005	Not operating during time of inspection		
Main Warehouse	Baler/Compactor 480V, 3Ph, Disc-005A	Not operating during time of inspection		
Main Warehouse	Compactor, CDP, Disc-006, Category 1	Not operating during time of inspection		
Main Warehouse	Disc-007, Category 1	Not operating during time of inspection		
Main Warehouse	ARU-1, 480V, 3Ph, Category 0 Heating Unit	Not operating during time of inspection		
Main Warehouse	Panel RP-3, BCP-027			
Main Warehouse	Panel LP-3, BCP-028			
Main Warehouse	Panel RP-4, BCP-029			
Main Warehouse	Trans TRD-006			
Main Warehouse	Trans TRD-005			
Main Warehouse	ARU-3, 480V, 3Ph, Category 0 Heating Unit	Not operating during time of inspection		
Main Warehouse	ARU-4, 480V, 3Ph, Category 0 Heating Unit	Not operating during time of inspection		
Main Warehouse	Exhaust Fan #13B, CMS-019			
Main Warehouse	Supply Fan #13, CMS-020			
Main Warehouse	Exhaust Fan #13A, CMS-021			
Main Warehouse	Exhaust Fan #12B, CMS-016			
Main Warehouse	Supply Fan #12, CMS-017			
Main Warehouse	Exhaust Fan #12A, CMS-018			
Main Warehouse	Panel ELP4 fed by EDP, BCP-016			
Main Warehouse	Panel ELP1 fed by EDP, BCP-017			
Main Warehouse	Panel LP-6, BCP-018			
Main Warehouse	Panel LP-6, BCP-019			
Main Warehouse	Panel LP-2A, BCP-020			
Main Warehouse	Panel LDP 2, DP-004			
Main Warehouse	Panel OP-1, BCP-001			
Main Warehouse	Panel OP-2, BCP-002	Found loose connection, repaired on site.		
Main Warehouse	Panel PP-4, BCP-003			
Main Warehouse	Panel PP-3, BCP-004			
Main Warehouse	Panel LP-4, BCP-005			
Main Warehouse	Panel PP-2, BCP-006			
Main Warehouse	Panel RP-1, BCP-007			
Main Warehouse	Panel PP-1, BCP-008			
Main Warehouse	Panel LP-1A, BCP-009			
Main Warehouse	Panel LP-5, BCP-010	Fluid or oil on wiring. Checked for leak inside panel.		
Main Warehouse	Panel LP-2, BCP-011			
Main Warehouse	Panel LP-1, BCP-012			
Main Warehouse	Panel ELP-3, BCP-013			
Main Warehouse	Panel ELP-2, BCP-014			
Main Warehouse	Panel IGP, BCP-015			
Main Warehouse	Panel LDP fed by MDP, DP-001	Found loose wire, Breaker RTU 3 & 6. Repaired on site.	Picture 5/5	Minor
Main Warehouse	Exhaust Fan #7B, CMS-001			
Main Warehouse	Supply Fan #7, CMS-002			
Main Warehouse	Exhaust Fan #7A, CMS-003			
Main Warehouse	Exhaust Fan #8, CMS-004			
Main Warehouse	Exhaust Fan #8A, CMS-005			
Main Warehouse	Exhaust Fan #8B, CMS-006			
Main Warehouse	Supply Fan #9, CMS-007			
Main Warehouse	Supply Fan #9A, CMS-008			
Main Warehouse	Supply Fan #9B, CMS-009	C Phase had no consumption		
Main Warehouse	Exhaust Fan #10, CMS-010			
Main Warehouse	Exhaust Fan #10A, CMS-011			
Main Warehouse	Exhaust Fan #10B, CMS-012			
Main Warehouse	Exhaust Fan #11, CMS-014			
Main Warehouse	Exhaust Fan #11A, CMS-015			
Main Warehouse	Exhaust Fan #11B, CMS-013			
Main Warehouse	Panel DP-002			
Main Warehouse	Panel CDP fed by MDP, DP-003			

Survey Begins: Tuesday, May 14, 2019 7:00:00 AM

Location	Electrical Equipment	Notes	Picture	Rating
Main Warehouse	Trans OP-1			
Main Warehouse	Trans RP-1			
Main Warehouse	Trans IGP			
Main Warehouse	Panel BDP fed by MDP, DP-005			
Main Warehouse	Panel DP-006			
Main Warehouse	Panel CPM fed by CDP, BCP-021			
Main Warehouse	MDP, SWG-001			
Main Warehouse	MDP, SWG-002			
Main Warehouse	Panel BR #1, BCP-022			
Main Warehouse	Panel BR #2, BCP-023			
Main Warehouse	Exhaust Fan #14B, CMS-022			
Main Warehouse	Supply Fan #14, CMS-023	Loose Fuse Holder Connection	Picture 3/3	Minor
Main Warehouse	Exhaust Fan #14A, CMS-024			
Main Warehouse	Exhaust Fan #15B, CMS-025 Disconnect 480V, 3Ph			
Main Warehouse	Supply Fan #15, CMS-026			
Main Warehouse	Exhaust Fan #15A, CMS-027			
Main Warehouse	Big Ass Fan (Door 54/53)			
Main Warehouse	Panel BR #3, BCP-024	Breaker is compromised	Picture 7/3-3	Minor
Main Warehouse	Exhaust Fan #6B, CMS-028			
Main Warehouse	Supply Fan #6, CMS-029	B Phase has stripped screw	Picture 13/4-3	Minor
Main Warehouse	Supply Fan #6A, CMS-030			
Main Warehouse	Exhaust Fan #5B, CMS-031			
Main Warehouse	Supply Fan #5, CMS-032	Loose Fuse Holder Connection	Picture 11/6-3	Minor
Main Warehouse	Exhaust Fan #5A, CMS-033			
Main Warehouse	Exhaust Fan #4B, CMS-034			
Main Warehouse	Supply Fan #4, CMS-035			
Main Warehouse	Exhaust Fan #4A, CMS-036			
Main Warehouse	Exhaust Fan #3B, CMS-037			
Main Warehouse	Supply Fan #3, CMS-038	Loose Fuse Holder Connection	Picture 15/7-3	Minor
Main Warehouse	Exhaust Fan #3A, CMS-039			
Main Warehouse	Exhaust Fan #2B, CMS-040			
Main Warehouse	Supply Fan #2, CMS-041	Loose Fuse Holder Connection	Picture 17/8-3	Minor
Main Warehouse	Exhaust Fan #2, CMS-042			
Main Warehouse	Lighting Contact (Exterior Lighting)			
	Square D Class 8910 Type DPA23 #1			
	Square D Class 8910 Type DPA23 #2			
	Square D Class 8910 Type DPA23 #3			
	Square D Class 8910 Type DPA23 #4			
	Square D Class 8910 Type DPA23 #5			
	Square D Class 8910 Type DPA24 #1			
	Allen Bradley 100-A30N*3 #1			
	Allen Bradley 100-A30N*3 #2			
Pump House	Panel B, Siemens 125A, BCP-032, Ckt. 1	Loose Connection	Picture 25	Minor
Pump House	Panel B, Siemens 125A, BCP-032, Ckt. 10	Loose Connection	Picture 27	Minor
Pump House	Panel A, Siemens 125A, BCP-031			
Pump House	Square D Transformer, 30kVA, TRD-007			

Warehouse Main Floor: Supply Fan 2

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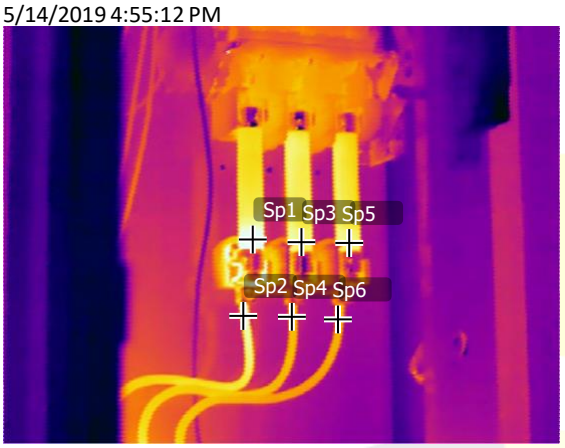

FLIR0017.jpg FLIR E75 78507272

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Measurements

Sp1	83.8 °F
Sp2	81.9 °F
Sp3	79.5 °F
Sp4	76.0 °F
Sp5	79.9 °F
Sp6	75.4 °F

Parameters

Emissivity	0.95
Refl. temp.	66 °F
Distance	3.3 ft
Atmospheric temp.	67.1 °F
Ext. optics temp.	68 °F
Ext. optics trans.	1
Relative humidity	48 %

Note

Supply Fan 2

Furnas 480V, 3Ph Fusible
HD Disconnect
Part No: D46120-001

Description:
Phase A has a loose fuse holder connection.

Recommendation:
Replace fuse holder.

Text annotations

VOLTS A-B	494.4V
VOLTS A-C	496.3V
VOLTS B-C	499.2V
AMPS A	8.8A
AMPS B	9.8A
AMPS C	9.9A
MV A	134.2MV
MV B	87.7MV
MV C	87.1MV

Rating: Minor
Temperature Difference: 8.4

Rating	Temp. Rise In Fahrenheit	Recommendations:
Minor	1-18	Routine repair during regular maintenance, little chance of physical damage.
Alert	19-36	Repair within 30 days check load and inspect for physical damage.
Serious	37-54	Repair or replace ASAP and inspect surrounding components for physical damage.
Critical	55+	Immediate Repair or Replace. Danger Exists!

Warehouse Main Floor: Supply Fan 6

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°F
81.9
65.5

FLIR0013.jpg FLIR E75 78507272

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Measurements

Sp1	75.9 °F
Sp2	77.4 °F
Sp3	82.2 °F
Sp4	82.2 °F
Sp5	77.6 °F
Sp6	80.3 °F

Parameters

Emissivity	0.95
Refl. temp.	66 °F
Distance	3.3 ft
Atmospheric temp.	67.1 °F
Ext. optics temp.	68 °F
Ext. optics trans.	1
Relative humidity	48 %

Note

Supply Fan 6

Furnas 480V, 3Ph Fusible
HD Disconnect Part No:
D46120-001

Description:
Phases B & C have loose fuse holder connections.

Recommendation:
Replace fuse holders.

Text annotations

VOLTS A-B	476.5V
VOLTS A-C	499.3V
VOLTS B-C	502.4V
AMPS A	9.2A
AMPS B	10A
AMPS C	10.3A
MV A	55.1MV
MV B	66.9MV
MV C	64.4MV

Rating: Minor
Temperature Difference: 6.3

Rating	Temp. Rise In Fahrenheit	Recommendations:
Minor	1-18	Routine repair during regular maintenance, little chance of physical damage.
Alert	19-36	Repair within 30 days check load and inspect for physical damage.
Serious	37-54	Repair or replace ASAP and inspect surrounding components for physical damage.
Critical	55+	Immediate Repair or Replace. Danger Exists!

Warehouse Main Floor: Supply Fan 3

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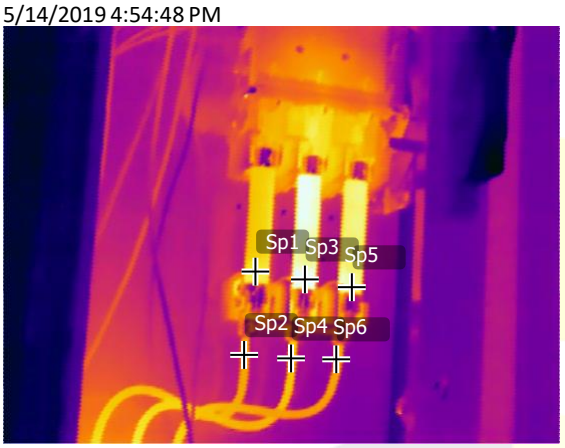

°F
82.4
66.1

FLIR0015.jpg FLIR E75 78507272

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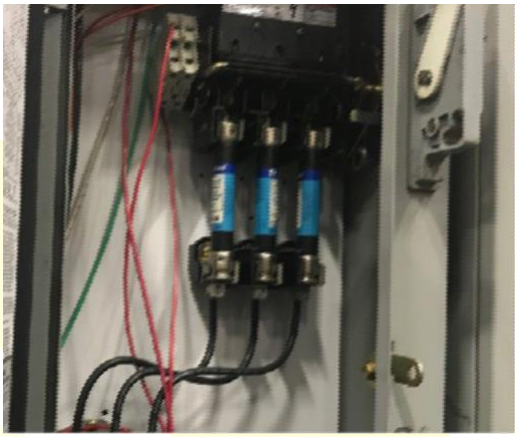

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Measurements

Sp1	78.7 °F
Sp2	74.7 °F
Sp3	82.6 °F
Sp4	76.7 °F
Sp5	80.7 °F
Sp6	74.7 °F

Parameters

Emissivity	0.95
Refl. temp.	66 °F
Distance	3.5 ft
Atmospheric temp.	66 °F
Ext. optics temp.	68 °F
Ext. optics trans.	1
Relative humidity	48 %

Note

Supply Fan 3

Furnas 480V, 3Ph Fusible
HD Disconnect
Part No: D46120-001

Description:
Phases B & A have loose fuse holder connections.

Recommendation:
Replace Fuse holders.

Text annotations

VOLTS A-B	494.2V
VOLTS A-C	496.3V
VOLTS B-C	499.4V
AMPS A	9.3A
AMPS B	10.6A
AMPS C	10.6A
MV A	126.7MV
MV B	197.2MV
MV C	62.1MV

Rating: Minor
Temperature Difference: 7.9

Rating	Temp. Rise In Fahrenheit	Recommendations:
Minor	1-18	Routine repair during regular maintenance, little chance of physical damage.
Alert	19-36	Repair within 30 days check load and inspect for physical damage.
Serious	37-54	Repair or replace ASAP and inspect surrounding components for physical damage.
Critical	55+	Immediate Repair or Replace. Danger Exists!

Warehouse Main Floor: Panel BR# 3 (BCP-024)

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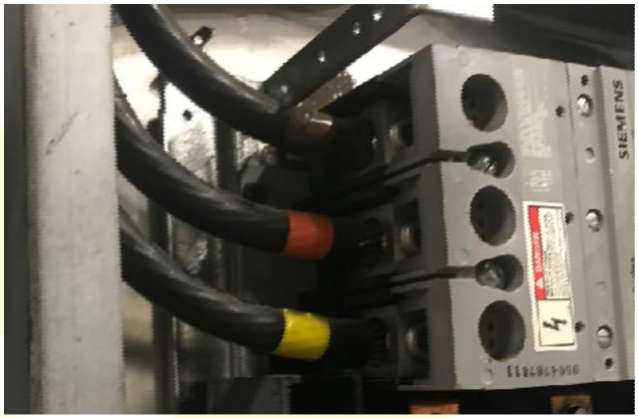

file3 (003).jpeg

Measurements

Sp1	69.8 °F
Sp2	70.9 °F
Sp3	72.6 °F

Parameters

Emissivity	0.95
Refl. temp.	66 °F
Distance	1.9 ft
Atmospheric temp.	68 °F
Ext. optics temp.	67.3 °F
Ext. optics trans.	1
Relative humidity	48 %

Note

Siemens Main Breaker 225A

Description:
Main Breaker is internally compromised.

Recommendation:
Replace Breaker.

Text annotations

VOLTS A-B	496.6V
VOLTS A-C	500V
VOLTS B-C	502.5V
VOLTS A-G	286.2V
VOLTS B-G	288.5V
VOLTS C-G	290.2V
AMPS A	31A
AMPS B	33.8A
AMPS C	35.9A
MV A	41.6MV
MV B	52.1MV
MV C	98.6MV

Rating: Minor
Temperature Difference: 2.8

Rating	Temp. Rise In Fahrenheit	Recommendations:
Minor	1-18	Routine repair during regular maintenance, little chance of physical damage.
Alert	19-36	Repair within 30 days check load and inspect for physical damage.
Serious	37-54	Repair or replace ASAP and inspect surrounding components for physical damage.
Critical	55+	Immediate Repair or Replace. Danger Exists!

Warehouse Main Floor: Panel LDP (DP-001)

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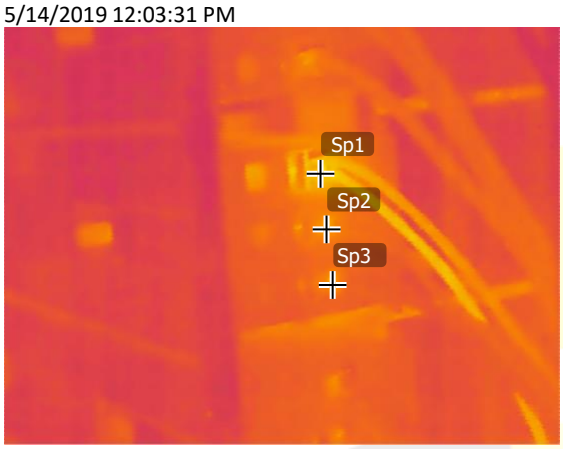

°F
72.6
65.3

FLIR0005.jpg FLIR E75 78507272

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FLIR0005.jpg FLIR E75 78507272

Measurements

Sp1	71.3 °F
Sp2	70.4 °F
Sp3	70.1 °F
RH 1	44.9 %
Air 1	68.7 °F

Parameters

Emissivity	0.95
Refl. temp.	58.3 °F
Distance	3 ft
Atmospheric temp.	67.1 °F
Ext. optics temp.	68 °F
Ext. optics trans.	1
Relative humidity	48 %

Note

Breaker RTU 3/6

Description:
Wire termination was loose inside the breaker. No load at the time of inspection. Couldn't log any measurements.

Recommendation:
Push wire in and tightened down lug on breaker.

Repaired on site at time of inspection
By: John Walton, Electrical Technician

Rating: Minor
Temperature Difference: 0.9

Rating	Temp. Rise In Fahrenheit	Recommendations:
Minor	1-18	Routine repair during regular maintenance, little chance of physical damage.
Alert	19-36	Repair within 30 days check load and inspect for physical damage.
Serious	37-54	Repair or replace ASAP and inspect surrounding components for physical damage.
Critical	55+	Immediate Repair or Replace. Danger Exists!

Warehouse Main Floor: Supply Fan 14

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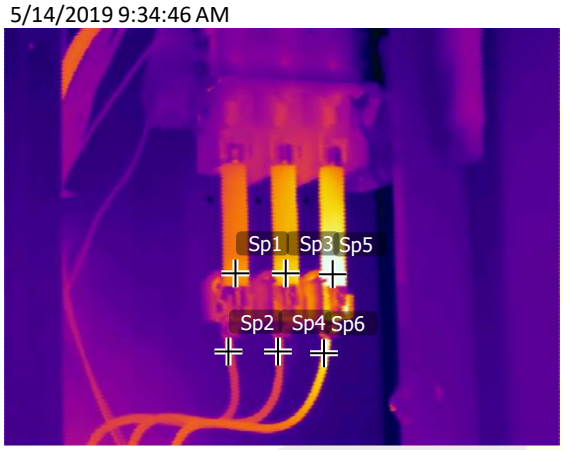
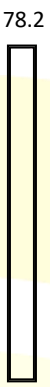


°F
78.2



62.2

FLIR0003.jpg FLIR E75 78507272

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file (003).jpeg

Measurements

Sp1	72.8 °F
Sp2	69.5 °F
Sp3	75.1 °F
Sp4	70.4 °F
Sp5	81.9 °F
Sp6	76.9 °F
RH 1	57.3 %
Air 1	62.4 °F

Parameters

Emissivity	0.95
Refl. temp.	58.2 °F
Distance	3.3 ft
Atmospheric temp.	64 °F
Ext. optics temp.	68 °F
Ext. optics trans.	1
Relative humidity	55 %

Note

Supply Fan 14

Description:
Phase C has a loose Fuse Holder connection.

Recommendation:
Replace fuse holder.

Text annotations

VOLTS A-B	489.1V
VOLTS A-C	491.3V
VOLTS B-C	494V
VOLTS A-G	281.5V
VOLTS B-G	284V
VOLTS C-G	285.4V
AMPS A	8.6A
AMPS B	9.4A
AMPS C	9.7A
MV A	53.4MV
MV B	58.3MV
MV C	106.7MV

Furnas 480V, 3Ph
Fusible HD Disconnect
Part No: D46120-001

Rating: Minor
Temperature Difference: 6.8

Rating	Temp. Rise In Fahrenheit	Recommendations:
Minor	1-18	Routine repair during regular maintenance, little chance of physical damage.
Alert	19-36	Repair within 30 days check load and inspect for physical damage.
Serious	37-54	Repair or replace ASAP and inspect surrounding components for physical damage.
Critical	55+	Immediate Repair or Replace. Danger Exists!

Warehouse Main Floor: Supply Fan 5

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FLIR0011.jpg FLIR E75 78507272

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file6 (003).jpeg

Measurements

Sp1	80.4 °F
Sp2	76.9 °F
Sp3	91.0 °F
Sp4	83.9 °F
Sp5	86.2 °F
Sp6	79.1 °F

Parameters

Emissivity	0.95
Refl. temp.	58.3 °F
Distance	2.4 ft
Atmospheric temp.	67.2 °F
Ext. optics temp.	67.3 °F
Ext. optics trans.	1
Relative humidity	48 %

Note

Supply Fan 5

Furnas 480V, 3Ph Fusible
HD Disconnect Part No:
D46120-001

Description:
Phase B has a loose fuse holder connection.

Recommendation:
Replace fuse holder.

Text annotations

VOLTS A-B	496.2V
VOLTS A-C	500.3V
VOLTS B-C	502.5V
AMPS A	9.5A
AMPS B	10.2A
AMPS C	10.7A
MV A	78.2MV
MV B	124.2MV
MV C	107.6MV

Rating: Minor
Temperature Difference: 14.1

Rating	Temp. Rise In Fahrenheit	Recommendations:
Minor	1-18	Routine repair during regular maintenance, little chance of physical damage.
Alert	19-36	Repair within 30 days check load and inspect for physical damage.
Serious	37-54	Repair or replace ASAP and inspect surrounding components for physical damage.
Critical	55+	Immediate Repair or Replace. Danger Exists!

Warehouse Main Floor: Panel B

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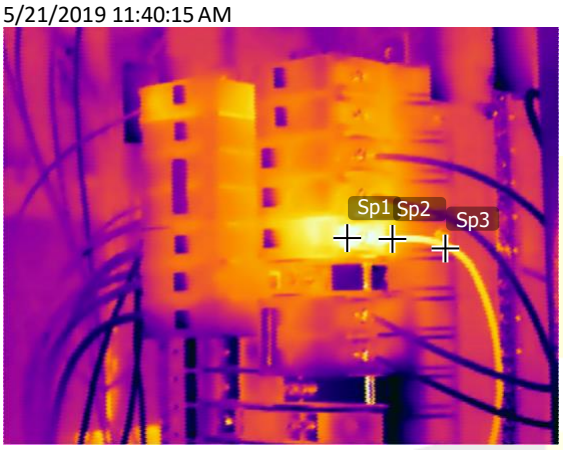

FLIR0025.jpg FLIR E75 78507272

°F
79.7
70.4

5/21/2019 11:40:15

FLIR0025.jpg FLIR E75 78507272

Measurements

Sp1	81.5 °F
Sp2	79.8 °F
Sp3	77.6 °F
RH 1	35.3 %
Air 1	70.2 °F

Parameters

Emissivity	0.95
Refl. temp.	67 °F
Distance	2.8 ft
Atmospheric temp.	72.6 °F
Ext. optics temp.	68 °F
Ext. optics trans.	1
Relative humidity	25.3 %

Description:
Found Termination issue with Circuit Breaker #10.

Recommendation:
Repair loose connection on site.

Repaired on site at time of inspection
By: Miguel Guerrero, Electrical Technician

Rating: Minor
Temperature Difference: 3.9

Rating	Temp. Rise In Fahrenheit	Recommendations:
Minor	1-18	Routine repair during regular maintenance, little chance of physical damage.
Alert	19-36	Repair within 30 days check load and inspect for physical damage.
Serious	37-54	Repair or replace ASAP and inspect surrounding components for physical damage.
Critical	55+	Immediate Repair or Replace. Danger Exists!

Warehouse Main Floor: Panel B

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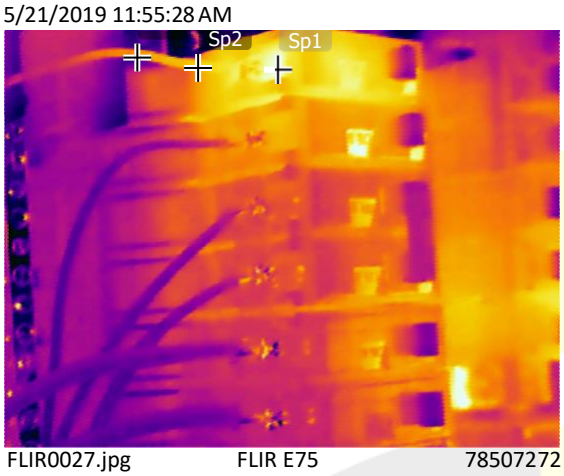

FLIR0027.jpg FLIR E75 78507272

°F
79.2
70.6

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FLIR0027.jpg FLIR E75 78507272

Measurements

Sp1	79.0 °F
Sp2	76.4 °F
Sp3	75.2 °F
RH 1	33.2 %
Air 1	72.3 °F

Parameters

Emissivity	0.95
Refl. temp.	66 °F
Distance	3.3 ft
Atmospheric temp.	72.6 °F
Ext. optics temp.	68 °F
Ext. optics trans.	1
Relative humidity	25.3 %

Description:
Found Termination issue with Circuit Breaker #1.

Recommendation:
Repair loose connection on site.

Repaired on site at time of inspection
By: Miguel Guerrero, Electrical Technician

Rating: Minor
Temperature Difference: 3.8

Rating	Temp. Rise In Fahrenheit	Recommendations:
Minor	1-18	Routine repair during regular maintenance, little chance of physical damage.
Alert	19-36	Repair within 30 days check load and inspect for physical damage.
Serious	37-54	Repair or replace ASAP and inspect surrounding components for physical damage.
Critical	55+	Immediate Repair or Replace. Danger Exists!

END OF REPORT