Electrical Inspections

**Absolute Infrared Inspection Services provides inspection services for electrical distribution systems as a preventative maintenance measure.**

An Electrical Distribution Inspection will locate anomalies associated with resistance generating heat creating a potential for electrical failure, loss of production, costly repairs and damage to other equipment in its path.

The Inspection Includes:

A. A Thermal diagnostics Inspection of the Electrical Distribution System Components.

B. High voltage components inspected will be checked for electrical discharge with ultrasound.

C. Any anomalies found will be recorded using reference, ambient and spot temperature readings.

D. A real life photo and a thermal image will be taken of each Anomaly for reference.

E. A report will be assembled with the information recorded.

F. A comments section will be completed for interpretation of anomalies.

Absolute Infrared Inspection Services would request to be accompanied by a Maintenance personnel or Electrician for accessing equipment.

In order to perform a thorough Thermal Diagnosis of equipment whenever possible equipment load should exceed 40%.

Craig Casler, CDT
Level III Thermographer
Level II ASNT
Level I Ultrasound
Absolute InfraRed Inspection Services

“Cost Effective Solutions for Energy Efficiency and Building Maintenance Needs”

Refractory & Furnace Tube Inspections

Absolute Infrared Inspection Services provides inspection services for:
Furnace Refractory & Tubes as a preventative maintenance measure.

An Infrared Furnace Refractory & Furnace Tube Inspection will locate anomalies associated with the breakdown of refractory and common problems associated with furnace tubes reducing the potential for loss of production, costly repairs and damage to other equipment.

The Inspection Includes:

A. A Thermal diagnostics Inspection of the Furnace Shell and Refractory Lined Components.
B. Furnace tubes will be scanned and images taken for reference.
C. Any anomalies found will be recorded using reference, ambient and spot temperature readings.
D. A real life photo and a thermal image will be taken of each Anomaly for reference.
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Craig Casler, CDT
Level III Thermographer
Level II ASNT
Level I Ultrasound
Corona Inspections

**Absolute Infrared Inspection Services** provides Corona inspection services for electrical distribution systems as a preventative maintenance measure.

This insulator was detected during a routine Corona inspection. Once replaced a large crack was visible in the insulator creating the corona shown in the corona image.

Corona is the indication of a voltage problem; when the circuit is energized voltage is present and a corona inspection can be done. Corona inspections can reveal missing hardware, damage, poor installation, defective insulating components, "bird-caged" wires (typically vertical conductors where the aluminum spreads away from the steel center conductor).

When corona occurs it creates **ozone**, **ultraviolet light**, **nitric acid**, electromagnetic emissions and sound. The nitric acid over time removes the plating and causes corrosion of the steel parts of the conductors and insulators.

Indoors electric motors, generators and switchgear can also have corona. The build-up of ionized air in an enclosed space or space with no air movement accelerates corona and flash-over and reduces the voltage at which corona can occur. Motors and generators can have multiple air pressures (air insulating value) present due to rotating fans moving air within an enclosure or in the winding slots.

Craig Casler, CDT  
Level III Thermographer  
Level II ASNT  
Level I Ultrasound
There are actually two cracks in this insulator that could not be seen from the ground even with binoculars.
Absolute Infrared Inspection Services provides inspection services for electrical distribution systems as a preventative maintenance measure.

This corona was detected during a routine electrical inspection of 13,800 Switch Gear. Two fields of energy in close contact creating corona.

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Craig Casler, CDT
Level III Thermographer
Level II ASNT
Level I Ultrasound
Oil Filled Transformer Poor Oil Circulation

Low transformer oil is a common problem but not widely recognized.

Generally oil filled transformers circulate oil by means of convection through the cooling fins; as the temperature of the oil rises from current draw on the transformer the heat rises to the top of the transformer and expands or flows into the top fill tube of the transformer, as the oil cools in the fins it settles to the bottom of the fins and back into the transformer case and again once in contact with the heat from the coil it rises to the top again circulating the oil as it was designed to. A few transformers are designed so the oil level drops at some point below circulation levels.

A common practice for transformer maintenance is to have oil testing done periodically to determine a variety of potential problems which generally requires a small sample of oil to be removed from the transformer to be tested. Over years of sampling the oil level will naturally drop. It can and will affect the operating condition of the transformer. The transformers generally have a temperature gauge and an oil level gauge. The oil level gauges appear to be a broad measurement of the oil level in the tank of low, Medium, High. The loss of oil needed to lose circulation in the cooling fins is minimal maybe only a couple of inches. Environmental changes in temperature alone are enough in some cases to cause poor oil circulation in the cooling fins of outside transformers such as a 30 Deg F day verses an 80 Degree day. This is generally because the oil level is too close to the level of the top fill tube of the cooling fins. If the oil level was fully over the top of the fill tube of the cooling fins simple expansion and contraction of oil from load or environmental temperature changes would not likely affect the circulation.

Some of the newer style transformers have a continuous vertical fin that is not affected as much by such minor changes in oil level. Never the less we still have a lot of the cooling fin tube style transformers in the field and need to insure they are performing well.

Absolute Infrared Inspection Services has found in some cases as many as 13 of 22 transformers that have poor circulation problems in transformer cooling fins.

One test that had been performed on 2008 to verify this was to attach a clear flexible tube to the bottom of the transformer drain valve and an upper oil port which acted as an oil level indicator. These transformers tested had previous problems with low oil circulation in the cooling fins. The oil level tubing indicator did reveal in all of the transformers tested that the oil level was low enough to affect oil circulation in the cooling fins.

Studies by others have shown that increased coil temperatures from poor oil circulation can drastically shorten the life of a transformer.

The infrared images on the next pages are some examples of poor oil circulation in cooling fins. I wanted to put this information out now that more testing has been done and verified this to be the case in a large number of transformers. Blockage in the cooling fins is also a concern as a cause of poor oil circulation and has been verified in some cases as well.

Looking at the infrared images I would dare to say you can see the oil level which the clear tube level test has verified.

I hope you have found this information useful and I will continue to pass on information gathered in the field from time to time.

Craig Casler, CDT
Level III Thermographer
Level II ASNT
Level I Ultrasound
Customer: XXXXXXXXXXXXXX
Date: 7/31/2008
Location: Elm Street Sub
Equipment: Sub Station Pole HDS101
Component: South Cable Support
Voltage: 34,500
Amp / Load: N/A
I.D. #

Point 1 Temperature: N/A  Db Point 1: 24
Point 2 Temperature: Db Point 2
Reference Temperature: N/A  Db Point 3
Delta Temperature: N/A  Photons: 1722
Delta Temperature: Ambient Temperature: 74

Comments: Corona was detected here. Corrective action needs taken cleaning or replacement of damage components.

See corresponding corona video.

Corona indicates a breakdown in insulation. Looking for visible damage such as cracked insulators, white powder from corona or arcing to locate the potential for this corona.

See the next page for the damage parts found during repairs.

<table>
<thead>
<tr>
<th>Repair Date</th>
<th>Description</th>
<th>Signature</th>
</tr>
</thead>
</table>

Thermal Diagnostics Report
By: Craig Casler
Level III Thermographer
Level II ASNT
String insulator from the previous inspection page with several cracks in the insulator.

The cracks in the insulator enable the electrical field of energy create corona with a phase to ground potential on this pole.
Steam Trap Inspections

Absolute Infrared Inspection Services provides inspection services for steam distribution systems as a preventative maintenance measure.

Steam gas which forms when water is heated above 212°F (100°C). In a pressurized system, steam is capable of storing and transporting large quantities of energy. Once steam has formed, more energy can be introduced by further heating. Once steam leaves the boiler, it begins to lose energy and cool. In order to maintain optimum steam system performance, steam traps are used to remove condensate from the system.

Like all mechanical devices, steam traps eventually fail. Failure in an open position allows costly steam losses to add up quickly. Failure in a closed position not only reduces steam system efficiency but also allows acidic condensate to attack steam system components. Visually, failed steam traps usually exhibit no unusual symptoms.

Using both ultrasound and thermography to inspect steam traps, a more complete assessment can be done ensuring optimal efficiency.

Craig Casler, CDT
Level III Thermographer
Level II ASNT
Level I Ultrasound
Mechanical Inspections

**Absolute Infrared Inspection Services provides inspection services for mechanical systems as a preventative maintenance measure.**

Mechanical drive assemblies are important to many manufacturing facilities for various tasks performed at a given time and can be vital to operations of an organization or production of manufactured products or process.

Infrared & ultrasound are valuable tools used in the early detection of potential problems or failing components including motors, gear boxes and drive assemblies of many types.

The inspections are designed to locate existing or potential problems, gather historical data of a component or process and utilize that information as a preventative maintenance measure reducing premature failure, reduce down time and costly repairs of equipment.

Craig Casler, CDT
Level III Thermographer
Level II ASNT
Level I Ultrasound
**Compressed Air Leak Inspections**

Absolute Infrared Inspection Services provides inspection services for locating compressed Air Leaks.

<table>
<thead>
<tr>
<th>Demand can affect efficiency</th>
<th>Leaking system</th>
<th>Tight system</th>
<th>Tight plus controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process demand*</td>
<td>1,500 cfm</td>
<td>1,200 cfm</td>
<td></td>
</tr>
<tr>
<td>Demand reduction</td>
<td></td>
<td>300 cfm (20%)</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>259 kW</td>
<td>243.5 kW</td>
<td>206.9 kW</td>
</tr>
<tr>
<td>Dynamic efficiency</td>
<td>5.8 cfm/kW</td>
<td>4.9 cfm/kW</td>
<td>5.8 cfm/kW</td>
</tr>
<tr>
<td>Annual energy cost*</td>
<td>$108,780</td>
<td>$102,270</td>
<td>$86,898</td>
</tr>
<tr>
<td>Net savings</td>
<td></td>
<td>$6,510 (6%)</td>
<td>$21,882 (20%)</td>
</tr>
</tbody>
</table>

*Example system at 90 psi and $0.05/kWh

Craig Casler, CDT  
Level III Thermographer  
Level II ASNT  
Level I Ultrasound
Low Slope Roof Inspections

Absolute Infrared Inspection Services provides inspection services for low slope roofs to slow down the deterioration process and damage caused by leaks and wet insulation.

The inspections are generally done at night in the warmer months.

The infrared camera detects wet insulation based on solar gain during the day.

The wet insulation is outlined with paint on the roofs surface making it easier to locate the cause of the leak.

Moisture probes and or core cuts are take to verify readings and patched with sound roofing practices.

A report is assembled with images and pictures of some of the wet areas and the location of all wet areas on a drawing including general conditions and recommendations.

Craig Casler, CDT
Level III Thermographer
Level II ASNT
Level I Ultrasound
Low Slope Roof Life Cycle Costing

Fully Adhered EPDM Roof System

50,000 Sq Ft Roof

$6.00 per square foot for replacement

$300,000 for your new roof

Estimated Life of your new roof 8 – 12 years if you do nothing but fix it when it leaks

At 10 years your roof has cost you $30,000 per year plus repairs

Estimated Life of your new roof 20 years with routine inspection and repairs starting the first year

At 20 years your roof has cost you $15,000 per year plus inspections and repairs.

Most if not all manufacturers roof warranties require annual inspections and repairs with a log of work done to maintain your warranty.

Prevent - interior damage and insurance claims, UN happy tenants, stained ceiling tile and carpeting, damage to the building and structure.

Improve your ROI

Know ahead of time when your roof will need replaced and plan for it

Reduce if not eliminate nuisance leaks and emergency repairs

Pick the right roof for the building

Include the proper slope and details to extend the life of the roof
CADD drawing indicating wet insulation on the drawing.
Absolute Infrared Inspection Services provides inspection services for residential and commercial buildings to locate anomalies associated with heat loss and cold infiltration.

The inspections are generally done on a cloudy day or in the evening in the colder months.

The conditions needed to qualify the presence of heat loss and or cold infiltration are an ideal minimum 40 deg F temperature difference between the inside and outside of the building being inspected to capture conducted heat loss and or cold infiltration.

This infrared inspection is a guide for the building owner to qualify and quantify the presence of heat loss and or cold infiltration. Conducted and or convected heat loss and or cold infiltration can greatly affect heating and cooling costs. Conducted heat loss and or cold infiltration can be addressed by adjusting R values with insulation to reduce the amount of energy needed to heat and or cool an interior space. Convected heat loss and or cold infiltration can be addressed by evaluating leak areas and making corrections as needed.

Craig Casler, CDT
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Commercial Heat Loss / Cold Infiltration Inspections

Locate Sources Ultimately Leading to Ice Build Up, Building Damage & Safety Issues

Heating & Cooling Cost May Be Reduced Greatly & Extend the Life of HVAC Equipment
Moisture infiltration Inspections

The building envelope (walls, roof, windows, etc) protects the interior environment from the elements, including ultraviolet light, wind, rain, or snow. Building design and construction are both vital to successful weatherproofing. If moisture has entered a building, the ultimate goal is to locate the source or sources of water infiltration and take corrective action. To use thermography successfully for moisture inspections requires an understanding of how moisture infiltration occurs and how it travels through various building media, as well as the climate and weather conditions, including temperature, relative humidity and dew point.