

Insight: Thermography

Recognizing the Risk

The infrared (IR) thermographic image on the right shows one phase in an electrical fuse block glowing bright yellow - a warning sign of potential risk hidden from normal vision and inspections. If not identified and corrected, failure resulting in fire or lost production is likely. Overheating electrical and mechanical systems are a major cause of equipment breakdown and fires that result in significant property loss and business interruption each year. The National Fire Protection Association (NFPA) lists electrical systems failures as the third leading cause of fires.

Implementation of written electrical and mechanical systems preventative maintenance risk management programs that include regular IR inspections is invaluable in reducing these hazards.

Electrical and mechanical systems can overheat for a variety of reasons including component fatigue, loose connections, overloading, corrosion, or other contamination and manufacturing defects. In such cases, slight temperature variances will build-up in “hot spot” areas. IR cameras in the hands of trained thermographers facilitate identification of these areas so that the trained thermographers can recommend corrections for implementation. Thermography is recommended for both critical electrical and mechanical systems. Mechanical systems include motor and conveyor bearings and other rotating machinery that can heat up from imbalances, general fatigue, and frictional increases from lubrication loss, corrosion, and dust.

AIG recommends compliance with the 2023 edition of *NFPA 70B- Standard for Electrical Equipment Maintenance* as part a minimum site comprehensive risk management program. The 2023 edition of NFPA 70B was changed from a “recommended practice” to a “standard” in the most current edition which means that wording was changed to mandatory language for potential jurisdictional enforcement.

AIG recommends following NFPA 70B (2023) with annual IR surveys for all electrical equipment and associated connections $\geq 315V$ (based on standardized country voltages) at facilities other than commercial and residential buildings. Commercial and residential buildings with no previous electrical issues or concerns should be completed every three years.

Thermographers with certification per *ANSI/ANST CP-105 Topical Outlines for Qualification of Nondestructive Testing Personnel* and *CP-189 ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel or equivalent* should be utilized and inspections should be performed by minimum Level I certified technicians with administration and oversight by at least one Level II certified technician. More frequent IR inspections by other maintenance technicians (including non-certified) during the normal scope of work are encouraged but should not be a substitute for a comprehensive IR survey by certified technicians. Where IR inspections are performed by a third party, it is critical that the results are reviewed with site personnel in a timely manner to enable prompt correction of critical findings.

IR view ports should be provided for switchgear cabinets that cannot be opened while energized. Contact resistance (Ductor) testing is an alternative to IR where there are interior divisions within switchgear or other obstructions that would prevent IR scanning.

Controlling the Hazard

Controlling the associated risk begins with conducting IR surveys at regular intervals utilizing trained thermographers that provide meaningful reports and recommended improvements with issues that have been found. Critical electrical areas and equipment that should typically be included in these surveys include but are not limited to:

- Battery ESS Systems
- Electric vehicle power transfer systems



- Photovoltaic systems
- Electrical switch gear, breakers, bus connections transformers and contacts
- Motor and generator connections, windings, feeders and exciters
- Motors, line shafts and process equipment bearings
- Friction in drive gears and drive belts

Infrared surveys should also be extended to critical non-electrical systems as well as including:

- Conveyor belt systems - pulleys, bearings, rollers, etc.
- Refractory systems - boilers, kilns, molten material containment, etc.
- Steam traps and piping insulation

Surveys should be conducted as part of a regular preventative maintenance program with timely reviews of reports and action should be taken to correct noted issues. While surveys may require panel and specific equipment access, thermal imaging equipment is performed through non-contact means and while equipment is under load/operation. Thus surveys can normally be performed without interruption to production operations or to the equipment that is under review.

Most clients that implement IR survey programs find incredible value not only in discovered risk reduction potential but also in cost savings associated with power use reductions due to increased operational system efficiency after repairs on identified systems and components are completed.

References & Resources

NFPA 70B (2023), Standard for Electrical Equipment Maintenance

ANSI/ANST CP-105 Topical Outlines for Qualification of Nondestructive Testing Personnel

CP-189 ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel or equivalent

*While NFPA documents are the global standard used by AIG, international equivalents may be acceptable.

[For more information, contact your local AIG Risk Engineer.](#)

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