

The Thermographic Electrical Inspection

The intent of the Thermographic Electrical Inspection is to assist in detecting potential equipment failure by measuring abnormal temperature signatures of Electrical Distribution System Components. By evaluating the operating condition of these components, potential failures can be located and problem severity determined as part of a structured ongoing maintenance program. This will provide your organization with a predictive and proactive risk management program where outages and repairs of your electrical system can be avoided.

Background

All objects around us including ourselves are constantly emitting thermal radiation (heat). This technique for making energy visible is called Infrared Thermography. The thermal image captured by the thermographic camera allows for meaningful interpretation. Data it contains is digitally stored and computer processed for further analysis. This information is stored for future reference and trend analysis.

Report Format

Any thermal anomalies are presented on a report page as a thermal image and a digital photograph of the electrical component. To best determine the severity of a problem direct temperature measurement of the equipment and the temperature differential of the faulty components are provided.

Interpreting the Results

Thermographic inspections should be performed under normal equipment load conditions. When equipment can be measured under normal operating conditions the following information can be used as a guide for the action to be taken.

Operating Temperature

Electrical distribution system components are designed to operate within certain temperature parameters. When electrical distribution system components continually operate in excess of those parameters their life is shortened directly proportional to the amount of excess temperature.

Temperature Differential

Areas of electrical components operating at higher temperatures than that of adjacent areas, comparisons to ambient air temperatures, and enclosures of electrical apparatus are typically an indication of a problem with the higher temperature part.

For every problem, components are always inspected for physical damage to determine if the component should be replaced rather than repaired. An inspection should be made after a problem has been repaired to ensure it has been properly corrected.

As a guide to determining the severity of a problem we recommend for any of the three classifications of infrared testing on electrical components. It should be noted that these temperature criteria's are employed in conjunction with other analysis procedures and tools in the interest of accurately identifying problem areas:

SIMILAR COMPARISONS - Components/Conductors that have equal or near equal loading

Problem Level	Temperature Differential	Description
Alert	7.2F-14.4F 4.1°C-8°C	First Stage. Monitor and repair during next scheduled maintenance.
Severe	14.5F-27F 8.1°C-15°C	Second Stage. Should be repaired before scheduled maintenance.
Critical	>27F >15°C	Acute Stage. Should be repaired immediately!
References: NFPA - 70B Standard, NETA, and EPRI		

AMBIENT COMPARISONS - Components/Conductors with no other items of similar load and ambient air is used as a reference

Problem Level	Temperature Differential	Description
Alert	18.2F-36F 10.1°C-20°C	First Stage. Monitor and repair during next scheduled maintenance.
Severe	36.1F-72F 20.1°C-40°C	Second Stage. Should be repaired before scheduled maintenance.
Critical	>72F 40°C	Acute Stage. Should be repaired immediately!
References: NFPA - 70B Standard, NETA, and EPRI		

INDIRECT COMPARISONS - Temperature observed across enclosed, electrical compartments and liquid/oil filled electrical items

Problem Level	Temperature Differential	Description
Alert	2F-5.4F 1.1°C-3°C	First Stage. Monitor and repair during next scheduled maintenance.
Severe	5.6F-9F 3.1°C-5°C	Second Stage. Should be repaired before scheduled maintenance.
Critical	9F >5°C	Acute Stage. Should be repaired immediately!
References: NFPA - 70B Standard, NETA, and EPRI		

The above criteria provide standardized guidelines when determining if a thermal anomaly warrants further investigation based on temperature difference. Other factors such as ambient temperature, environmental conditions, criticality of the equipment, and electrical analysis tests must be considered.