Electrical Safety Solutions:
CSA Z462 — 2012 Edition
from Schneider Electric Canada Services & Projects
Shock and electrocution have long been recognized as a serious workplace hazard. In recent years arc flash has also become recognized as a serious workplace hazard.

Canadian Occupational Health and Safety Regulations have been developed to address these hazards. These laws in essence require an employer to take reasonable precautions to prevent electric shock and burn injuries.

The Canadian Standards Association (CSA) Z462: Workplace Electrical Safety is the document most often referenced for electrical safety. It has been referenced by regulators in their guidelines.

Schneider Electric Services and Projects advocate the use of CSA Z462, most importantly for worker safety, but also to preserve electrical equipment. An arc flash accident can render equipment unusable and place the facility in a costly downtime mode, which could last hours or days.

It is estimated that the combination of a workplace injury and equipment downtime can cost as much as **8 - 10 million dollars**.

The Liberty Mutual Research Institute for Safety reports that electrical injuries are the second most costly worker’s compensation claim.

CSA Z462-12 requires an employer to develop and implement an Electrical Safety Program. It also defines the requirements for safe work practices and requires audits and revisions to keep the safety program up to date.

While basic compliance to CSA Z462 requirements is established with a five-step process, a sixth step assists the facility owner with fine tuning the electrical power system, both for safety and operability.

Step 1: Develop, Implement and Audit an Electrical Safety Program


Step 3: Conduct Regularly-Scheduled Safety Training and Audits for All Electrical Workers

Step 4: Ensure Adequate Supplies of Personal Protective Equipment (PPE) and Proper Tools

Step 5: Maintain All Electrical Distribution System Components

Step 6: Follow Strategies to Mitigate and Control Arc Flash Hazards

Did you know?

Hiring contractors to perform electrical work does not absolve the facility owner (host employer) of responsibility.

CSA Z462-12 Clause 4.1.5 indicates that a facility owner is ultimately responsible for safety at their site and must communicate known electrical hazards to the contracted worker(s).

In addition, the facility owner must report any contract employee’s safety violations to the contract employer.
Step 1

Develop Implement and Audit an Electrical Safety Program.

This is a written document created by the employer that covers all areas of the company’s electrical safety practices. It includes such things as lock out procedures, method of qualifying the workers, selection and application of PPE, methods of establishing a safe work area, and arc flash hazard calculations, equipment labeling, and worker audit procedures. While the requirement to develop and implement an electrical safety program was in the previous edition of CSA Z462, it has been further refined in the 2012 edition.

CSA Z462-12 clarifies and expands upon the requirement to audit the safety program itself. This audit must be performed on a three-year cycle to assure continued compliance of the policies and procedures to the standard. When the auditing determines that the principles and procedures of the electrical safety program are not being followed, the appropriate revisions to the training program or revisions to the procedures must be made. In addition, workers must be evaluated for compliance to the standards and the policy, and any deviations must be documented.

The safety program is a **living document** that must be audited and revised over time to ensure it is kept up-to-date.
Step 2

Conduct an Electrical System Study to Determine Potential Arc Flash Energy Levels.

This is an electrical system engineering study that is overseen by professional engineers familiar with the power distribution and control equipment and the calculation methods required. The methodology for conducting an arc flash analysis is outlined in IEEE 1584™ Guide for Performing Arc-Flash Hazard Calculations.

CSA Z462-12, Clause 4.3.5.1 states that an arc flash hazard analysis shall determine the arc flash boundary, the incident energy at the working distance, and the personal protective equipment that people shall use within the arc flash boundary.

An arc flash hazard analysis must be updated when a major renovation or modification takes place. At a minimum, it should be reviewed every five years because changes in the electrical distribution system could affect the results of the arc flash hazard analysis.

Apply Warning Labels to Equipment.

CSA Z462-12 Clause 4.3.5.4 requires that equipment that is likely to be examined, adjusted, serviced, or maintained while energized shall be field-marked with a label containing all of the following information:

a) At least one of the following:
   • Available incident energy and the corresponding working distance
   • Minimum arc rating of PPE
   • Required level of PPE; or
   • Highest Hazard/Risk Category for the equipment
b) Nominal system voltage
c) Arc flash boundary; and
d) Date of the hazard analysis

In addition, the calculation method and data to support the information for the label must be documented.

Schneider Electric can assist with providing the full package including the data collection, analysis, and label installation.
Step 3
Conduct Regular Safety Training and Assessments.

CSA Z462-12 defines a qualified person as “one who has skills and knowledge related to the construction and operation of the electrical equipment and systems, and has received safety training to recognize and avoid the hazards involved.” This training requirement means that the employee must receive safety training specific to the hazards of arc flash, arc blast, shock, and electrocution.

CSA Z462-12 also requires the employer to verify that each worker is complying with the safety-related work practices specified by CSA Z462-12. This requirement has been added in the 2012 issue of the standard.

Canadian Regulations require employers to provide information, instruction and supervision to a worker to protect the health and safety of the worker.

Step 4
Ensure Adequate Supplies of PPE and Proper Tools.

CSA Z462 requires workers working in areas where electrical hazards are present to be provided with and use protective equipment that is designed and constructed for the specific parts of the body to be protected and for the work to be performed. This can include arc-rated shirt and pants, an arc-rated coverall, or a multi-layer arc flash suit. Additional PPE requirements consist of an arc-rated face shield and balaclava or an arc flash suit hood, rubber insulating gloves and leather protectors; EH-rated safety footwear, safety glasses, and a hard hat. The 2012 edition of CSA462-12 also requires employees who are working within the arc flash boundary to wear hearing protection.

Properly-rated equipment is needed to test voltages. Insulated hand tools and equipment are required for workers who are to perform testing and troubleshooting on energized equipment.

* Schneider Electric Services & Projects have partnered with the CSA Learning centre to provide electrical safety training that is based on CSA Z462-12.
Maintain All Electrical Distribution System Components.

Electrical distribution equipment that is properly installed and maintained is much less likely to experience an arc flash incident. Additionally, the “active” components in electrical distribution systems comprise of fuses, circuit breakers, and protective relays that help protect the system in the event of an electrical fault. These over-current protective devices have a critical role in controlling the arc flash energy. Therefore, it is crucial to keep these devices in proper operating condition with a regular maintenance program. Without proper over-current protection, a sustained arcing-fault event can subject electrical workers to much higher than anticipated levels of arc flash energy. On the other hand, modern, properly adjusted over-current protective devices that have been well maintained are able to detect an arcing fault condition and clear the fault quickly, ensuring the lowest possible level of arc flash energy.

Unless adequate maintenance is performed, the electrical system study and the arc flash analysis will not be a correct representation of the potential performance of the power system. Therefore, in addition to compliance with CSA Z462, Schneider Electric recommends that facilities also implement NFPA 70B 2010 Edition: Recommended Practice for Electrical Equipment Maintenance. Our qualified field services personnel perform on-site preventive and predict maintenance services for any manufacturer’s electrical equipment. Upon completion, a detailed report is provided that identifies potential issues along with corrective recommendations.

Equipment must be in an electrically-safe condition during maintenance, testing, and repair.
Six-step process

[Step 6]

Follow Strategies to Mitigate and Control Arc Flash Hazards.

This often overlooked step is one of the most crucial in optimizing the safety and performance of the power distribution system. The arc flash analysis performed in step two establishes the arc flash boundary, incident energy and the required PPE for the existing power system condition. However, in its existing condition, some power distribution system arc flash energy levels may require a very high level of arc flash PPE to adequately protect the worker. Arc flash suits and hoods are hot and cumbersome to work in, and can reduce visual acuity while performing routine tasks such as testing and troubleshooting.

The goal of arc flash mitigation is to reduce the arc flash energy, and thus the PPE, to a level that facilitates the performance of routine tasks. Arc flash mitigation has been a rapidly developing area of research and development for Schneider Electric. We are constantly working on new mitigation strategies to promote electrical workplace safety.
Why Choose Schneider Electric Engineering Services & Projects when implementing CSA Z462 Safety Solutions?

Schneider Electric Engineering & Projects have been proactively engaged in electrical workplace safety and compliance since arc flash requirements were first introduced.

Many of our engineers are leaders in CSA, EEE, NFPA, and other power system standard-making organizations. Specifically we offer:

Arc Flash Analysis
If your facility meets any of the following conditions, you should consider consulting Schneider Electric Services and Projects for an arc flash analysis:
An arc flash study has not been performed in the past five years
• Short circuit, protective coordination studies have not been performed in the past five years
• Changes have occurred to the electrical distribution system since the last arc flash hazard analysis was performed
• A safety audit is required
• Your facility’s insurance policy is up for renewal
• Modifications or expansions of the electrical distribution are being considered.

Arc Flash Safety Training
Our experts can conduct customized, on-site training at your facility to educate your employees and any outside electrical contractors you use about the dangers of arc flash and how to follow the CSA Z462 workplace safety guidelines. Upon course completion, participants, will be able to:
• Recognize electrical hazards
• Understand the need and process to de-energize electrical equipment
• Realize the dangers of exposure to arc flash
• Manage arc flash incident more effectively
• Understand the different levels of arc flash and PPE and how to choose and appropriate level
• Implement effectively safety procedures

Maintenance Optimization & Management
Achieve maximum reliability and safety over your entire installation with our Maintenance, Modernisation, Monitoring and Management Plan (MP4).

Energy Efficiency
Manage the efficiency of assets while reducing your energy bill with our Detailed Energy Efficiency Analysis and Energy Site Studies.
Arc Flash Mitigation Solutions

Schneider Electric Services provides a variety of arc flash mitigation solutions for any brand of electrical equipment.

Lowers arc flash energy by reducing the arcing time.

Over-Current Protective Device (OCPD) Coordination Study

An OCPD coordination study optimizes circuit breaker and relay settings and can be specified as a component of the arc flash study. The speed of operation of the OCPD determines the duration of an arc flash event.

Specialized Relaying Such as Light Sensing Technology

Strategically-placed light sensors in switchgear compartments makes it possible to sense the arc within a millisecond. Modern relays can sense this condition and trip the appropriate circuit breaker. Other relaying technologies are zone selective interlocking and differential protection.

Virtual Main Relay

Low-voltage switchgear and switchboards can be subjected to dangerous levels of arc flash incident energy when fed directly from a power transformer. Upgrading switchgear with a virtual main relay adds over-current sensing to the low-voltage side of the service transformer and is designed to trip an existing upstream fault-breaking device.

Removes worker from location or places a barrier between worker and exposed energized parts.

Infrared (IR) Windows

IR windows allow you to obtain condition and status information of electrical equipment without the need to remove equipment panels. The complete unit is permanently fitted into electrical equipment and enables infrared inspections to be performed without downtime.

Remote Racking System (RRS)

A RRS allows medium-voltage circuit breaker racking operations to be performed via a control panel located away from the cell, removing the operator from manual contact with the circuit breaker. In addition, a RRS may reduce the need for PPE because the worker is removed from the arc flash boundary.

Wireless Temperature Monitoring System (WTMS)

A WTMS allows for easy field installation of wireless sensors into low- and medium-voltage equipment. Sensors can be placed in locations usually not accessible with an infrared camera. They can be installed on equipment with high arc flash energy ratings, allowing equipment condition to be monitored without a risk of danger to personnel or equipment.
We are a network of Schneider Electric Services located in over 130 countries.

We offer complete service solutions to install, maintain, analyze and modernize your electrical system.

We provide a wide range of comprehensive, focused solutions to performance problems for any type of electrical equipment.

For more information, call 1-800-265-3374 or visit www.schneider-electric.com/ca