



Safety Measures ^{ELECTRICAL}

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

Electrical Safety Related Electrical Equipment: Labels & Safety Signage

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

Electrical safety related electrical equipment labeling, and safety signage may not be recognized as important. With respect to arc flash and electric shock hazards Canada adopted a legal requirement as mandated by the Canadian Electrical Code Part I (CE Code Part I) in the 2006 Edition, Rule 2-306. In fact it is this rule that was added in the 2006 Edition of the CE Code Part I that is actually the catalyst for the changes that have occurred in Canada related to energized electrical work and the adoption of NFPA 70E Standard for Electrical Safety in the Workplace as the CSA Z462 Workplace electrical safety Standard, first published and available to



Figure 1. CE Code Part I, Rule 2-306

industry in January of 2009.

You may think that beyond the minimum equipment label required in Figure 1 from the CE Code Part I Rule 2-306 what

other electrical equipment labeling and safety signage related to arc flash and shock is really required.

The CE Code Part I, Rule 36-006 Warning Notices provides specific legal requirements for the installation of “Danger High Voltage” or “Danger XX,XXXV” signage to be installed on listed high voltage electrical equipment, cables/cable trays and fences (see Figure 2 for examples) and other requirements as listed in the Rule. In some cases Provincial or Territorial OHS Regulations may also stipulate a legal requirement for “Danger High Voltage” safety signage.

Beyond legal requirements for electrical equipment safety signage in Canada the CSA Z462 Workplace electrical safety Standard requires that an employer’s Electrical Safety Program include a detailed risk assessment procedure (e.g. CSA Z462, Clause 4.1.7.8).

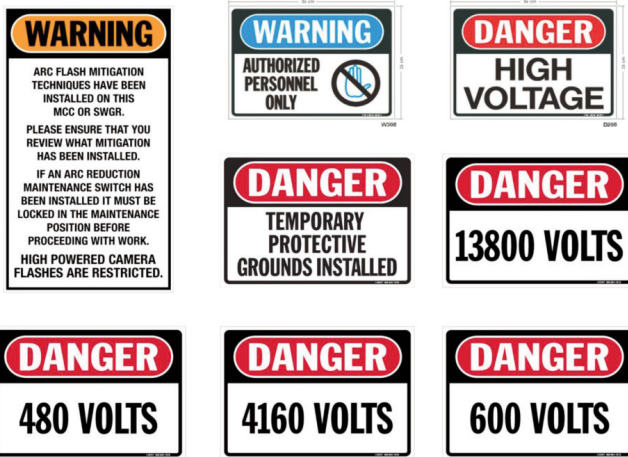


Figure 2. CE Code Part I, Rule 36-006 Safety Signage Examples

There are two requirements in a work task-based qualitative risk assessment procedure, determine the potential injury or damage to health of workers (harm) and the likelihood of occurrence (probability) of the exposure to the identified electrical hazard and apply both preventive and protective risk control methods.

As a component of the risk assessment procedure the recognized hierarchy of risk control methods shall be applied as noted on CSA Z462, Clause 4.1.7.8.5. One of the hierarchies of risk control methods is “Awareness” or you may have identified this as “Warning Signs & Barricading.”

When a work task’s arc flash risk assessment is completed there are two methods for the Qualified Person to determine “Additional Protective Measures.” The employer can then apply an equipment label as identified in CSA Z462, Clause 4.3.5.7 Equipment Labelling. An example of this voluntarily applied equipment label that complies with ANSI/NEMA Z535.4 (also reference CSA Z462 Annex Q Arc Flash and Shock Warning Equipment Labels) is provided in Figures 3 and 4. The “Danger” signal pane would be used if the calculated incident energy is greater than 140.0 cal/cm².

Other elements of the risk assessment procedure where electrical equipment labeling, and safety signage will benefit reducing likelihood of occurrence related to the potential for human error:

1. Ensure electrical equipment identification labeling is installed, visible and legible. Equipment identification shall match what is indicated on single line diagrams and is important with respect to high voltage switching & isolation. Ensure single line diagrams for high voltage electrical equipment are posted within sight of the electrical equipment.

! WARNING	
Arc Flash and Shock Hazard	
ARC FLASH PPE Arc Flash PPE Category 4	SHOCK PROTECTION 480 VAC
Arc Flash Boundary Working Distance 144 inches 24 inches Reference [Company] Electrical Safety Program For Arc Flash PPE Requirements.	RIG Class # 0 Limited Aprch. Boundary 42 inches Restricted Aprch. Boundary 12 inches (FOR EXPOSED ENERGIZED CONDUCTORS or CIRCUIT PARTS)
Equipment: MCC #1 Building, SWGR #1 Protective Device: LOAD SIDE of FB-1 Report #: TWBESC-XXX-YYY-AHA-ZZZ Rev 1.0	Analysis By: TWBESC Date: 2020-01-30 Standard #: IEEE 1584-2018

Figure 3. Warning Detailed Arc Flash & Shock Equipment Label

! DANGER	
Arc Flash and Shock Hazard	
ARC FLASH PPE 345.7 cal/cm² incident energy	SHOCK PROTECTION 480 VAC
Arc Flash Boundary Working Distance 480 inches 24 inches Reference [Company] Electrical Safety Program For Arc Flash PPE Requirements.	RIG Class # 0 Limited Aprch. Boundary 42 inches Restricted Aprch. Boundary 12 inches (FOR EXPOSED ENERGIZED CONDUCTORS or CIRCUIT PARTS)
Equipment: MCC #1 Building, SWGR #1 Protective Device: LINE SIDE of FB-1 Report #: TWBESC-XXX-YYY-AHA-ZZZ Rev 1.0	Analysis By: TWBESC Date: 2020-01-30 Standard #: IEEE 1584-2018

Figure 4. Danger Detailed Arc Flash & Shock Equipment Label

Electrical Line

m a g a z i n e

Have you **RENEWED** your **COMPLIMENTARY** subscription?

Has your address changed? Make sure there will be no interruptions to the delivery of your magazine and e-mail your change of address to info@electricalline.com.

If you are not getting your own copy of Electrical Line Magazine, go to electricalline.com/subscribe and **SUBSCRIBE TODAY!**

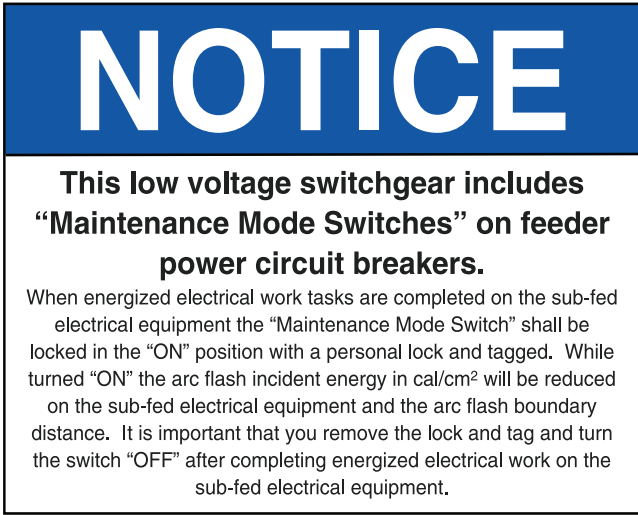


Figure 5. Notice Signage Arc Flash Maintenance Mode Switch Installed

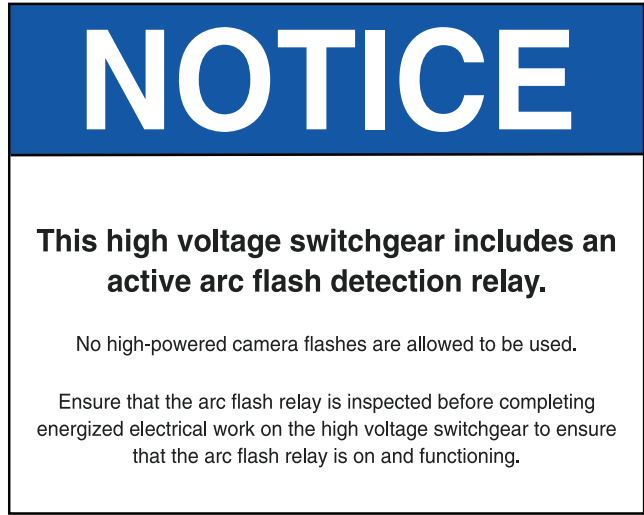


Figure 6. Notice Signage Arc Flash Detection Relay Installed

2. Add electrical equipment “voltage” labeling, black text on white label and font size large enough to be easily visible. Key to the shock risk assessment and arc flash risk assessment is that the Qualified Person identifies the nominal electrical equipment voltage.
3. With respect to likelihood of occurrence and risk related to “look alike equipment” add “Section #s” or “Cell #s” to high voltage electrical equipment front and especially the back and “Section #s” to motor control centres (MCCs).
4. Add specific “Notice” electrical safety signage where incident energy reduction methods have been engineered and included in electrical equipment. This ensures that the Qualified Person is aware and follows an identified procedure and confirms the incident energy reduction method is “on.” See Figures 5 and 6.
5. Add specific “Notice” electrical safety signage confirming that electrical equipment is arc resistant electrical equipment and the specific specification and type. It is important that the Qualified Person understands that the electrical equipment is arc resistant and the requirements related to performing energized electrical work tasks. See Figure 7.

Installing electrical safety related electrical equipment labelling, and safety signage is a legal requirement related to

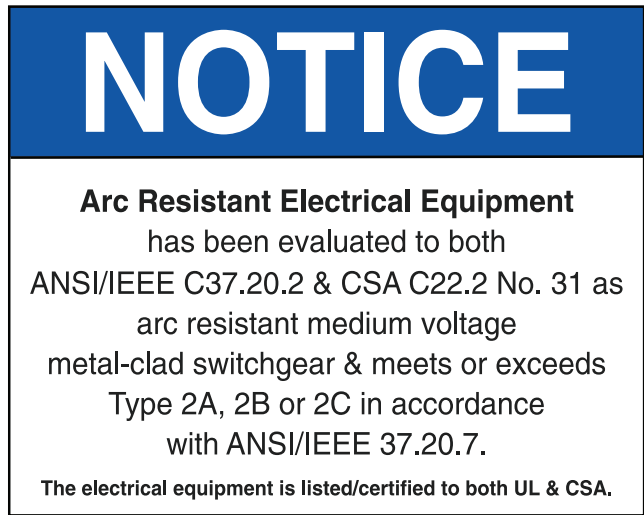


Figure 7. Notice Signage Arc Resistant Electrical Equipment

specific electrical equipment. Beyond the legal requirement and aligned with the CSA Z462 Workplace electrical safety Standard additional electrical equipment labelling and safety signage would be a prescriptive requirement of CSA Z462 or when a detailed work task-based qualitative risk assessment procedure has been completed and contributed to the Qualified Person identifying requirement personal protective equipment and reducing the likelihood of occurrence of human error.



Terry Becker, PEng, CEM, IEEE Senior Member is the first past Vice-Chair of the CSA Z462 Workplace electrical safety Standard Technical Committee and currently a Voting Member and Working Group Leader for Clause 4.1 and the Annexes. Terry is also a Voting Member on the CSA Z463 Maintenance of electrical systems Standard and a Voting Member of the IEEE 1584 Guide for Performing Arc-Flash Hazard Calculations. Terry has presented at Conferences and Workshops on electrical safety in Canada, the USA, India and Australia. Terry is a Professional Engineer in the Provinces of BC, AB, SK, MB 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.