

Shock Doctrine

Setting a standard for arc flash risk assessment and the condition of electrical equipment.

BY TERRY BECKER

IS YOUR ELECTRICAL power distribution equipment in your facility in a “normal operating” condition or “abnormal operating” condition? Have you been completing adequate and appropriate electrical equipment maintenance at acceptable frequencies? What is the impact and relationship of the lack of electrical equipment maintenance and the risk of an arcing fault and arc flash occurring?

Reviewing your electrical power distribution equipment maintenance strategies from the perspective of managing the risk of an arcing fault and arc flash occurring is most likely something you have not considered before. This is new information and a new perspective, but critical to managing risk related to arc flash as identified in the updated CSA Z462, 2015 third edition and the new CSA Z463 *Guideline on Maintenance of Electrical Systems* published in February 2014.

Arcing faults and arc flash

But let's go backwards before we go forwards. Arc flash is an abnormal condition on energized electrical equipment. An arc flash is created when energized electrical equipment experiences an arcing fault caused by a breakdown in insulation between conductors and circuit parts, the air is ionized and



Abnormal conditions such as human interaction can lead to the breakdown in insulation of energized electrical equipment that can cause an arcing fault and an arc flash to occur.

an electric arc is created that can evolve into an arc flash, depending on the voltage level and short-circuit current available. When an arc flash occurs, a variety of effects occur; the most prominent effect is the release of heat or incident

energy that can cause burn to the skin. We now know that arc-rated clothing can reduce the risk of burn to the skin from incident energy to the 50 per cent probability of the onset of a second degree burn when the arc rating of the clothing is less than or equal to

the anticipated incident energy.

Several “abnormal conditions” (such as human interaction and the condition of the energized electrical equipment) can lead to the breakdown in insulation of energized electrical equipment that can cause an arcing fault and arc flash to occur.

Reviewing and applying industry accepted “Standards” or “Guidelines” need to be part of your ongoing, continuous improvement strategy when you consider how to mitigate worker exposure to arc flash. It is important that you keep pace with the changes in these documents and extract the value they offer when applied to preventing equipment failure and possible worker injury.

The *CSA Z462 Workplace Electrical Safety Standard* is in its second edition and in January 2015 the third edition will be published. One of the most significant changes in the forthcoming edition of CSA Z462 is that the Annex F – risk assessment procedure – will become an integral part of the standard that is imbedded in the clauses. When a qualified electrical worker is required to complete an energized electrical work task they will be required to: identify hazards, assess risks and implement risk controls according to a hierarchy of methods. A qualified electrical worker will be required to complete an “Arc Flash Risk Assessment.”



Terry Becker, who wrote this feature, explains that arc-rated clothing can reduce the risk of burn to the skin from incident energy to the 50 per cent probability of the onset of a second degree burn.

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The advertisement features a large image of the Dynafor LLX2 load indicating device, which is a blue and black electronic device with a red sensor and a red button. It is connected to a thick, black cable. The background shows a blurred image of a power line tower.

When completing the “Arc Flash Risk Assessment,” the qualified electrical worker will have to determine the severity of potential harm and the likelihood of occurrence. In Annex F of CSA Z462 the likelihood of occurrence is comprised of three parameters: frequency of exposure to the hazard, the probability of occurrence and the ability to avoid exposure.

Of these three likelihood-of-occurrence parameters, the condition of electrical equipment is a key element in the probability of an arcing fault and the occurrence of an arc flash. Additionally, if an arcing fault and arc flash occurs it is critical that the upstream electrical protective device opens as predicted to clear the fault and limit the arc flash incident energy released.

An important note related to “Arc Flash Risk Assessment” has been added to CSA Z462: “Improper or inadequate maintenance can result in increased opening times of the overcurrent protective device, thus increasing the incident energy. When equipment is not properly installed or properly maintained, PPE selection based upon incident energy analysis or the PPE category method may not provide adequate protection from arc flash hazards.”

The operation and maintenance of energized electrical equipment and consideration of the probability of an arcing fault has not been formally considered when prioritizing electrical equipment maintenance. In fact, infrared scanning and ultrasonic analysis are used to predict potential failure, but the perspective of their application most likely focused

on reliability as a priority.

Typically, electrical equipment maintenance was completed to maintain certainty related to reliability and limit damage to electrical equipment. These two elements of the benefit of completing electrical equipment have not changed, but “maintenance for safety” will now have to be a priority.

Csa Z463 guideline

The new *CSA Z463 Guideline for Maintenance of Electrical Systems* provides guidance on establishing an electrical equipment maintenance program, and for reviewing your electrical equipment maintenance strategies. The guideline advises how we can manage and reduce the risk related to the probability of an arcing fault and arc flash from occurring, as well as how we can ensure that incident energy released in an arc flash is minimized. Following a “Safety Management System” approach with a defined “framework” for an electrical equipment maintenance program will ensure consistency and manage frequencies of maintenance performed. CSA Z463 also specifically identifies that if appropriate maintenance is not completed, then incident energy from an arc flash may be higher than predicted in alignment with the CSA Z462 note (listed on page 28).

The CSA Z463 Guideline can be reviewed in combination with the *NFPA 70B Recommended Practice for Electrical Equipment Maintenance* and, when the maintenance strategies are defined, we can have testing completed by applying the requirements of the *ANSI/NETA MTS Standard for Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems*. These documents can be used in tandem to develop and maintain a comprehensive Electrical Equipment Maintenance Program.

Energized equipment

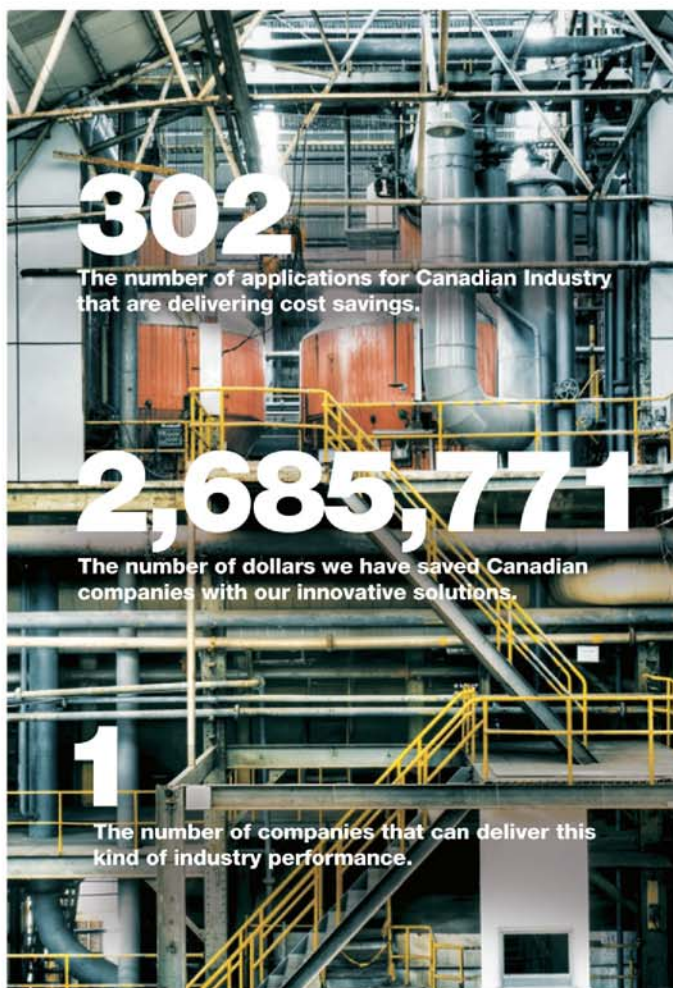
With the updated *CSA Z462 Workplace Electrical Safety Standard*, a new focus will be placed on the condition of energized electrical equipment when an energized electrical work task is

performed on it. A “Risk Assessment Procedure” will be required and, by extension, a significant parameter of likelihood of occurrence will be the probability of occurrence.

By ensuring minimum maintenance is completed on energized electrical equipment we can guarantee the reduction in risk of exposure

to incident energy release from an arc flash. **PEM**

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