

PLANT ENGINEERING[®]

January 2008
PlantEngineering.com

ELECTRICAL CONNECTION

Common-sense practices help keep employees safe

Electrical safety is increasingly important to OSHA. While many regulations are involved, here are seven common-sense best practices that can help ensure plant safety and minimize unnecessary downtime.

Assure selective coordination

Selective coordination of circuit protection prevents an overload, short-circuit or arc-flash event in one circuit from causing other circuits fed by the same feeder upstream to lose power. While the NEC requires selective coordination for certain circuits, such as those supplying power to emergency equipment, health care facilities or elevator circuits, it's also considered a best practice anywhere in a manufacturing plant where uptime is critical.

Use current-limiting protective devices

Current-limiting fuses or circuit breakers clear a fault before the maximum available fault current can flow, in less than ½ an ac cycle (8.3 ms). By limiting the maximum stress on components, this effectively increases the short-circuit current rating and life expectancy of an electrical panel, making it safer and more reliable.



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Current-limiting fuses also contribute to selective coordination and meet NEC 110.9 and NEC 110.10 design requirements. A properly sized current-limiting fuse or current-limiting circuit breaker near the load will open before a non-current-limiting breaker located upstream.

Current limiting devices provide an added benefit: they help reduce arc-flash hazards. By reducing the peak current and duration of an arcing fault, they reduce the incident energy of an arc flash. For example, consider the transformer metering section of a 2,000 kVA, 4,160 V/480 V substation. If the transformer secondary is protected with a conventional non-current limiting circuit breaker, the incident energy from an arc flash could reach 10.5 cal/cm², placing it in

Hazard Risk Category 3 with a Flash Protection Boundary of 34 inches. If the transformer secondary is protected with current-limiting Class L fuses, the incident energy is reduced to 1.27 cal/cm², placing it in Hazard Risk Category 1, with a Flash Protection Boundary of 12 inches.

Perform an electrical hazard assessment

NFPA 70E requires an electrical hazard assessment prior to work on or near electrical conductors that are, or may become energized. The results of the assessment are used to determine the work practices, protection boundaries and personal protective equipment required to protect employees from an arc flash and electrical shock.

Anything that a plant can do to reduce the risk of arc flash to its workers is required by OSHA and is a best practice.

Turn it off

The best way to prevent problems when working on electrical equipment – and the method preferred by OSHA – is to shut off the power before working on or near any enclosure that may contain exposed energized components. After donning the appropriate level of PPE (as determined by a properly executed electrical hazard assessment), a qualified worker must test potentially live parts to ensure that the equipment is in an electrically safe condition. After that is done, there are no concerns about boundaries, PPE and Hazard Categories.

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Document it

A company can train and provide proper PPE, but if it isn't documented, OSHA may assume it didn't happen. Specify the required worker qualifications, precautions, tools and PPE – as well as the reasons for them – in work orders. A recommended practice and requirement of NFPA 70E is to use Energized Electrical Work Permits when planning work on or near energized equipment. The permit must include the reason for live work.

Maintain protective devices

Exercise circuit breakers by turning them off and back on yearly. This keeps the contacts clean, makes sure the lubricant is properly distributed and verifies that the breaker isn't frozen in position. Failure to exercise breakers

in this manner could have catastrophic consequences.

Some circuit breakers can be adjusted for short or long time delays and instantaneous current. The problem is that some users mistakenly increase the settings to eliminate nuisance trips. Doing this incorrectly (by increasing the instantaneous current setting) can dramatically increase arc-flash hazards; it may also defeat selective coordination. Only a trained engineer should change a breaker setting.

Update, consolidate fuses

The number of and types of fuses used in a typical manufacturing plant tend to grow with time, making spares stocking a bigger job, tying up money and making it hard to find the right fuse when

it's needed. Invite the fuse vendor into the plant for a free assessment of all the fuses being used.

Most manufacturers or distributors can recommend a much shorter list of replacement fuses that consolidates inventory and upgrades fuses to the latest current-limiting fuses.

Some modern fuses have indicator windows that allow workers to easily identify blown fuses, are safer to replace, extend the life of the equipment and will reduce arc-flash hazards. Some vendors also offer stocking programs, in which they replenish stock as needed – one less task for plant personnel.

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Page layout as originally published in Plant Engineering has been modified.

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