

## Infrared Thermography Survey

### The Hartford Steam Boiler Inspection and Insurance Company

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**Client:**

XYC Corporation  
4321 Any Town, New York  
United States

**HSB Representative:**

Bill Viot

**Location:**

ABC Company, Inc.  
1234 Any Street  
Boston, Massachusetts 02576  
United States

**Service Date:**

March 24, 2022

**Additional Date:****Conferred With:**

Danny Wilcox

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March 24, 2022

## Inspection Summary

HSB Thermography Services would like to take this opportunity to thank you for your assistance in completing the recent infrared survey of your facility.

The scope of work at your facility included the following areas:

Switchyard, Transformers, Distribution Panels, Motor Control Centers, VFD's and Breaker Panels.

Equipment not surveyed during this visit includes de-energized, lightly loaded, inaccessible and/or deemed by plant personnel to be non-critical.

As a result of this service the following Findings are presented for your review:

- 1 CRITICAL
- 1 SEVERE
- 2 ALERT
- 3 ADVISORY

Should you have any questions or comments concerning this report or our services, we are here to assist you. Please feel free to call me at 860-281-2541 or by email:

[William\\_Viot@hsb.com](mailto:William_Viot@hsb.com)

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## Overview

### About HSB Thermography Services

Infrared thermographic surveys are non-contact, non-destructive examinations used to find abnormal or unexpected thermal patterns or temperature differentials. These thermal patterns may indicate such conditions as loose connections, overloaded circuits or phases, deteriorated or damaged insulation or refractory, or excessive or unwanted friction, among others.

To perform the thermographic survey of your facility, HSB Thermography Services used the FLIR Thermacam infrared imaging system. This system utilizes the latest developments in un-cooled technology to generate the most accurate data available.

The calibration for this system is certified traceable to The National Institute of Standards and Technology, NIST, USA and the Swedish National Testing and Research Institute, SP. This calibration is based on the International Temperature Scale (ITS-90).

Bill Viot is a Level II Thermographer in accordance with the American Society of Nondestructive Testing (ASNT) SNT-TC-1A and Hartford Steam Boiler Inspection and Insurance Company's Qualification Standards.

### Recommendation Summary

Rec No	Severity	Location Area	Equipment Location	Equipment ID	Est. Repair Cost Before Failure	Est. Repair Cost After Failure
2022-03-001	Critical	Outside Substation	Main Transformer	East Secondary Bushing	\$ 5000.00	\$78000.00
2022-03-002	Severe	Raw Materials	Pellet Feeder	Main Breaker	\$ 100.00	\$4000.00
2022-03-003	Alert	Press Dept.	Pres No.22	Disconnect	\$ 50.00	\$475.00
2022-03-004	Alert	Packing Dept.	Palletizer Control Panel	Fuse No.1673	\$ 25.00	\$40.00

Total Estimated Repair Costs Before Failure	\$5,175.00
Total Estimated Repair Costs After Failure	\$82,515.00
Cost Avoidance	\$77,340.00


*\*Before and After costs- This estimate is based only on direct damage to the equipment and does not include the costs of business interruption, extra expenses, spoilage, etc.*


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## Recommendations

### Critical Recommendations

Rec. No.:	Equipment ID:	Initial/Follow-up:	Recommendation Status:
2022-03-001	East Secondary Bushing	Initial	Open

	Location Area:	Outside Substation
	Equipment Location:	Main Transformer
	Est. Repair Cost Before Failure:	\$5000.00
	Est. Repair Cost After Failure:	\$78000.00
	Estimated % of Production:	100%
	Estimated Down Time:	10-14 Days

	Reference Point	76.4°F
	Box 1 Max Temp	176.0°F
	Box 1 Temp Rise	99.6°F

#### Bushing Connection Fault

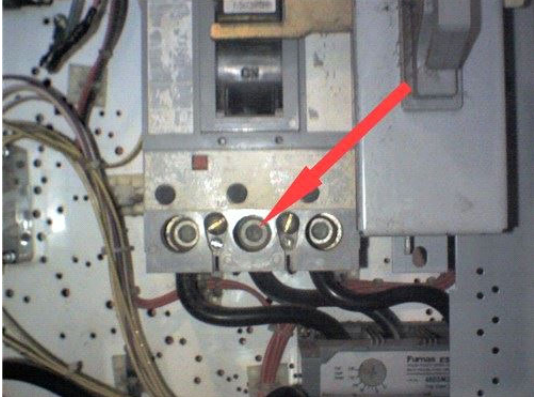
The thermal pattern indicates the transformer has an internal problem conducting heat out to the surface of the bushing. This should be investigated and repaired by a qualified HV electrical contractor.


\*This is rated as "CRITICAL" due to the high replacement cost of the transformer and potential business interruption should a failure occur.

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## Severe Recommendations

Rec. No.:	Equipment ID:	Initial/Follow-up:	Recommendation Status:
2022-03-002	Main Breaker	Initial	Open

	Location Area:	Raw Materials
	Equipment Location:	Pellet Feeder
	Est. Repair Cost Before Failure:	\$100.00
	Est. Repair Cost After Failure:	\$4000.00
	Estimated % of Production:	50%
	Estimated Down Time:	2 Days

	Reference Point	139.9°F
	Box 1 Max Temp	262.5°F
	Box 1 Temp Rise	122.6°F

### Poor Connection

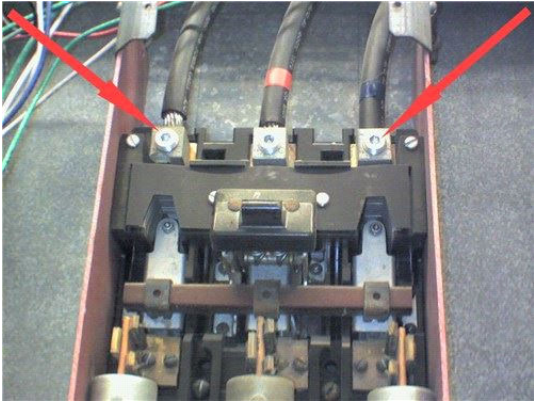
The lug connection should be disassembled, cleaned, inspected for damage and repaired as necessary. Replace any discolored or damaged hardware and cut back the wire to sound conductor. Reassemble and torque the fastener according to the manufacturer's specifications.


\*This is rated as "SEVERE" due to the very high temperature and potential business interruption.

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## Alert Recommendations

Rec. No.:	Equipment ID:	Initial/Follow-up:	Recommendation Status:
2022-03-003	Disconnect	Initial	Open

	Location Area:	Press Dept.
	Equipment Location:	Pres No.22
	Est. Repair Cost Before Failure:	\$50.00
	Est. Repair Cost After Failure:	\$475.00
	Estimated % of Production:	10%
	Estimated Down Time:	1 Days

	Reference Point	91.4°F
	Box 1 Max Temp	132.3°F
	Box 1 Temp Rise	40.9°F
	Box 2 Max Temp	139.1°F
	Box 2 Temp Rise	47.7°F

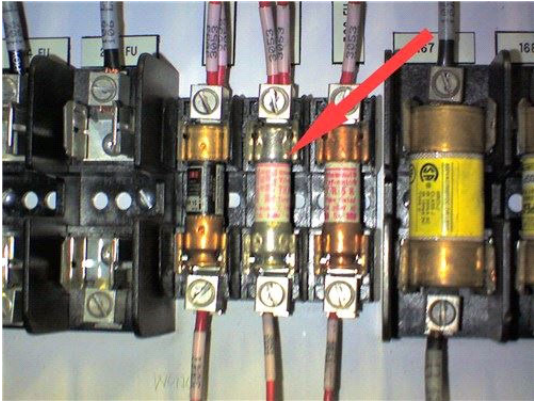
### Poor Connection


The lug connections should be disassembled, cleaned, inspected for damage and repaired as necessary. Reassemble and properly lubricate and torque fasteners according to the manufacturer's specifications, using new hardware as required.



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Rec. No.:	Equipment ID:	Initial/Follow-up:	Recommendation Status:
2022-03-004	Fuse No.1673	Initial	Open

	Location Area:	Packing Dept.
	Equipment Location:	Palletizer Control Panel
	Est. Repair Cost Before Failure:	\$25.00
	Est. Repair Cost After Failure:	\$40.00
	Estimated % of Production:	0%
	Estimated Down Time:	0 Days

	Reference Point	81.1°F
	Box 1 Max Temp	121.0°F
	Box 1 Temp Rise	39.9°F

### Improper Connection

Remove the fuse, inspect and clean the fuse clip and cap. Reinsert the fuse ensuring the fuse clip is making good contact with the fuse cap and providing proper tension. The fuse and fuse clip are not making a proper connection. The fuse should be removed; the surfaces of the fuse and clip inspected and cleaned of any oxidation. Reinsert the fuse ensuring the fuse clip is providing proper spring tension. If the temperature is still elevated, replace the fuse. Also, all three fuses should be the same size, style, and type from the same manufacturer.

This report does not purport to set forth all hazards nor to indicate that other hazards do not exist. By issuing this report, neither the Company nor any of its employees makes any warranty, express or implied, concerning the contents of this report. Furthermore, neither the Company nor any of its employees shall be liable in any manner (other than liability that may be expressed in any policy of insurance that may be issued by the Company) for personal injury or property damage or loss of any kind arising from or connected with this inspection or failure to inspect.

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## Recommendations

### Advisory Recommendations

Rec. No.:	Equipment ID:	Initial/Follow-up:	Recommendation Status:
2022-03-005	All Electrical Equipment	Initial	Open

#### **Infrared Scan: Optimize - Potential Savings Opportunity Condition**

An infrared scan of the complete electrical system has not been conducted within the last three years.

#### **Recommendation**

An infrared survey of the complete electrical system should be performed at the earliest convenience and repeated every three years. The survey should include, but not necessarily be limited to, all electrical connections, cable runs, bus ducts and electrical distribution panels. Survey results and Recommendation should be made available to qualified maintenance department staff or electrical contractor to address corrective actions noted. All electrical and mechanical equipment emits heat in the form of electromagnetic radiation. Abnormal or unexpected thermal patterns can be indicative of problems with the equipment that could lead to a breakdown, failure or cause a fire. Infrared cameras are sensitive to thermal radiation and can detect and measure temperature differences between surfaces. Infrared thermography is a noncontact and nondestructive way to detect problems such as "hot spots" or heat imbalances which may indicate loose or corroded connections or overload conditions that should be corrected in an electrical system.


#### **Optimize - Potential Savings Opportunity**

Heat loss resulting from loose or corroded connections can also mean reduced operating efficiency and corresponding increased energy costs. While a single loose connection may represent only a small, incremental energy loss, numerous loose connections throughout the electrical system could in sum translate to a larger energy savings opportunity that could be executed by qualified personnel. Infrared thermography integrated with the other elements of a well constructed Electrical Preventive Maintenance Program can address both loss and efficiency.



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Rec. No.:	Equipment ID:	Initial/Follow-up:	Recommendation Status:
2022-03-006	MDP-1A	Initial	Open

Missing Side Cover		
	Location Area:	Assembly Dept.
	Equipment Location	By Overhead Door

### Condition


Missing covers were observed at the following components of the facility electrical system: **MDP-1A.**

### Recommendation

Junction boxes, panels, switches and receptacles should be properly covered and sealed. Exposed electrical conductors allow dirt and moisture to reach parts of the system and can lead to premature failures and can also represent a safety hazard.

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Rec. No.:	Equipment ID:	Initial/Follow-up:	Recommendation Status:
2022-03-007	Lighting Panel	Initial	Open

FPE Stab-Lok Panel		
	Location Area:	Warehouse
	Equipment Location	Shipping Office

### Condition

It was noted that this facility may utilize Federal Pacific Electric Company (FPE) Stab-Lok breakers and/or panelboards. Testing by several others concluded that certain Stab-Lok breakers do not trip according to UL requirements and, in some cases, jam in the "on" position. In addition, overheating problems have been found with the panelboard internal bus connections.

### Recommendation

A qualified electrical contractor should inspect the suspected equipment and if identified, the Federal Pacific Electric Stab-Lok panelboards and breakers should be completely replaced with new panelboard and breaker installations. Additional information can be found at HSB.com Knowledge Center Loss Prevention Document # 115

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## **Recommendation Type Definitions**

### **Critical Recommendations**

The noted condition presents a significant risk of personnel injury, property or fire damage, exhibits signs of advanced degradation and imminent failure, and/or may subject the facility to an extended business interruption.

### **Severe Recommendations**

The noted condition presents a risk of personnel injury, contained property damage and fire may be possible, and/or localized equipment damage and business interruption may result.

### **Alert Recommendations**

The noted condition is routine in nature and is easily repairable. Cost is often limited to labor and a few minor parts.

### **Advisory Recommendations**

The following is helpful information based on HSB's experience and engineering judgement.

## **Recommendation Response**

Please click the link below to provide updates or additional information related to recommendations.

<https://hsbuat.losscontrol360.com/jmp/FVSBTRW>