



Safety Measures ELECTRICAL

“Elimination is the first priority!
Ensure a risk assessment is completed before energized work tasks are completed.”

Importance Of Building A Compliant Electrical Maintenance Program (EMP)

By Terry Becker, P.Eng., CESC, IEEE Senior Member

As defined by the CSA Z463 Maintenance of electrical systems Standard an Electrical Maintenance Program is:

- *a program of regular inspection and service of equipment used to detect potential problems and to take proper corrective measures through the approved work process controls.*
- *Maintenance can be defined as corrective maintenance or preventive maintenance. Planned maintenance strategies can include predictive, preventive, proactive, reliability centred maintenance, risk based or run to fail.*

As defined by the NFPA 70B Standard on Electrical Equipment Maintenance an Electrical Maintenance Program is:

- *A managed program of inspecting, testing, monitoring, analyzing, and servicing electrical systems and equipment with the purpose of maintaining safe operations and production by reducing or eliminating system interruptions and equipment failures.*
- *The EMP shall include elements that consider current condition of maintenance of electrical equipment and*

systems as well as the potential safety and operational risks to maintenance and operational personnel.

Does your company have an Electrical Maintenance Program that would comply with these requirements? What should a compliant EMP include for framework/table of contents? How can we develop an EMP for our company or use CSA Z463 and NFPA 70B to validate and update an existing EMP? Why should my company develop and implement a compliant EMP?

Why Should My Company Develop And Implement A Compliant EMP?

An adequate Electrical Maintenance Program (EMP) assures electrical equipment health and reliability, and also ensures the electrical equipment operates and functions as designed. It further aids in predicting when electrical equipment failure may be imminent so that proactive maintenance can be completed.

Electrical equipment maintenance is a critical factor for the accuracy of arc flash hazard incident energy analysis calculations. Calculated incident energy levels are dependent on the operating times of electrical protective devices such as relays and circuit breakers. If the electrical protective device’s fault clearing time doesn’t correspond with how the electrical protective device actually performs under an electrical fault condition, the calculated incident energy may be a higher value than calculated as these devices typically act slower and not faster. In some cases, the devices may not operate at all. Lengthening the operating time during an electrical fault can increase the incident energy values, increases the arc flash boundary distance, and would require an increase in the arc rating of arc flash PPE required to be worn to perform an energized electrical work task.

Electrical equipment maintenance is often the most neglected strategy to maintain a safe work environment. Besides manufacturer’s instruction and operating manuals industry accepted best practices Standards provide direction on developing an Electrical Maintenance Program (EMP) and the required content it should include to address maintenance strategies, determining electrical equipment criticality of service/prioritization (e.g., consequence), failure analysis, and the need for a risk assessment to determine appropriate inspection and test procedures and at what maintenance interval. A

PLAN-DO-CHECK-ACT philosophy is promoted consistent with CSA Z45001 Occupational health safety management systems – Requirements with guidance for use.

The EMP can control not only electrical equipment maintenance inspection and testing, but address acceptance testing where a baseline is established that can be used for trending and identifying changes in safety and reliability of electrical equipment when it is put into its normal operating condition. Predictive maintenance techniques can be deployed to determine an out-of-tolerance condition and predicting when electrical equipment failure may occur and proactively controlled scheduling of outages to implement required maintenance.

Electrical equipment also has a predictable life cycle. A comprehensive maintenance plan for electrical equipment will ensure that the expected reliability is sustained. Implementing routine maintenance and appropriate inspections and test procedures at determined maintenance intervals can be completed when condition indicators warrant it.

Electrical equipment shall be maintained in accordance with manufacturers’ instructions or industry consensus standards to reduce the risk associated with failure. The equipment owner or the owner’s designated representative shall be responsible for maintenance of the electrical equipment and documentation. Related to risk when executing energized electrical work tasks the following recommendations are provided:

1. Overcurrent protective devices shall be maintained in accordance with the manufacturers’ instructions or industry consensus standards. Maintenance tests and inspections shall be documented.
2. All working space and clearances around energized electrical equipment required by electrical codes and standards shall be maintained.
3. Electrical equipment, raceway, cable tray, and enclosure bonding and grounding shall be maintained to ensure electrical continuity.
4. Electrical enclosures shall be maintained to guard against unintentional contact with exposed energized conductors and circuit parts and other electrical hazards. Covers and doors shall be in place with all associated fasteners and latches secured.
5. Locks, interlocks, and other safety equipment shall be maintained in proper working condition to accomplish the control purpose.



EASA 2025

CONVENTION & SOLUTIONS EXPO

July 19-22 • Nashville, Tennessee
Gaylord Opryland Resort & Convention Center



POWERING
the **FUTURE**

Register today at easa.com/convention

6. Access to working space and escape passages shall be kept clear and unobstructed.
7. Identification of components, where required, and safety-related instructions (e.g., operating or maintenance), if posted, shall be securely attached and maintained in legible condition.
8. Warning signs, where required, shall be visible, securely attached, and maintained in legible condition.
9. Circuit or voltage identification shall be securely affixed and maintained in updated and legible condition.
10. Electrical cables and single and multiple conductors shall be maintained free of damage, shorts, and ground that would expose employees to an electrical hazard.
11. Flexible cords and cables shall be maintained to preserve insulation integrity.
12. For overhead electric lines under the employer's control, grade elevation shall be maintained to preserve no less than the minimum designed vertical and horizontal clearances necessary to minimize risk of unintentional contact.
13. Fuses shall be maintained free of breaks or cracks in fuse cases, ferrules, and insulators. Fuse clips shall be maintained to provide adequate contact with fuses. Fuse holders for current-limiting fuses shall not be modified to allow the insertion of fuses that are not current-limiting. Non-current limiting fuses shall not be modified to allow their insertion into current-limiting fuse holders.
14. Molded-case circuit breakers shall be maintained free of cracks in cases and cracked or broken operating handles.
15. Circuit breakers that interrupt faults approaching their interrupting ratings shall be inspected and tested in accordance with the manufacturer's instructions.

The employers Electrical Safety Program (ESP) assumes that specific electrical equipment maintenance requirements are implemented based on safety and criticality of service. For

specific details related to an Electrical Maintenance Program, establishing appropriate electrical equipment maintenance strategies, defining specific electrical equipment inspection and test procedures and frequencies of maintenance inspections and test procedures and other requirements reference can be made to the CSA Z463 Maintenance of electrical systems Standard, NFPA 70B Standard for Electrical Equipment Maintenance, manufacturer's recommendations and the ANSI/NETA Standard for Maintenance Testing Specifications (MTS). More on an Electrical Maintenance Program in future articles.

I will continue my efforts to communicate information in Electrical Safety Measures and share the knowledge and experience I have in an effort to "Get it Right!!" Knowledge is power! TAKE CONTROL of ARC FLASH! PLACE MORE FOCUS on ELECTRIC SHOCK!



Terry Becker, PEng., CESP, IEEE Senior Member is a founding member and the First Past Vice-Chair of the CSA Z462 Workplace electrical safety Standard Technical Committee and currently a Voting Member and Clause 4.1 and Annexes Working Group Leader. Terry is also a Founding Member and a Voting Member on the

CSA Z463 Maintenance of electrical systems Standard and a Voting Member of the IEEE 1584 Guide for Performing for Arc-Flash Hazard Calculations. Terry has presented at Conferences and Workshops on electrical safety in Canada, the USA, India, Australia and Italy. Terry is a Professional Engineer in the Provinces of BC, AB and ON. Terry is an Electrical Safety Specialist, Management Consultant, and can be reached at 587.433.3777 or by email terry.becker@twbesc.ca.

...2025 ENERGY STORAGE CANADA CONFERENCE

POWERING Canada's Energy Advantage

JOIN US!

AT CANADA'S ONLY NATIONAL ENERGY STORAGE CONFERENCE & TRADESHOW

September 25 & 26, 2025

Toronto, ON

Automotive Building | 105 Princes' Blvd



Industry Experts



Networking Sessions



Latest Research



Industry Tradeshow



EVENTS.CANPLANINC.CA/ESC2025

WWW.ENERGYSTORAGECANADA.ORG