Increases personnel safety and reduces PPE requirements

What is a flash hazard?

Personnel safety is of paramount importance in today's work environment. Of recent concern is the potential for serious injury due to exposure to electrical arcs. There has been a lot of research performed and recent standards have been written, NFPA® 70E-2004 and IEEE® 1584, to address the risks of arc-flash hazards for personnel working on or near energized electrical equipment.

NFPA 70E-2004 defines Flash Hazard as: *A dangerous condition associated with the release of energy caused by an electric arc.* This is primarily heat energy and may result in serious or life-threatening burns.

Eaton has developed solutions to increase personnel safety by reducing the potential released heat energy.

Proper protection for the flash hazard

In an arc-flash incident, electrical energy is converted into heat, pressure, visible light and radiation. The present practice for flash hazard analysis considers only the heat energy (incident energy) exposure. Incident energy is measured and expressed in calories per centimeter squared (cal/cm^2). The goal is to minimize personnel exposure to incident energy levels less than 1.2 cal/cm^2 (Hazard Category 0). Higher energy levels can result in second degree burns or worse.

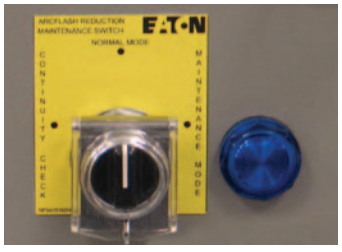
Present analysis methods generate warning labels that enable personnel to select the appropriate personal protective equipment (PPE) based on the available incident energy hazard level.

Alternatives to reduce PPE requirements

1. De-energize equipment. Not always feasible.
2. Move the person farther away from the electric arc. This can be achieved with tools and techniques such as remote racking or remote switching.
3. Lower the available fault current. This may be difficult to achieve.
4. Change the overcurrent protection to a faster tripping time. This can be easily accomplished with an Arcflash Reduction Maintenance System™ retrofit.

Arcflash Reduction Maintenance System

A circuit breaker equipped with an Arcflash Reduction Maintenance System can improve safety by providing a simple and reliable method to reduce fault clearing time. The Arcflash Reduction Maintenance System is controlled by a lockable switch than can easily activate a faster tripping time at the work location and be incorporated into a lockout/tagout (LOTO) procedure. Equipment downstream of a circuit breaker equipped with an Arcflash Reduction Maintenance System can have a significantly lower incident energy level. An Arcflash Reduction Maintenance System can be applied to any LV power breaker by modifying the existing Digitrip™ trip system or retrofitting a breaker with a Digitrip retrofit kit.



Door-Mounted Hardware

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Benefits of the Arcflash Reduction Maintenance System

- Increased personnel safety—by limiting the available arc-flash energy
- Simple to operate
- Enabled with the circuit breaker door closed by a door-mounted lockable switch (no extra PPE required)
- Enabled only for the time required to perform the work
- Preserves overcurrent coordination under normal conditions
- Reduction in incident energy levels may permit reduced levels of PPE, improving worker comfort and mobility

Application of the Arcflash Reduction Maintenance System

The Arcflash Reduction Maintenance System has five pickup settings that must be chosen by an experienced power system analyst. The setting is chosen to avoid nuisance tripping due to load and/or transient currents. This "engineered" setting is enabled with a simple lockable switch. In addition, remote annunciation is possible through use of an available auxiliary contact.

Application examples

Figure 1 and **Figure 2** are examples. Both graphics are coordination curves with increasing current along the horizontal scale and increasing time along the vertical scale. The maximum available bolted fault current is where the individual colored bandwidths end. IEEE Standard 1584 provides the most probable arcing current based on laboratory testing. The standard also requires checking at 85% of this arcing value. The hazard risk category must be selected based on whichever of these two values produces the worst incident energy based on magnitude and device clearing time. The appropriate arcing currents are shown on the graphics.

Figure 1 shows an existing 600A breaker with trip settings selected to override motor starting. The arcing current is calculated to be 5.1 kA. With existing breaker settings, the incident energy is greater than 40 cal/cm^2 (greater than NFPA 70E Hazard/Risk Category 4) due to the excessive time of tripping. **Figure 1** also shows the application of the Arcflash Reduction Maintenance System, which provides high-speed clearing (0.05 seconds) to reduce incident energy to less than 4 cal/cm^2 (NFPA 70E Hazard/Risk Category 1).

Figure 2 shows another example with much higher available fault current and a 1600A frame breaker. An Arcflash Reduction Maintenance System setting is chosen (5.9 x), which is above the total load plus transient load (5.92 kA) and below the minimum arcing current (16.98 kA). In this example, the incident energy/Hazard Risk Category was reduced from 10.7 cal/cm^2 (NFPA 70E Hazard/Risk Category 3) to 2.2 cal/cm^2 (NFPA 70E Hazard/Risk Category 1).

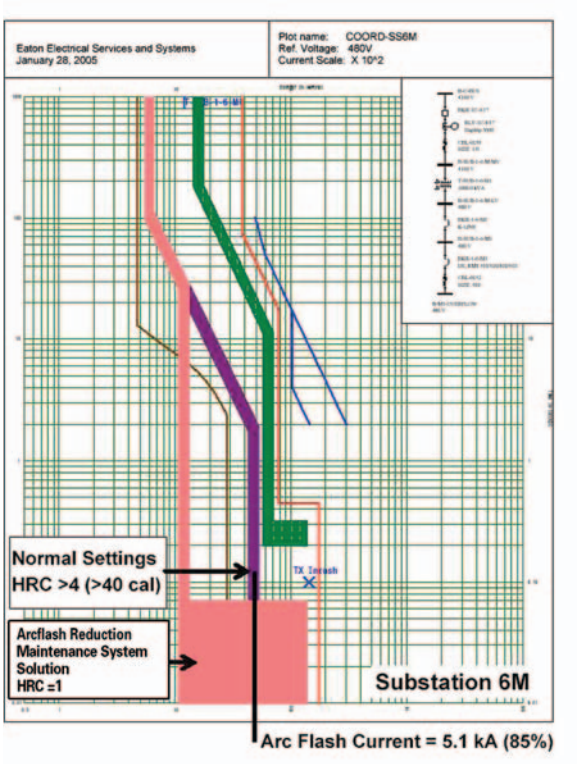

Figure 1

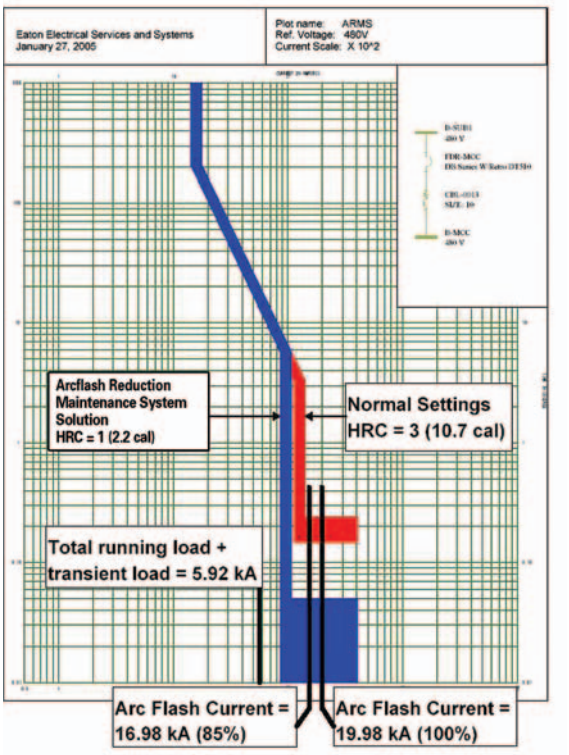

Figure 2

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