



Arc Flash Standard

1.0 PURPOSE

SaskPower's Standard Protection Code has provisions for working on apparatus in the Alive, Separated, Isolated and De-energized states. When apparatus is worked on in the Alive state there is potential for worker exposure to electrical arc flash. Workers may also be exposed to arc flash hazards when performing day-to-day switching operations on high energy apparatus.

This standard supports the Personal Protective Equipment Policy and the purpose of this standard is to outline SaskPower's general requirements for Arc Flash Protection.

2.0 DEFINITIONS

2.1 Flame-Resistant [FR]

The property of a material whereby combustion is prevented, terminated, or inhibited following the application of a flaming or non-flaming source of ignition, with or without subsequent removal of the ignition source.

Flame resistance can be an inherent property of a material, or it can be imparted by a specific treatment applied to the material.

2.2 Apparatus

All equipment pertaining to the generation, transmission, distribution, and the use of electrical energy. Some examples are lines, transformers, breakers, pumps, motors, valves, relays, etc. [SaskPower Standard Protection Code]

2.3 Arc Rating

The maximum incident energy resistance demonstrated by a material (or layered system of materials) prior to breakopen or at the onset of a second-degree skin burn. Arc rating is normally expressed in cal/cm².

2.4 Branch Circuit

The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s).

2.5 Close Proximity

For the purpose of this standard close proximity shall be when the worker crosses the Electrical Work Safety Perimeter boundary. **(see below)**

2.6 Electrically Safe Work Condition

A state in which the equipment has been disconnected from all electrical energy sources, locked/tagged, tested to ensure the absence of potential and/or grounded as required by approved safe work procedures, job plans and hazard and risk assessments. The intent of this is to eliminate worker exposure to arc flash hazards.



2.7 Electrical Work Safety Perimeter

A defined or controlled boundary the purpose of which is to ensure that:

- Unprotected / unauthorized personnel do not enter the arc flash hazard zone; and
- Personnel working on equipment are not distracted.

The Electrical Work Safety Perimeter:

- Shall be a minimum 3.05m [10ft] from exposed current carrying components that have not been put into an Electrically Safe Work Condition.
- For equipment with high fault levels the Electrical Work Safety Perimeter distance will be verified by the personnel responsible for and in charge of the activity
- Necessary precautions shall be taken to identify and/or control the Electrical Work Safety Perimeter [i.e. barrier tape, pylons, watchpersons, signage, etc.].
- An Electrical Work Safety Perimeter is not required for work on 'branch circuit' apparatus, unless the hazard identification and risk assessment indicates otherwise.
- Entry into the electrical work safety perimeter requires the use of approved flame resistant clothing.

2.8 Energized:

Electrically connected to or having a source of voltage.

2.9 Potential Incident Energy

The amounts of energy impressed on a surface [a worker's body, hands, face etc.] a certain distance from the source, generated during an electrical arc event.

- Normally expressed in cal/cm² calculated at the expected working distance.
- Potential Incident Energy can be determined by referencing: the "Arc Protection Guidelines for SaskPower Transmission and Distribution", and/or "IEEE 1584-2002 IEEE Guide for Performing Arc-Flash Hazard Calculations".

2.10 Working On or Work

Making contact with energized equipment with any body parts, tools, probes, or test equipment.

3.0 METHOD / PRACTICE

3.1 Hazard Assessment

- The Hazard and Risk Assessment process will be used to assess the potential incident energy for the intended task and apparatus. The hazards will be evaluated and control measures will be implemented that minimize the potential for harm in the event of an electrical fault. Preference should be given to control measures that eliminate or minimize the potential incident energy. Personal Protective Equipment (PPE) is the last line of defense.
- The tables in CSA Z462-08 Workplace Electrical Safety Table 4 the IEEE 1584-2002 Guideline for Performing Arc Flash Hazard Calculations and the Arc Protection Recommendations for SaskPower Transmission and Distribution can be used in assessing the task related hazard.
- For apparatus and/or tasks not listed in the documents listed in the tables in CSA Z462-08 or the Arc Protection Recommendations for SaskPower Transmission and Distribution the IEEE 1584-2002, IEEE Guide for Performing Arc Flash Hazard Calculations shall be used.
- In addition an Electrical Work Safety Perimeter shall be established when work is being performed on apparatus that has not been verified to be in an Electrically Safe Work Condition. Entry into the Electrical Work Safety Perimeter requires the use of Arc Flash PPE.



3.2 Selection

- When it has been determined that elimination of the Arc Flash Hazard is not practical the workers shall select Arc Flash PPE that provides protection from the anticipated potential incident energy. The tables in CSA Z462-08 Table 4 and the Arc Protection Recommendations for SaskPower Transmission and Distribution can be used to assist in selecting PPE of the appropriate protection level.
- The Arc Flash PPE shall provide protection for the workers face and eyes, hearing, hands, upper and lower body, and feet.
- The Flame Resistant (FR) material used in the construction of FR PPE shall be Inherently Flame Resistant or a permanent [for the normal life of the garment] FR treatment.
- The Arc Flash PPE shall have a minimum Arc Rating of 8cal/cm² [CSA Z462-08 Hazard/risk Category 2].

3.3 General Rules

- Flame Resistant Clothing must be worn as an outer layer, not worn under other types of non-Flame Resistant garments.
- Wear protective clothing for maximum protection [i.e. collars closed, cuffs and sleeves worn down and secured]
- Only garments constructed of FR or non-melting fabrics shall be worn beneath the outer layer of Flame Resistant Clothing.

3.4 Exceptions

- This standard does not apply to work that is to be done in accordance with an approved work procedure that ensures the electrical hazards are managed by other measures i.e. Barehand procedures, rubber glove.
- Work procedures approved by local management will be developed for work on metal clad switchgear installations. When the anticipated potential incident energy exceeds 40 cal/cm² a combination of PPE, administrative controls and engineering controls will be used to minimize potential incident energy to the lowest practical level for the specific apparatus.
- Arc Flash PPE is not required for :
 - Work on apparatus that operates at less than 50Volts
 - Work on branch circuit apparatus, maximum 20 amp overcurrent protection, that has a fault level <10000 Amps

3.5 Laundering and Maintenance

- Keep flame resistant clothing clean in order to maintain flame resistance and thermal protection. Soiling (i.e. oil, gas, solvents, coal, etc.) may reduce the protective qualities and increase the risk of second and third degree burns.
- Read the label on the protective garment and follow manufacturer's specifications for cleaning (i.e. laundering or dry cleaning).
- The repair of flame resistant clothing shall be the responsibility of SaskPower. Responsibility for laundering flame resistant clothing shall be as per local procedures.



4.0 REFERENCES

- Saskatchewan
 - The Saskatchewan Occupational Health and Safety Regulations, 1996
- SaskPower (located on SafetyNet)
 - Personal Protective Equipment Policy
 - Safety Rulebook
 - Arc Protection Recommendations for SaskPower Transmission and Distribution
 - Standard Protection Code
- Third Party
 - CSA Z462-08 Workplace Electrical safety
 - NFPA70E , Standard for Electrical Safety in the Workplace
 - IEEE 1584-2002, IEEE Guideline for Performing Arc Flash Hazard Calculations