

For industrial environments ( $\geq 400$  V, 3-phase,  $>100$  A)



## Reference Standards:

SSG 4510 (SWE), NFPA-70E (USA), EN 50110-1, UK HSE EAWR, EN 61482-1-2, EN 61482-1-1, IEEE 1584 (2002/2018)

## 1.0 Identify Arc Flash Hazard Zones

### Identify and delegate responsibility:

For example, electrical safety manager, site manager, employer, H&S engineer, or designated electrical responsible person (EN 50110-1).

### Hierarchy of Control (Risk Control Steps):

1. Elimination – Remove the hazard completely from the workplace.
2. Substitution – Replace the hazard with a less dangerous one.
3. Engineering Controls – Isolate people from the hazard through design or technical measures.
4. Administrative Controls – Change the way people work, e.g. through procedures, training, and supervision.
5. Personal Protective Equipment (PPE) – Use protective gear such as gloves, visors, and safety glasses as the last line of defence.

**NOTE:** This order reflects effectiveness – elimination is most effective, PPE least effective as it relies on correct use.

### Actions:

- Identify risk locations
- Map out switchgear, distribution boards, motor controls with:
  - Voltage  $\geq 400$  V
  - Current  $> 100$  A or large motor drives
  - Aged installations
  - History of live work or faults
- Follow SSG 4510 (SWE) chapters 4–5 for marking and classification.

## 2.0 Simplified Risk Analysis

### 2.1 Fault Current Calculation

Formula:

$$I_{sc} = \frac{1732 \times S}{Z \times V} \quad I_{sc} [A] = \frac{1732 \times \text{Transformer size (kVA)}}{\text{Impedance (\%)} \times \text{Voltage (V)}}$$

**Example:** Transformer size, Impedance typically 6-8%  
500 kVA, 6 %, 400 V  $\rightarrow$  **36 kA**

### 2.2 Energy Estimation - Table Method

If no arc flash study is available:

- Use NFPA 70E (USA) or IEC 61482-1-1.
- Shorter working distance  $\rightarrow$  much higher incident energy.

Distance	System	Fault Current	Incident Energy (cal/cm <sup>2</sup> )	Recommended PPE Level
45 cm	400V AC, 3-Phase	4-10 kA	4-8	HRC 2 (8 - 25 cal/cm <sup>2</sup> )
		10-25 kA	8-25	HRC 3 (25 - 40 cal/cm <sup>2</sup> )
		$>25$ kA	$>25$	HRC 4 ( $>40$ cal/cm <sup>2</sup> )

For detailed analysis: IEEE 1584 or IEC 61482-1-1 (Open Arc).



## 3.0 When To Engage A Certified Electrical Engineer

### If the risk is not negligible:

→ Engage a certified electrical consultant to perform a full arc flash study according to IEC 61482, IEEE 1584 (2002 or 2018), or SSG 4510 risk assessment section.

### Results should include:

- Energy values (cal/cm<sup>2</sup>)
- Boundary distances (safety distance where incident energy = 1,2 cal/cm<sup>2</sup>)
- Labelling (marking each risk location)
- Inventory of protective settings

**NOTE:** This document is provided by a PPE supplier and does not replace a professional risk assessment.

## 4.0 Labelling & Signage

Follow SSG 4510 (SWE), NFPA-70E (USA) EN 50110-1, local regulations.

- Arc flash energy (cal/cm<sup>2</sup>)
- PPE requirements
- Approach boundaries
- Voltage



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## 5.0 PPE Selection

Only CE-marked PPE according to EN 61482-2.

- **HRC 1:** 4–8 cal – light
- **HRC 2:** 8–25 cal – medium
- **HRC 3:** 25–40 cal – heavy
- **HRC 4:** >40 cal – maximum

## 6.0 Training And Documentation

- Annual training on arc flash hazards and PPE use.
- Keep records: Risk assessments, PPE issue logs, training attendance.

## Country Differences (Sweden – Germany – UK)

- **Sweden:** AFS + SS-EN, SSG 4510 widely used, formal roles defined.
- **Germany:** DGUV rules + EN; higher documentation requirements.
- **UK:** HSE & Electricity at Work Regulations; “reasonably practicable” safety level.