Arc flash solutions catalogue
Australia

Safety solutions - Protecting employees and the enterprise

Powering Business Worldwide

The risk of an arc flash event is real

An arc flash hazard is a proven significant and dangerous threat to electrical personnel. Eaton's Arc Flash Compliance Program provides a comprehensive safety solution and helps ensure that you meet all of the arc flash requirements for a safe work environment.

An arc flash event releases a tremendous amount of energy in the form of heat, toxic fumes, pressure waves, blinding light, sound waves and explosions that can result in serious injuries including critical burns, collapsed lungs, loss of vision, ruptured eardrums, puncture wounds and even death.

Temperatures can reach 20,000°C - four times hotter than the temperature of the sun. These excessive temperatures cause the air and metal in the path of the arc to expand and explode, creating an arc blast. Throughout the world, arc flash threatens the safety of personnel.

Companies face lost man-hours, law suits, fines, equipment damage, facility downtime and lost production.

These kinds of faults can result from many factors - a dropped tool, accidental contact with electrical systems, buildup of conductive dust, corrosion or improper work conditions.

As personnel perform regular maintenance on electrical equipment, it is crucial that they are aware of arc flash dangers, know how to avoid them and use equipment designed to minimise arc flash risks.

Facts & figures about arc flash

What is arc flash?

Arc flash is the result of an electric current that is passed through air when the insulation between energised conductors is no longer sufficient to withstand the applied voltage.

How does arc flash occur?

The majority of arc flash events take place during or immediately after work on an electrical installation.
An arc flash is often the result of human action, such as a circuit breaker racking interlock failure, misplacement of a test probe, or dropping a tool onto live parts of an installation.

In addition, work activities such as voltage testing, fault finding and commissioning taking place with energised conductors in close proximity sometimes cannot be avoided.

One misconception about arc flash

A common misconception is the assumption that high voltage systems are more dangerous than low voltage systems with regard to arc flash hazard. The fact is that low voltage installations can have a very high potential arc energy level. Additionally, they are operated and worked on much more frequently.

The risk of an arc flash event is real

Camp Hill substation, Brisbane QLD
3 People suffered from electrical burns (19/02/2014, Brisbane Times)

Dural, NSW
Electrician received burns to his face & hands (25/05/2015, Hills Shire Time)

Sydney CBD NSW
Electrician suffered burns to 95% of his body (05/10/2012, The Sydney Morning Herald)

Morley Galleria, Perth WA
Two men died and two suffered critical burn injuries (03/02/2015, news.com.au)

Standards

Australian/New Zealand standards

AS/NZS 3007, electrical equipment in mines and quarries - surface installation and associated processing plant

- Clause 2.8.5 Arc flash / blast protection, requires that designs shall include provisions for the prevention of arc flash / blast injury. It notes that consideration should be given to the use of remote switching and refers users to IEEE 1584 and NFPA-70E for information on arc flash / blast protection.

AS/NZS 4836, safe working on or near low-voltage electrical installations and equipment

- Clause 2.3.3 advises that people working on or near energised conductors should be aware that fault currents of up to 20 times the rated current of the supply transformer can flow for short times during arc fault conditions.
- Section 9 – Personal protective equipment (PPE)
  - Table 9.1 lists the compliance requirements for various types of PPE.
  - Table 9.2 provides guidance on the selection of PPE appropriate to the task and rated current of the installation.

US standards

IEEE Standard 1584, guide for performing arc flash hazard calculation

- Provides a method for calculating the available incident energy where a worker might be exposed to energized electrical equipment.

NFPA 70E, hand book for electrical safety in the workplace

- Adopts IEEE Standard 1584: calculation procedures.
- Article 130, Work involving Electrical Hazards highlights the importance of conducting arc flash hazard analysis as part of the hazard identification and risk assessment.
  Provides guidance to determine:
  - The arc flash boundary.
  - The incident energy at the working distance.
  - Personal protective equipment (PPE) that people within the arc flash boundary shall use.

Total arc flash strategies & solutions

What happens when the available incident energy exceeds 40 cal/cm^2 at the working distance?

NFPA 70E, Article 130

– indicates that if, at the working distance, the incident energy exceeds 40 cal/cm^2, greater emphasis may be necessary with respect to de-energising when exposed to electrical hazards.

PPE provides limited protection.

In addition to the thermal energy, an arc fault can generate a significant pressure wave, noise, toxic gases and shrapnel. It's difficult to predict the injury to the worker and anyone nearby from these additional hazards.

Strategies to reduce incident energy:

A. Reduce the clearing time

B. Reduce the fault current

C. Increase the working distance

Eaton arc flash mitigation technologies

A. Reduce the clearing time

1 Arcflash Reduction Maintenance System™

2 Zone selective interlocking

3 ARCON®

B. Reduce available fault current

4 High speed fuses

5 Fault Current Limiting (FCL) circuit breakers

C. Increase the working distance

6 Remote racking

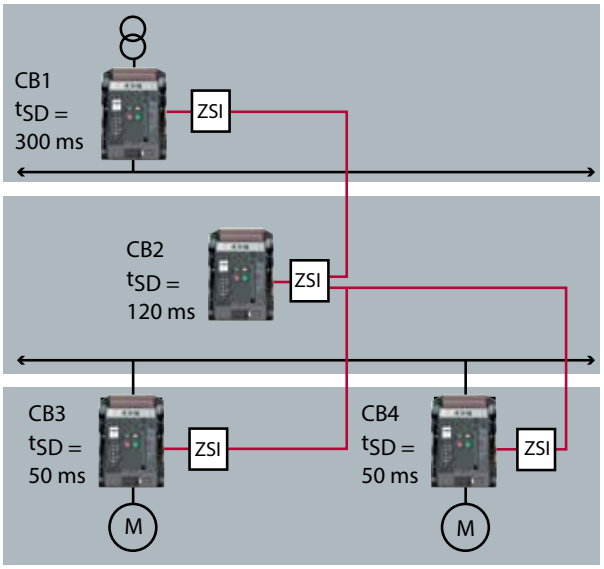
Arc flash mitigation technologies overview

Arcflash reduction maintenance system™

- Is a maintenance mode function on the Eaton circuit breaker trip unit.
- Maintenance mode can be activated either directly on the breaker or via remote switching.
- Maintenance mode allows you to reduce fault clearing time, hence reducing the available arc flash energy.

Zone selective interlocking (ZSI)

- Is a communication function available on Eaton's circuit breaker trip units.
- It allows breakers to "talk" to one another.
- The breaker closest to the fault trips, with no intentional delay (ie. Ignores pre-programed delay setting).



ARCON®

- An engineered solution, components consist of light and current sensors, evaluation unit and quenching device.
- In the event of an arc fault, emitted light and arc current will either initiate the quenching device or trip the incomer breaker.
- "Lightning fast" clearing of arc flash fault (2ms).

High speed fuses/ FCL circuit breaker

- Engineered solution using high speed fuses or fault current limiting circuit breakers.
- Limiting magnitude of the fault current.
- Clear fault in one-half cycle or less, significantly limiting the arc flash energy.

Remote racking

Provides a means of remotely racking a circuit breaker from a safe distance.

Manual racking VS remote racking

Arc flash incident energy analysis

Electrical arc flash is real, although it is an unexpected event due to unforeseen human errors. Commonly, the result is destruction of the equipment involved, fire and injury to/death of the workers involved.

An arc flash incident energy analysis is critical in order to assess the hazard and identify the appropriate PPE or a mitigation technique to protect workers.

Comprehensive analysis

Eaton's Arc Flash Service provides a comprehensive analysis of each part of the electrical network. We provide insight into the arc flash issues at any location to assess the hazard.

In addition we can investigate possible solutions to lower the hazard of an arc flash and ways to limit the workers' exposure by system design, equipment modification, alternative protection settings, applying maintenance mode and remote switching. These are only a few of many methods which can be used to effectively improve electrical safety.

It is a small but necessary investment, because we want to protect what matters most – our greatest asset being our people.

Eaton's electrical business is a global leader with expertise in power distribution and circuit protection; backup power protection; control and automation; lighting and security; structural solutions and wiring devices; solutions for harsh and hazardous environments; and engineering services. Eaton is positioned through its global solutions to answer today's most critical electrical power management challenges.

Eaton is a power management company with 2014 sales of $22.6 billion. Eaton provides energy-efficient solutions that help our customers effectively manage electrical, hydraulic and mechanical power more efficiently, safely and sustainably. Eaton has approximately 102,000 employees and sells products to customers in more than 175 countries.

For more information, visit www.eaton.com.

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