



A Qualitative Infrared Thermographic Survey of Electrical System Components



The Widget Building - Widgetville Michigan

**Mr. William Widget IX
Pinnacle Widgets Inc
1234 Widget Lane
Widgetville, MI 99943**

**Armco Infrared LLC - Thermal Imaging Services
Authorized ElectricIR™ Contractor
888-908-3547 info@ARMCOinfrared.com**



Mr. William Widget IX
Pinnacle Widgets Inc
1234 Widget Lane
Widgetville, MI 99943

3-11-2009

Dear William Widget IX:

The electrical switchgear of The Widget Building at 4321 Widget Boulevard in Widgetville Michigan, was the subject of an infrared (IR) survey on 3-11-2009. Equipment designated by the client for this survey is listed in this report.

Your Armco Infrared LLC - *ElectricIR™* 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

Armco Infrared, an Authorized *ElectricIR™* Contractor, was retained for an electrical thermographic survey of the building 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. This report is based on information obtained at the site at the given date and time. 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. The report is based on the information available to us at this 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 method of rating 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.

Rating	Temperature Rise F°	Recommendation
Minor	1-15 °F	Routine, Repair during regular maintenance, little chance of physical damage.
Alert	16-50 °F	Repair within 30 days, watch load and inspect for physical damage.
Serious	51-100 °F	Repair/Replace ASAP. Inspect surrounding components for physical damage.
Critical	100+ °F	Immediate repair/replace. Danger exists!

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,

Robert E McCoy Jr, PE

N.C. Registered Professional Electrical Engineer #020697
Certified Level III Thermographer #7672
BPI Certified Building Analyst #5009435
Armco Infrared LLC - Authorized *ElectricIR™* Contractor
216 E Chatham Street Unit 109, Cary NC 27215

GLOBAL REPORT INFORMATION

Client:	Pinnacle Widgets Inc
Building Name:	The Widget Building
Building Location:	4321 Widget Boulevard
Facility Qualified Assistant	Good Buddy
Survey Date:	3-11-2009
Ambient Temperature:	35
Imager used:	Flir T620
Notes:	

REPORT FINDINGS -- TOTALS and SUMMARY

(NR) Not Rated =	6
(M) Minor =	1
(A) Alert =	1
(S) Serious =	2
(C) Critical =	1
TOTAL =	11

Understanding Infrared Imagery

Infrared imagery is often a grayscale picture or thermograph whose scales (or shades of gray) represent the differences in emitted energy from the surface often referred to as temperature. As a general rule, patterns in the image that are lighter in shade are warmer and darker patterns cooler. Unlike visible imagery that capture visible light in the 0.4-0.7 micrometer wavelengths, objects observed using infrared imagery capture infrared wavelengths in the 3-5 or 8-14 micrometer range. Visible lights that produce heat and other relatively hot objects are very evident, but as a result of their heat or infrared emission and not due to the visible light emissions.

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. Imager 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 saved to a CD-ROM for the clients use.

We scan the building with sensitive infrared cameras to detect the patterns and record them for later analysis. Once a pattern is detected the infrared images can be saved for documentation in the report. *For more information, please visit us at... www.ARMCOinfrared.com and www.electricir.com.*

SECTION A: DATA LOG

EQUIPMENT DATA LOG & INSPECTION STATUS											
CLIENT NAME: Pinnacle Widgets Inc.											
FACILITY NAME: The Widget Building											
1234 Widget Production Lane											
Widget, MI 66666											
ABBREVIATION LEGEND								FAULT RATING LEGEND			
OV = Overview	NO = Not Operating	CS = Combination Starter	DISC = Disconnect	OK							
FV = Front View	NS = Not Surveyed	MCC = Motor Control Center	FDISC = Fused Disconnect	1 = Minor - Routine Repair							
RV = Rear View	LO = Locked Out	MCR = Master Conrol Relay	CBPNL = Circuit Bkr Pnl	2 = Alert - Repair 30 Days							
SV = Side View	CNR = Cover Not Remo	MTS = Master Transfer Switch	EXT = Exterior	3 = Serious - Repair ASAP							
UPS = Upstairs	QA = Qualified Assista	ATS = Automatic Tfr Switch	US = Ultrasound Inspection	4 = Critical-Danger Immed Repair							
DNS = Downstairs	OH = Overheated	XFMR = Transformer	US = Ultrasound Inspection	5 = Get the Hell out NOW							
			CTL+SHFT+;								
Location 1	Location 2	Equipment Name	Time of Day	Stated Load	Survey Type	Temp Rise	Fault Rating	Fault No.	Load Phase A	Load Phase B	Load Phase C
Plant 4	Shipping Dept	P4-D CBPNL	12:47 PM	Full	IR	67	3	1			
Plant 4	Main	P4-A XFMR		<40%	IR		OK				
Plant 4	Main	P4-B FDISC		>40%	IR		OK				
Plant 4	Boiler #5	P4 FDISC Feedwater Pump		Full	IR	62	3	2			
Plant 5 Computer Room	Main	P5-C1 FDISC	12:48 PM	Full	IR	14	1	3			
Plant 5 EXT	Substation	P5-A XFMR		<40%	IR		OK				
Plant 6 Production	Main	P6-D DIST PNL		<40%	IR		OK				
Plant 6 Production	Main	P6-C DIST PNL		Full	IR&US		OK				
Plant 6 Production	Main	P6-B DIST PNL		<40%	US		OK				
Chip Core Bldg	Main	P49A FDISC		Full	IR	48	2	4			
Chip Core Bldg	Truck Loading	P49D CBPNL	12:48 PM	>40%	IR	123	4	5			

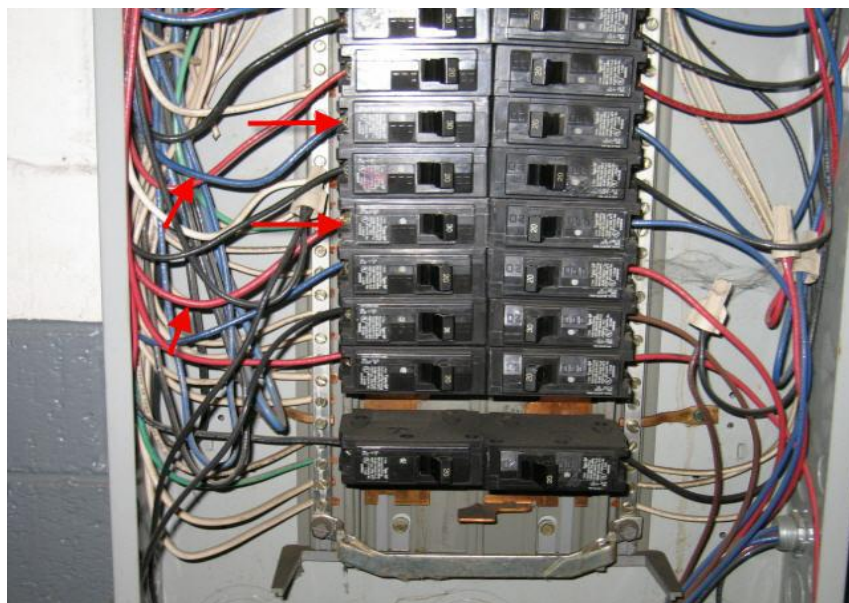
SECTION B: REPAIR GUIDE

REPORT #:	AREA1:	AREA2:	EQPT NAME	Temperature Rise:	Fault Rating	Survey Notes and Comments
1	Plant 4	Shipping Dept	P4-D Lighting Panel	67	Serious	Rebalance loads in panel – investigate possible breaker damage
2	Plant 4	Boiler #5	P4 FDISC Feedwater Pump	62	Serious	Feedwater pump is high priority
3	Plant 5 Computer Room	Main	P5-C1 FDISC	14	Minor	Power feed to half of IT department - higher priority than indicated
4	Chip Core Bldg	Main	P49A FDISC	48	Alert	Incorrect fuse installed - Fuse corrected now - overload investigated at next pm
5	Chip Core Bldg	Truck Loading	P49D FDISC	123	Critical	Possible fire hazard - investigate and repair today

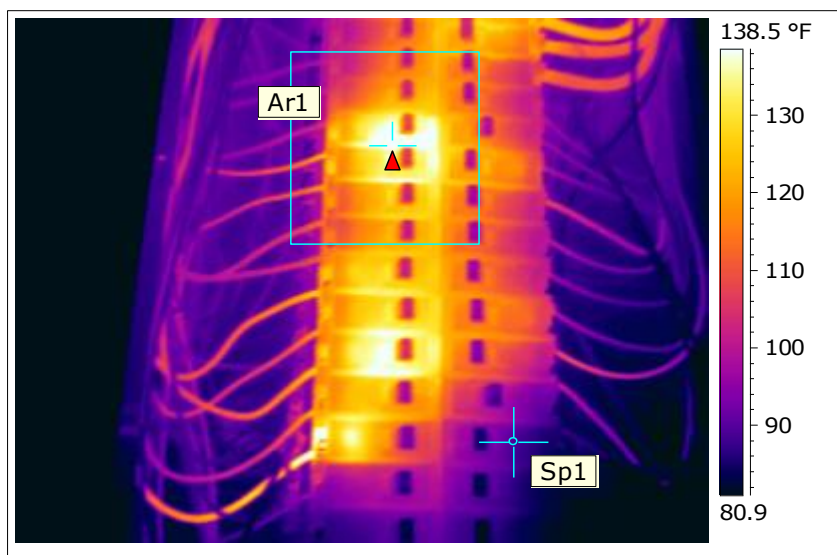
SECTION C: THERMOGRAPHIC REPORTS

THERMOGRAPHIC REPORT

REPORT #: 1	
CLIENT	Pinnacle Widgets Inc
BUILDING	The Widget Building
AREA 1	Plant 4
AREA 2	Shipping Dept
EQPT NAME	P4-D Lighting Panel
Image Date	3/11/2009
Image Time	5:05:38 PM
Image File Name	IR_1.jpg



Reference Temperature	
Sp1.Temperature	100.3 °F
Ar1.Max Temperature	167.4 °F
Temperature Rise:	67 °F
Fault Rating Serious	
AMPERAGES:	
Phase A	Amp Phase A: NA
Phase B	Amp Phase B: NA
Phase C	Amp Phase C: NA



DESCRIPTION & RECOMMENDATION *(Please also review chart below):*

Possible Equipment Damage - The thermal image is indicative of potential internal damage or a defective breaker. We recommend satisfactory equipment operation with subsequent repairs or replacements as needed.

Overload conditions may also be issues which are to be investigated.

Rating	Temperature Rise in F°	Recommendation
Minor	1-15 °F	Routine, Repair during regular maintenance, little chance of physical damage.
Alert	16-50 °F	Repair within 30 days, watch load and inspect for physical damage.
Serious	51-100 °F	Repair/Replace ASAP. Inspect surrounding components for physical damage.
Critical	100+ °F	Immediate repair/replace. Danger exists!

QUESTION ABOUT THIS REPORT? Call 1-888-722-6447

REPAIRED BY:

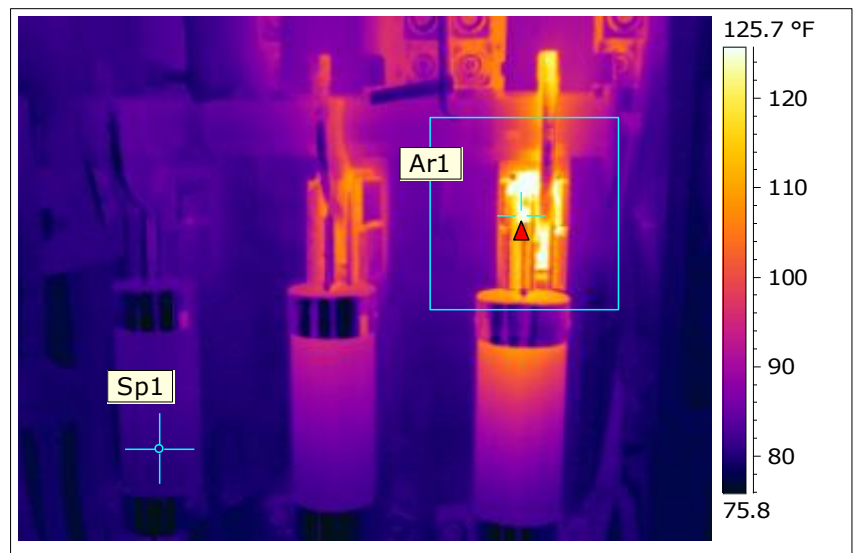
DATE:

THERMOGRAPHIC REPORT

REPORT #: 2	
CLIENT	Pinnacle Widgets Inc
BUILDING	The Widget Building
AREA 1	Plant 4
AREA 2	Boiler #5
EQPT NAME	P4 FDISC Feedwater Pump
Image Date	3/11/2009
Image Time	5:34:29 PM
Image File Name	IR_2.jpg



Reference Temperature	
Sp1.Temperature	90.8 °F
Ar1.Max Temperature	152.4 °F
Temperature Rise:	62 °F
Fault Rating Serious	
AMPERAGES:	
Phase A	Amp Phase A: NA
Phase B	Amp Phase B: NA
Phase C	Amp Phase C: NA



DESCRIPTION & RECOMMENDATION *(Please also review chart below):*

Poor Connections - The thermal image finding is often indicative of a loose or poor connection. We recommend checking connection integrity with repairs as may be necessary.

Rating	Temperature Rise in F°	Recommendation
Minor	1-15 °F	Routine, Repair during regular maintenance, little chance of physical damage.
Alert	16-50 °F	Repair within 30 days, watch load and inspect for physical damage.
Serious	51-100 °F	Repair/Replace ASAP. Inspect surrounding components for physical damage.
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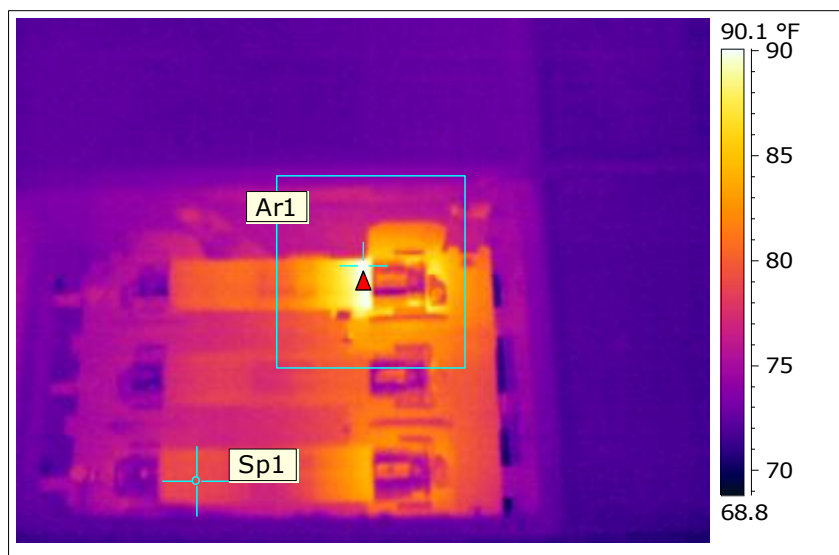
REPAIRED BY:	DATE:
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THERMOGRAPHIC REPORT

REPORT #: 3	
CLIENT	Pinnacle Widgets Inc
BUILDING	The Widget Building
AREA 1	Plant 5 Computer Room
AREA 2	Main
EQPT NAME	P5-C1 FDISC
Image Date	3/11/2009
Image Time	3:54:32 PM
Image File Name	IR_3.jpg



Reference Temperature	
Sp1.Temperature	88.6 °F
Ar1.Max Temperature	102.5 °F
Temperature Rise:	14 °F
Fault Rating Minor	
AMPERAGES:	
Phase A	Amp Phase A: NA
Phase B	Amp Phase B: NA
Phase C	Amp Phase C: NA



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Rating	Temperature Rise in F°	Recommendation
Minor	1-15 °F	Routine, Repair during regular maintenance, little chance of physical damage.
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REPAIRED BY:

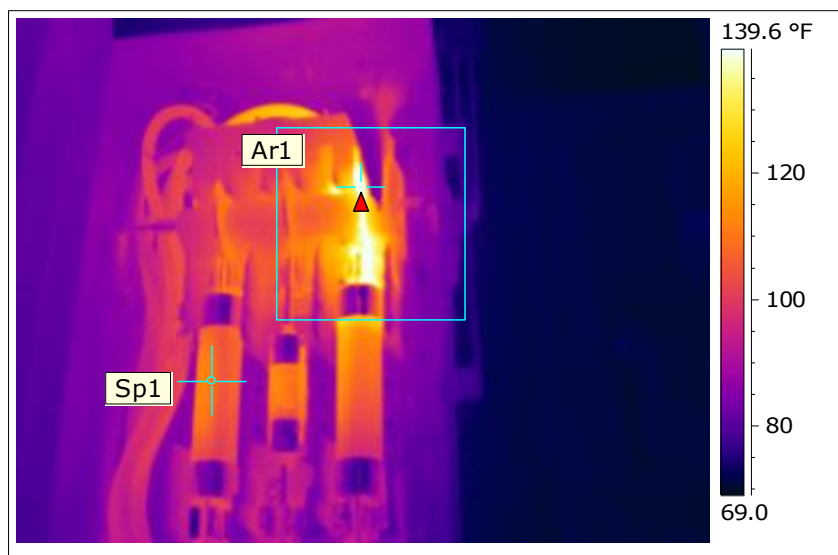
DATE:

THERMOGRAPHIC REPORT

REPORT #: 4	
CLIENT	Pinnacle Widgets Inc
BUILDING	The Widget Building
AREA 1	Chip Core Bldg
AREA 2	Main
EQPT NAME	P49A FDISC
Image Date	3/11/2009
Image Time	5:38:26 PM
Image File Name	IR_4.jpg



Reference Temperature	
Sp1.Temperature	123.5 °F
Ar1.Max Temperature	171.7 °F
Temperature Rise:	48 °F
Fault Rating Alert	
AMPERAGES:	
Phase A	Amp Phase A: NA
Phase B	Amp Phase B: NA
Phase C	Amp Phase C: NA



DESCRIPTION & RECOMMENDATION *(Please also review chart below):*

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Minor	1-15 °F	Routine, Repair during regular maintenance, little chance of physical damage.
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REPAIRED BY:

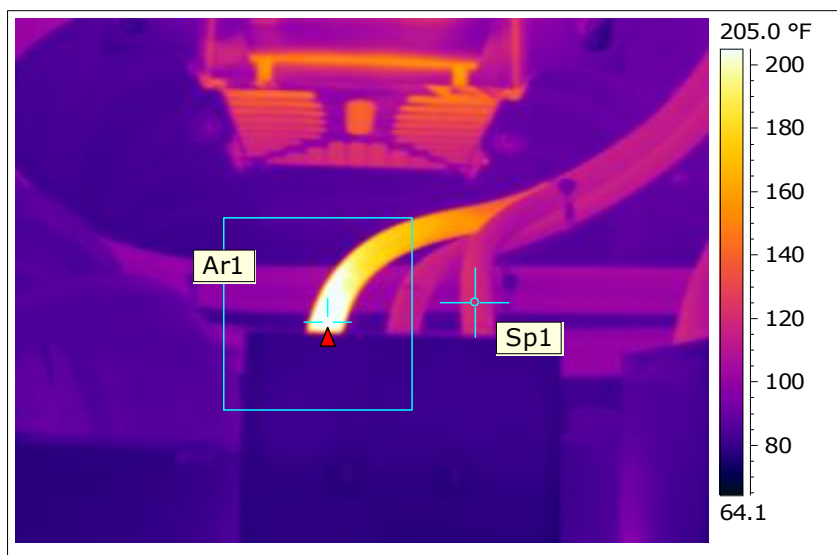
DATE:

THERMOGRAPHIC REPORT

REPORT #: 5	
CLIENT	Pinnacle Widgets Inc
BUILDING	The Widget Building
AREA 1	Chip Core Bldg
AREA 2	Truck Loading
EQPT NAME	P49D FDISC
Image Date	4/14/2011
Image Time	8:22:51 AM
Image File Name	IR_5.jpg



Reference Temperature	
Sp1.Temperature	134.1 °F
Ar1.Max Temperature	257.0 °F
Temperature Rise:	123 °F
Fault Rating Critical	
AMPERAGES:	
Phase A	Amp Phase A: NA
Phase B	Amp Phase B: NA
Phase C	Amp Phase C: NA



DESCRIPTION & RECOMMENDATION *(Please also review chart below):*

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Rating	Temperature Rise in F°	Recommendation
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Critical	100+ °F	Immediate repair/replace. Danger exists!

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REPAIRED BY:

DATE: