INDUSTRIAL

Workplace safety is everyone’s business, and most industrial companies in North America have made safety a top priority over the past few decades. Yet today accidents, injuries, and even death on the job do occur. In 2012, for example, over 4,300 workplace fatalities were reported. Of these, 156 were caused by electrocution. From 1992 through 2010, an average of 268 workers died from electrocution each year, and in 2009 there were 2,620 non-fatal injuries due to contact with electrical current.

It’s certainly good news that workplace injuries and fatalities are trending downward, but their numbers are still far too high. In addition to causing pain, suffering, and loss to victims and their families, as well as having a negative impact on other workers, accidents due to electrical safety code violations can have a negative economic impact on employers, including significant financial penalties and high costs related to medical and disability expenses.

INDUSTRIES WITH GREATEST RISK

According to the Electrical Safety Foundation International (ESFI), a high percentage of accidental workplace fatalities from 2003 through 2010 occurred in the construction, manufacturing, utility, transportation, agriculture, mining, and natural resources industries. What do all of these fields have in common? In most cases, their workers perform their jobs in harsh and often wet or hazardous environments, both indoors and outdoors, and typically are involved in using high-powered electrical equipment.

Examples of some high-risk work environments include:

- Oil and gas refineries, mines, and quarries
- Water treatment plants
- Power distribution plants and public and private utility service and repair operations
- Commercial construction and large transportation sites (roads, bridges, airports, etc.)
- Large, automated agricultural plants
- Food, beverage, and chemical processing facilities involving heavy machinery and frequent equipment washdowns
- Indoor and outdoor event sites such as sports stadiums, concert venues, convention centers, and golf tournament and temporary festival setup areas

In these settings, whether indoors or out, unprotected electrical connections exposed to moisture, metals, and harsh conditions can cause interruptions in power flow. Improper use of equipment can cause problems, ranging from nuisance tripping or short circuits to major malfunctions that pose significant risk of injury and death, such as fires and electrocution.

While large industrial operations face the greatest level of risk, even smaller operations are not risk-free. Frequent incidents of electrical shocks and nuisance tripping are cause for concern even for smaller contractors who maintain teams of individual tradespeople, such as electricians, plumbers, and construction workers, to build homes, small office buildings, and stores.

In addition to wet environments and improperly done electrical connections, another potential cause of electrical mishaps on the job is the workers themselves. It’s not uncommon for workers to decide to take dangerous shortcuts instead of following their employer’s mandated safety regulations.

Under time pressure, workers may justify overriding the rules (and their own better judgment) just to get the job done, or to get it done faster to avoid production downtime or delaying completion of the assigned task. This need for speed coupled with false confidence in one’s own expertise poses a potentially lethal risk—definitely not a risk worth taking.

FOLLOWING THE CODES REDUCES RISK

An important step toward creating safer workplaces is to study and follow electrical safety codes such as those set forth in the National Fire Protection Association’s (NFPA) National Electrical Code. The NEC is an advisory set of guidelines published specifically to safeguard persons and property from electrical hazards.

Another key agency is OSHA. Many local authorities having jurisdiction have adopted NEC standards for safety and best practices, and industrial companies are bound by law to follow OSHA regulations.
Both NEC and OSHA concur that:

- Electrical equipment must be free from hazards likely to result in dangerous conditions, injuries, or fatalities.
- Worker protection must be provided in wet locations, and workers must be protected from live equipment.
- Workers must be protected from ground faults through the use of ground fault protection.

A ground fault circuit interrupter (GFCI) is an electrical wiring device that disconnects a circuit whenever it detects that the electrical current is not balanced between the energized conductor and the return neutral conductor. Such an imbalance may indicate current leakage through the body of a person who is grounded and accidentally touching the energized part of the circuit, resulting in an electrical shock. GFCI devices are designed to disconnect quickly enough to prevent injury caused by such shocks.

GFCI devices can be placed on individual electrical power cords (in-line GFCI), or can be deployed systemically to protect an entire system from ground faults, nuisance tripping, and other hazards. For employers and workers alike, the advantage of adopting the systemic approach within a fixed plant or operation is the assurance of having “always on” worker protection in place.

To help them achieve this goal, both NEC and OSHA define proper electrical safety practices in detail, right down to the individual component level. The codes also spell out how employers can provide safety for their teams and assets when working at more temporary sites—such as building construction, tunnel repairs, or entertainment event setup.

**CODE-COMPLIANT GFCI COMPONENTS**

While it’s not practical to include all of NFPA’s NEC guidelines and OSHA regulations here, following is a snapshot of some key GFCI components and requirements as stated in the industrial standards.

**CORDSETS**

Extension cords used with portable electric tools need to be 3-wire and rated hard or extra-hard usage cable. (The same standard applies to temporary and portable lights.) Recommended types include: Type S, SE, SEO, SEOO, SJ, SJ/E, SJEO, SJEOO, SJ/O, SJ/T, SJ/TOO, SO, SOO, ST, STO, STOO, EV, and EVJ.

These rugged cords are made with heavier gauge wire and are thicker and much better insulated than light-duty cords designed for use in residential and office settings. Flimsy cords laid on a plant floor or in any damp or harsh environment can too easily be crimped, bent, broken, or cut by heavy foot traffic or heavy rolling equipment.

To protect workers from accidental contact with live conductors, both NEC and OSHA require adequate strain relief for cables entering junction boxes, cabinets, or fittings, and openings through which conductors enter must be effectively closed.

Finally, when choosing extension cords, remember that cords should not exceed 100 ft in length. Excessive distance can trigger nuisance tripping, and a worker may not even realize that the long cord is the source of the problem.

**OUTLET BOXES/RECEPTACLES**

For wet or damp areas, it’s essential that all equipment and wiring devices, including single and duplex receptacles, be designated for use in wet locations, so that water cannot enter or accumulate inside. NEMA 4, 4X, 6, 6P, IP65, IP66, and IP67 are considered to be “watertight.” Similar NEMA and IP standards also apply specifically to locations that are exposed to gases, fumes, vapors, liquids, or other agents which can have a deteriorating effect on conductors and equipment.

In duplex receptacles, outlets should be flip-lid protected, with an individual flip lid for each outlet. If both outlets are not protected, moisture would be able to penetrate the unused (empty) outlet when the other one is being used.

Unless listed as portable, boxes must be rigidly supported from a structural member of the building and all box openings must be adequately closed to guard against accidental contact with live equipment.

In selecting code-compliant GFCI components for workplace safety, it’s important to choose products from a reliable source. Taking a “total GFCI system” approach and sourcing the components from a highly rated supplier can eliminate the complexity and ensure that all parts will be compatible. As you evaluate marketplace offerings, you will find that leading vendors now offer innovative components that not only meet OSHA and NEC standards, but also provide superior construction, performance, and reliability.