Electrical Safety
IN THE WORKPLACE

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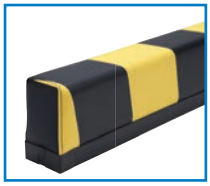

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PUBLISHER'S NOTE

Welcome to our first issue of 2022. The start off the new year, we have a call to action (as well as breaking news from OSHA) to share to you from Scott Margolin, Co-Chairman of The Partnership for Electrical Safety. Margolin is seeking arc flash stories to help educate the industry to take proper care against arc flashes. Will you consider sharing? Read his message below.

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Warning: this isn't a usual article where you read to get information; we're turning that model upside down and asking you for information instead. The Partnership for Electrical Safety (PES) would like to hear your arc flash stories. We understand the common reaction, "I can't share, I'm not allowed," and we very much hope to change that culture. When a train derails or a ship sinks, or a product injures people, there is an investigation, causes are determined and findings are shared so that all may learn from it and be safer in the future. This is also true in other more directly analogous situations like bullet resistant vests for police and soldiers. But somehow, it hasn't been true with most arc flash incidents… causes and learnings tend not to be shared outside the company, and sometimes not even inside it. The old adage rings far too true here: those who do not learn from the past are doomed to repeat it. Please, help us help others by sharing your stories and learnings even if we have to redact specifics like names and companies.

People learn more and remember better and longer through stories than we do through facts, logic, and lectures. If you have an arc flash story, you can help put a human face on the dry statistics by sharing key details where possible. Publicized saves encourage people to obtain and properly wear PPE; when a police officer is saved by a ballistic vest, there are almost always news stories and awards, and others learn the vests work and are more likely to wear them. IACP (International Association of Chiefs of Police) even helps sponsor a Survivor's Club, whose mission is to honor "law enforcement officers who have survived a life-threatening situation as a result of wearing body armor. By recognizing officers through our program, we elevate the importance of wearing body armor for officer safety. The ultimate goal of the Survivors' Club is to reduce injury and death by encouraging officers to wear personal body armor during every shift."

If this sounds like a great parallel for arc flash safety, it should… because this program played a major role in shifting the culture and wearing the vests and has saved hundreds of lives (and counting) as a result. We at PES intend to encourage similar engagement within the arc flash world.

SHARING MISTAKES TOO

The other side of this coin is more difficult. But sharing mistakes, painful as they may be to relive and hard as they may be to admit, unquestionably helps others to work more safely and saves lives. Some people have even made it their calling in life; Brandon Schroeder (https://believeinsafety.com) is an excellent example. Schroeder speaks very openly and effectively about the cascade of events that led to his arc and the consequences he and his family suffered, as well as what can be done differently. Everyone who hears him speak is moved and gains a new perspective; more people sharing more incidents more often will without question help drive safer work and reduce injuries and fatalities. There are still more than 600,000 American electrical workers doing energized work without PPE, despite a standard (NFPA 70E) that's addressed arc flash for over 20 years. This continues to result in catastrophic injuries and fatalities, and we simply MUST change the dynamic. Don't work energized if you don't have to, and if you do, recognize the arc flash hazard, and don't wear fuel. Get and wear the appropriate arc rated clothing and other PPE.

We'd like to hear about arc flash events where people were saved from injury or more severe injury by PPE, as well as incidents which resulted in less desirable outcomes due to lack of PPE, inadequate

PPE, or improperly worn PPE. If you're able to share names that's ideal, but if it's simply not possible, comments like "Mr. X was in his mid-30s, with 12 years' experience" instead of a person's name and "at a mid-sized electrical contractor in the northeast" instead of a company name will work. We'd like to encourage a culture where we celebrate saves and learn collectively; where people and companies are applauded for the things they do right and share learnings to reduce bad outcomes in the future. PES absolutely will not share any stories without permission, and will not reveal names of people, companies, or specific locations without express written permission. We'll use these stories for educational purposes only, to help industry understand the magnitude of the problem and the successes in addressing it. Submitters who specifically choose to do so will have their stories featured on the PES website; we'll confirm your intent before posting. You can submit at smargolin@partnershipforelectricalsafety.org or on the website https://partnershipforelectricalsafety.org.

BREAKING OSHA ARC FLASH NEWS

In addition to working with industry, PES has been engaged in helping DOL, Congress, and OSHA understand the magnitude of the hazard posed to commercial and industrial electrical workers in America. Last summer both the U.S. Senate and the House of Representatives sent bipartisan letters to DOL expressing concern over the lack of progress and the sheer number of unprotected workers and the injuries and fatalities which result. OSHA responded to Congress, and here are three excerpts from their response that directly address this issue:

OSHA agrees with you on the seriousness of industry hazards associated with arc-flashes

OSHA expects employers to fully protect their employees, and requires the proper use of PPE with respect to the use of arc-rated clothing under Subpart S to ensure that employees are fully protected from arc-flash hazards. The LOI contains recommendations that employers consult updated versions of consensus standards such as NFPA 70E…

The exchange between Congress and OSHA led to a request for a meeting, which was held just before this magazine went to press, on January 28th, 2022. That meeting included Congressional staff, a significant number of OSHA representatives from multiple Directorates including Enforcement, Construction, and Standards and Guidance, PES Board members, and the IBEW, among others. The primary subject was the >600,000 American electrical workers who are still not provided life-saving arc flash protection despite a standard that's been in place for over 20 years, and the fact that that this huge number of unprotected workers has remained static for at least a decade.

The Partnership for Electrical Safety views this renewed level of focus and engagement by Congress and OSHA as a clear signal that this situation must be addressed and rectified. The path forward and timing are yet to be determined, but this new engagement and actions should serve as advance notice that arc flash PPE is very much on the radar, and that further action may be forthcoming. Stay tuned.

– SCOTT MARGOLIN

Electrical Safety IN THE WORKPLACE

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AD INDEX

Ensuring UL-Compliant Jobsite Power

By Brian Earl, Contributor

Critical to safe jobsite power, UL announced two new standards affecting Jobsite Temporary Power – UL 943 affecting GFCI's and UL 1640 affecting Open Neutral Protection, effective May 5, 2021.

These two mandates are particularly impactful as they both involve life safety measures to prevent electrical shock.

UL 943

Throughout GFCI evolution, UL 943 provides specific requirements for ground-fault circuit-interrupters that adhere to the electrical installation codes of Canada, Mexico, and the United States. As of May 5, 2021, UL 943 requires that products used in portable applications (in-line GFCI cordsets and Portable Distribution Units, for example) incorporate auto testing technology to further elevate worker and worksite safety.

UL 1640

UL 1640 applies to portable power distribution units (PDUs) which regulate and provide power to locations without adequate, existing distribution systems. To attain UL 1640 compliance in a construction site, a product must provide open neutral protection, along with standard GFCI protection.

UNDERSTANDING THE BASICS OF HOW UL 943 AND UL 1640 WORK TOGETHER

UL 943 ensures that GFCI's work as intended by automatically and continuously testing their circuitry. Jobsites are harsh environments where GFCI typically fail through moisture and dust intrusion, or electrical power surges. GFCI's by nature are mechanically held devices. Meaning once you latch the device, unless it trips, power is being delivered to the receptacles. In their operation, GFCI circuity monitors the hot, neutral, and ground conductors, measuring the amount of power that goes out and is returned. If there is a difference, the circuit immediately releases and prevents shock to the user. On jobsites with portable cords supplying power to portable distribution units (PDU)'s (often called spider boxes or sleds either because of the cords that exit at all angles or because they are often dragged along by their cords, like a sled), there is a potential for the cord be damaged, perhaps the neutral severed, leaving the hot conductor intact and rendering the GFCI module in operative to sense a fault.

Since the GFCI is a mechanically held device, power from the hot conductor would still flow through the GFCI receptacles. Without the neutral conductor to sense a fault, the remaining hot conductor and power could cause electrical harm to a worker.

Enter UL 1640. Among several requirements for safe electrical design, construction. and wiring practices, is the requirement for open neutral protection for electrical receptacles. In the situation described above, if the neutral conductor was damaged or severed the open neutral relay, protecting the electrical outlet would release.

Together, these two UL Standards ensure safe electrical power is continually delivered to electrical receptacles in portable electrical devices including GFCI in-line cord sets used in portable applications. ESW

Brian Earl is VP of Marketing, Product Management and Sales at Ericson Manufacturing (www.ericson.com).

What Does a Comprehensive Electrical Safety Program Look Like?

By Dave Hernandez, Contributor

For employers, engineers, and safety managers, creating a workplace where team members know how to approach electrical hazards is a top priority. NFPA 70E offers standards and guidelines to build out an effective electrical safety program and provides procedures for energized work to be performed, based on electrical safety rules established by OSHA.

A comprehensive electrical safety program only works when employees uphold the best safety practices, and everyone is held accountable for safety. Your program should be developed specific to your work environment and appropriate for voltage, energy levels, and circuit conditions.

The foundation of an effective electrical safety program is a thorough arc flash study that analyzes all potential hazards and provides employees the information to make the right safety decisions.

NFPA 70E breaks down electrical safety programs into five parts – Principles, Controls, Procedures, Hazard/Risk Analysis, and Audits.

Hazard/risk analysis provides the data procedures are developed around, then work in combination with control methods and safety principles employees follow. Procedures should be designed for each specific task. While the hierarchy of risk controls (HORC) outline six general methods for controlling electrical hazards and can be explored in more detail in the NFPA 70E.

There are two methods of hazard/risk analysis that can be used – The PPE Category Method or the Incident Energy Method.

The PPE category method is used in cases when an arc flash study has not been performed and equipment is not labeled with arc flash incident energy. Before doing any live electrical work, calculations need to be made on the spot to determine the proper PPE category for the job at hand.

The incident energy method is more efficient and reliable than the PPE Category method. When using the incident energy method, a comprehensive arc flash study is performed, then all calculations are generated, and electrical equipment and panels are labeled so that workers do not have to perform the calculations themselves. Labels display the incident energy level that tell employees the precise PPE rating to suit up in before performing the work.

Audits are a regular part of any electrical safety program and make certain that workers have the ability to perform their jobs on par with established procedures. Programs should outline the way team members will be evaluated on their adherence to safety principles. OSHA and NFPA require annual audits and updates on a three-year code cycle.

The goal of every comprehensive electrical safety program is protecting employees from shock, burn, blast, and other hazards. By addressing the following areas, your program will be up to NFPA recommendations.

CREATING YOUR PROGRAM

First, your safety program should be standardized and written out, with proper lockout/tagout procedures.

Then it's important to keep up with training. Qualified electrical workers should complete safety training every three years and contact release training should occur annually.

Arc flash studies should be conducted every five years as part of hazard/risk analysis. The alternative is utilizing the PPE category method each time work is performed, but that can be tedious.

PPE accessibility is critical to keeping team members safe. Voltage rated gloves must be available and switched out every six months

to ensure performance. Arc Flash PPE must be available for work on high energy panels, whether it's part of a worker's regular uniform or additional protective layers needed for the job. All equipment should be kept up to date, accessible, and maintained.

Finally, no worker should perform electrical work unless they're qualified for the project and current with their training. It's important that electrical safety programs detail the training required for each task.

Always ensure the right PPE and tools are used on the job and the PPE category method or incident energy method is used when performing hazard/risk analysis for work on or near energized lines. Electrical shock ratings and arc flash should always be part of hazard/risk analysis, whether the PPE or incident energy method is used.

THE BENEFITS OF A THOROUGH PROGRAM

A comprehensive electrical safety program will also help protect your property and equipment. General housekeeping keeps equipment clean and free of debris and can save money in the long run.

Checking for exposed live parts can help prevent accidents. Live parts should always be properly contained. Make sure no panels are missing breakers, panel blanks, or cut out holes, and junction boxes are not missing covers.

Establish proper working clearances based on equipment voltage class. Qualified team members should be able to work safely around equipment and steer unqualified employees clear of the area. Equipment needs to be properly spaced to comply with NEC.

Regular maintenance, like testing, commissioning, and regularly scheduled shut downs for cleaning are crucial. Infrared scanning can be used to locate hotspots within electrical systems and direct maintenance needs.

Voltage markings should be clearly visible on panels, and panels should be named in an organized way on electrical schematics.

Communication is another key component of every comprehensive electrical safety program. Each job should be planned, and written procedures should be established the first time a task is performed.

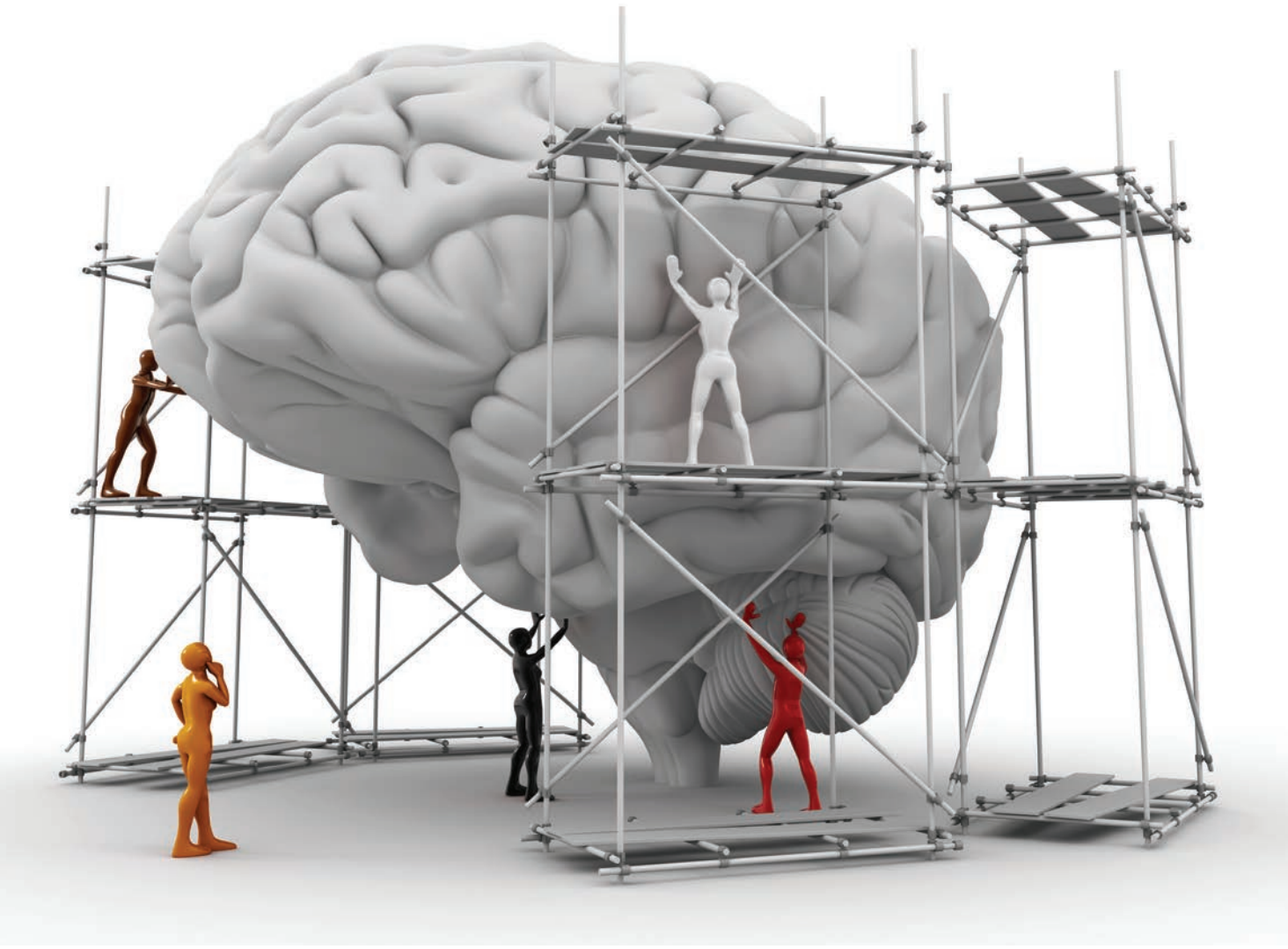
NFPA 70E requires briefings for each task so employees are aware of hazards, procedures, controls, and the PPE they'll need. When a task is complex or highly hazardous, a more thorough discussion may be necessary. Hazards should always be the focal point because they might not always be apparent to the worker.

When it's time to engage in electrical work, all equipment should be inspected to ensure insulation and integrity of enclosures. Consider all equipment energized until an electrically safe work condition has been established with the methods detailed in the NFPA 70E.

If it's necessary to perform energized work, it's important to use established procedures and proper PPE. Document all energized tasks on work permits approved by a safety manager.

Designing a comprehensive electrical safety program takes effort and diligence. Starting with a thorough arc flash study as the foundation, proper hazard/risk analysis, development of controls and procedures, maintenance, and communication make your facility safe for everyone on your team. ESW

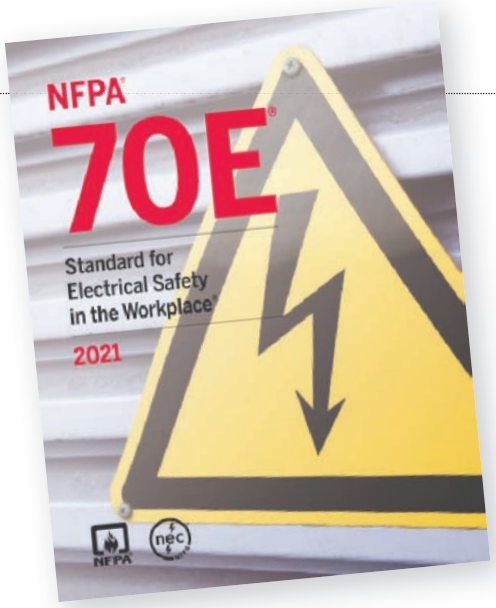
Dave Hernandez, PE, CEM, GBE, CESCP is a distinguished Professional Engineer licensed in 52 U.S. jurisdictions and serves as the Chief Operating Officer at Electrical Power & Safety Co. (https://epsco.co), a world leader in electrical safety. He has overseen over 20,000 electrical projects, sits on various industry committees, and has published several white papers.



Reconstructing How We Deliver Electrical Safety Knowledge to Minimize Exposure and Help Save Lives

By Corey Hannahs, Contributor

Electrical safety is without question a critical component to a successful electrical installation. Yet many seem to have differing viewpoints on what is safe and what risks should be taken. At the root of every electrical safety incident is a person who made a choice, based on the information they had available. Sometimes proper training is not provided and at other times, proper training may have been provided, but chosen not to be utilized by the individual. Either scenario can end in a fatal result, or a non-fatal physical or mental injury that continues to impact the victim for years to come. Even when the incident proves to be non-fatal, long-term sequalae, or lingering effects, from a previous electrical injury have been known to produce neurologic, psychological, and physical symptoms. With so much at stake, it is crucial that electrical safety training continue to be reevaluated by all involved to determine where we can improve.



NFPA 70E

Having proper knowledge of how to perform electrical tasks safely is a necessary, solid foundation. NFPA 70E® Standard for Electrical Safety in the Workplace® should be the cornerstone that electrical safety training is built upon, as it provides guidelines and procedures for working safely around electricity. Something to consider is modifying how much training on electrical safety takes place. For example, looking at the apprenticeship model in my home state, there is a minimum of 576 hours of classroom-based related technical instruction (RTI) required. Of the 576 required hours of RTI, 450 hours are mandated to have so many hours trained on specific components. The safety component requirement is 10 hours of the 450. There is also no mandate that those 10 hours be electrical safety training such as NFPA 70E, as it could revolve around first aid, CPR, AED, OSHA training, etc. and still meet the requirement specifications. All things considered, an apprentice could go through an entire 576-hour program and receive only 10 hours - equating to 1.74% of the full program hours - of safety training that may or may not be electrical safety based. Sure, there are 126 hours additional flexible RTI hours of training available to train on electrical safety, after the 450 required hours, but there is no mandate that electrical safety is part of those additional hours. And my state is likely not unique to this arrangement of electrical apprenticeship hours, as many states utilize similar templates provided by governmental organizations, such as the United States Department of Labor, as a baseline to create their individual state Standards of Apprenticeship. The quantity of electrical safety training that is required should be revaluated to better align with how important being safe around electricity is for individuals. There has to be more emphasis placed on the need for safety training that is specific to working around electricity within apprenticeship programs. Occupational Safety and Health Administration (OSHA) Standard 1910 has specific rules to help keep individuals safe when working around electricity, like Personal Protective Equipment (PPE) in Subpart I, that are often met by using procedures within NFPA 70E. But training on these rules are not always built into apprenticeship programs themselves. Where required, employers often look to outside resources to train on NFPA 70E procedures that will help meet OSHA requirements. Apprenticeship programs need to be designed so the applicable electrical safety training is built into their programs and employers can train additionally, as needed, for job-specific or industry-based tasks.

Another item to consider is the methods by which electrical safety training is delivered. In the aforementioned apprenticeship program example, safety training is one of many training components within the program. But electrical safety is a critical part of many of the processes and procedures that are learned in other areas of an apprenticeship. How can a defective circuit breaker be changed out safely if electrical safety procedures aren't followed as part of the process? Teaching electrical safety as part of the specific task process,

instead of as a stand-alone component, would allow apprentices to learn safety as a step that is already built into the task. Just as it is learned that you turn a screwdriver to the left to loosen a screw that holds a circuit breaker in place, it could also be learned that establishing an electrically safe work condition (ESWC) is an integral step in safely changing out a defective circuit breaker. Understanding electrical safety is part of the process but building it into specific tasks will help individuals understand electrical safety needs and form habits helping to ensure they return home safely each night. As constructors, methods are constantly revaluated to build things that are more viable and sustainable, always trying to determine how to "build a better mousetrap." If there is a better way to reconstruct the delivery of electrical safety training, versus the way it has always been done, it only makes sense to move forward doing so. Safety needs to be trained as a step built into the task-specific process and not treated as an add on component.

Electrical safety is ever evolving and no one person holds all the answers. It becomes necessary to look at and evaluate what becomes the norm, eliminate any complacency, and be open to rethinking how we train electrical safety. College football coach Bo Schembechler was known for saying, "Every day you either get better or you get worse. You never stay the same." When it comes to electrical safety, I believe that also holds true. We must continue to use every new day as an opportunity to get better on how we train electrical safety. Lives depend on it. ESW

Corey Hannahs is a Senior Electrical Content Specialist at the National Fire Protection Association (NFPA). In his current role, he serves as an electrical subject matter expert in the development of products and services that support NFPA documents and stakeholders. Hannahs is a third-generation electrician, holding licenses as a master electrician, contractor, inspector, and plan reviewer in the state of Michigan. Having held roles as an installer, owner, and executive previously, he has also provided electrical apprenticeship instruction for over 15 years. Hannahs was twice appointed to the State of Michigan's Electrical Administrative Board by former Governor Rick Snyder, and he received United States Special Congressional Recognition for founding the B.O.P. (Building Opportunities for People) Program, which teaches construction skills to homeless and underprivileged individuals.

Electrical Safety Finds Its North Star

By Derek Vigstol, Contributor

For years, the electrical industry has sought answers to the ever-present question, "How do we balance the work we need to perform with our desire to stay alive and in one piece at the end of a shift?"

It wasn't that long ago that our safety on the job was in our own hands with little more than the knowledge of previous generational experience to guide us through the perils that lie in wait for us when working with electrical systems. Of course, things have been improving significantly with the rise in popularity of NFPA 70E®: Standard for Electrical Safety in the Workplace®. However, injuries and fatalities from electrical causes have plateaued in recent years, and while NFPA 70E has been a great starting point, it is time to find our true guiding star, the electrical safety program.

A company's electrical safety program is not a new concept or idea by any means. Many employers have implemented wildly successful electrical safety programs over the years and many of these stellar plans have fed into the success and revisions of NFPA 70E itself. However, there are many out there that need some work yet. Let's look at some of the common misconceptions when it comes to a company's electrical safety program and how we can debunk some of these mistakes.

COMMON MISTAKES OF AN ELECTRICAL SAFETY PROGRAM

First, it is not uncommon for companies to say, "Our electrical safety program is that we follow NFPA 70E." This is relatively common among small to medium-sized employers that might not have anyone who fits in the full-time role of an OHS professional, and it is not unheard of for companies that do have a safety professional on staff. This is a relatively simple fix since they have already agreed that they are going to follow NFPA 70E. We simply need to point out that there are two sections in the document that require an employer to draft a program. Section 105.3 states that it is the responsibility of the employer to establish, document, and implement the safety-related work practices and procedures required by NFPA 70E, and 110.5(A) requires that the employer shall implement and document an overall electrical safety program. Therefore, if you follow NFPA 70E, you must develop an electrical safety program that is appropriate to the level of risk your employees are exposed to.

Another common pitfall that companies often fall into is this idea that if they simply never do energized work, their electrical safety program can simply be a statement like, "Employees shall not be permitted to perform energized work." This mentality is dangerous and gives a false sense of security. The only way that this could even be a possibility is if the only work being performed is on systems that have yet to be connected to a source of electrical supply, and the worker will only use hand tools. This is not likely the situation and it is highly unlikely that we will enlist the help of the utility to unhook the building every time we need to work on or around electrical equipment. Even the act of placing equipment in a state where it is safe to work on is, in and of itself, an energized task since we must assume that equipment is energized until we have proven it is not through an absence of voltage test. So even to turn it off requires a plan on how we protect ourselves from the hazard present during this process.

The last pitfall that appears time and time again is that an organization will draft up an ESP in a vacuum and then mandate compliance with procedures and policies that create an attitude of contention among those that must put them into practice. This creates a situation within an organization where there is a storm brewing on the horizon that threatens the safety within the facility. It fosters thoughts where workers feel that the rules don't make sense, and they often actively seek

workarounds to what is in the program, or they simply just ignore the program all together. Often, the program is written with the best intentions in mind for safety, but when nobody follows it, the program becomes unworthy of the paper that it is printed on. And, when employees become willing to bypass the rules they don't agree with, it opens the door for them to ignore the entire program itself.

SOLUTIONS TO COMMON MISTAKES

The question now becomes, "So what can we do to prevent this?" First, we need to take a long hard look at our electrical safety program, and if we don't have one, that might be the first indication that we have some work ahead of us. But, if we have an ESP, let's try and break it. Hiring an outside third-party to come poke holes in what we have in place and make recommendations for making improvements can help give us insights into where to focus efforts. Also, accept the fact that our employees will encounter electrical hazards from time to time, but stress that it is unjustified energized work that will not be allowed. This spins the "no energized work" mentality on its head a bit so that we can identify that there are times where we will be exposed, but only when it is necessary.

Remember, the electrical safety program is our opportunity to develop a specific set of policies, procedures, and reference material that can keep employees safe from electrical hazards within our facilities. This program should be written with this guiding light at its core. We can outline what specific tasks are permitted and which are not. We can outline specific procedures for placing certain equipment in an electrically safe work condition. It is our opportunity to take the generalized, industry consensus approach from within NFPA 70E and tailor it to our actual needs and provide a program that is better than simply following NFPA 70E. And we also can include our employees in the development of this program so that we ensure the policies and procedures written will make sense for how they are to be put into practice.

Lastly, we need to provide training on this program. It never fails while I am teaching a class for qualified persons that I will ask for a show of hands as to who has seen the company's electrical safety program, and the response can usually be summed up as "crickets." Rarely have I had a response that shows a commitment to ensuring that employees understand the principles, policies, and procedures contained within the program. It has happened, but it is more of the exception than the rule. My question for those workplaces that do not provide training based on their ESP is, "Why invest all of the time and energy into developing the program if you choose not to tell anyone about it?"

An electrical safety program can be all encompassing for what policies a company needs in place to reduce the risk to their employees from electrical hazards. If we give it the attention it needs and recognize where the pitfalls and common misconceptions exist. Form a committee, develop rules in accordance with the work to be performed on the equipment that exists, engage those doing the work, make an effort to discover the shortcomings of the program, and don't forget to spread the message to all involved. If we keep these principles in mind, chances are we will develop our true North Star when it comes to keeping employees safe from the hazards that arise from our use of electricity in the workplace. ESW

Derek Vigstol is an electrical safety consultant for E-Hazard and co-host of E-Hazard's electrical safety podcast "Plugged Into Safety." E-Hazard is the industry leading provider of electrical safety consulting, & training services. For more information check out www.e-hazard.com.

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Arc Flash Safety: Helping Companies Keep Workers Protected from one of the Most Dangerous Electrical Safety Hazards

By Kevin Pietras, Director of Offering Management, Honeywell Electrical Safety

One of the most dangerous and pervasive electrical safety issues (arc flashes) occur when electrical current passes between two or more conducting surfaces or from conductors to the ground. Far from being a harmless spark, 76,000 workers each year[1] are disabled because of serious shock and burn injuries caused by arc flashes.

Arc flashes can have several causes, such as gaps in insulation, corrosion, condensation, dust or other impurities on a conducting surface. Take for example the case of Graeme Edwards[2], a unit controller with more than 30 years of experience who was reinstalling a high-voltage circuit breaker at an Australian power station. Edwards knew it was a potentially hazardous - though routine - procedure, so he did the work during a planned outage. Despite the outage, the electricity short circuited through a cable that was too long, causing an explosion, and leading to Edwards' death. In this situation, a trained professional passed away, leaving behind grieving family and coworkers. As shown here, arc flashes are hard to predict and difficult to prevent against. But as with many workplace safety issues, the first step to preventing serious injury is awareness, education, and having the right protective equipment.

With so much industrial and consumer equipment today relying on power-hungry electrical devices, it's more important than ever to understand the full impact of arc flashes - including safety hazards and the human and financial costs.

THE MAIN HAZARDS OF ARC FLASHES

Electrical hazards are an all-too-common source of injury. In fact, electrical safety accidents perpetually rank as a leading cause[3] of workplace deaths. Arc flashes present a significant danger and regularly cause serious injury, as electrical arcing produces temperatures as high as 35,000°F - hotter than the surface of the sun's temperature of 9,941°F. So even if the victim doesn't touch anything, he or she can be fatally injured - especially when you consider that burns can occur over a distance of 10 feet.

Burns pose a significant danger. As much as 80% of electrical injuries are burns resulting[4] from an arc flash and aftereffects, such as ignition of flammable clothing. Arcs typically release five to 30 calories. Exposure to just one to two calories causes second-degree burns. In 0.1 seconds, a worker can get a third-degree burn. And the odds of someone surviving a burn decrease as age increases.

There are other debilitating effects. Hearing loss, eye injury, skin damage from blasts of molten metal, lung damage, and blast injury can all occur from an arc flash. The biggest factors in helping keep workers safe from arc flashes is awareness, education, and companies choosing and maintaining the proper protective equipment.

TAKE STEPS TO PREVENT ELECTRICAL INJURIES

Prevention costs less than noncompliance. The Wisconsin Safety Council estimates that for every dollar spent on training, three dollars are saved on injury costs. In one survey[5] of arc flash injury victims conducted by the Fire Protection Research Foundation, 94% of respondents believed that the incident could have been prevented. In fact, the prevention method most often referred to was simply

"turn the power off."

As with any sort of safety process, the best way to cope with a danger is to avoid the situation and stay out of harm's way. But when that is impossible, companies should minimize the risk and help ensure their employees who do put themselves at risk are protected. To prevent workplace electrocutions:

- Train workers in electrical safety
- Implement and follow safe work procedures including wearing properly rated arc flash personal protective equipment (PPE)
- Follow corresponding OSHA, NEC, or NESC requirements
- Implement and follow OSHA's Lockout and Tagout (LO/TO) procedures, found here[6]

Training is more than an occasional talk. Improve safety training and risk awareness across the organization – and not just because OSHA requires it. For safety managers, responsibilities include raising employees' awareness of their actions and the possible results. Employees must understand the consequences of any missed protocol and understand why they should follow proper safety procedures at all times (even when nobody's looking).

Among the best guidelines to follow:

- Ensure your company has a written safety program that identifies risks, sets boundaries, and establishes the PPE needed to protect workers from arc flashes and other electrical hazards
- Document the electrical regulations and work processes
- Provide the training and tools to ensure they are understood and consistently enforced

PPE HELPS MANAGE ARC FLASH RISK

When an arc flash event occurs, it is caused by a short circuit condition where electricity travels outside of its planned path. The temperature of an arc flash can reach over three times hotter than the sun. This means workers in potential arc flash environments, such as those who operate on electrical panels in buildings, need specialized PPE to prevent them from experiencing substantial consequences.

Arc flash PPE requires head-to-toe solutions.

Arc flash PPE requires head-to-toe solutions. When workers don their PPE ahead of entering an environment with the potential for an arc flash, they need to be wearing pro-

tective garments like coats, overpants, and coveralls made with arc flash resistant materials. Head, face, and neck protection is critical too. Arc flash hoods are designed to cover the head, face, and neck to protect against extreme temperatures. When considering the right face shield to use, workers should opt for selections that ensure reliable visibility even in poorly lit rooms and anti-fog and anti-scratch coatings to guarantee lens longevity.

Quite simply, no worker should get near electrical equipment without wearing the right PPE chosen by their employer. It's obvious that electrical hazards are unpredictable. A worker cannot know if the workspace had a water leak, or if the wind will whip the wires to a place where they shouldn't be. The consequences of a "minor" misjudgment are not minor when it comes to electrical power.

PPE is considered the last line of defense, after all the other steps have been taken in a safety plan. Don't treat PPE as an invincibility shield, as electrical hazards are frighteningly powerful. Everybody who gets near an industrial power plug should wear the appropriate gear. "Appropriate" is important; make sure workers have the exact PPE needed for every application.

Luckily, PPE that protects against arc flashes has come a long way - from heavy, non-breathable garments to comfortable and lightweight moisture-wicking fabric. Having modern, comfortable PPE encourages personnel to wear them more readily. After all, if employees don't wear them, they can't be protected. In addition, eye protection now features clear lenses that allow a full field of vision while protecting against arc flashes. This evolution of PPE allows users to adapt to wearing PPE more readily.

Hundreds of deaths and thousands of injuries occur[7] each year due to electric shock, electrocution, and arc flash. But almost all these tragic events are preventable. A clear understanding of the dangers involved is vital to worker safety. So is a culture-driven adherence to well-vetted and correctly executed processes and procedures. PPE is the last line of defense and is crucial in the safety process, enabling organizations to protect their employees and avoid costly - and tragic - mistakes. ESW

Arc flash hoods are designed to cover the head, face, and neck to protect against extreme temperatures.

SOURCES:

1. https://sps.honeywell.com/content/dam/his/en-us/images/gated-content/lp-salisbury-arc-flash/sps-his-electrical-safety-salisbury-pro-wear-plus-arcflash-whitepaper.pdf
2. https://www.abc.net.au/news/2019-06-14/graeme-edwards-yallourn-power-station-did-nothing-wrong/11210834
3. https://ehsdailyadvisor.blr.com/2019/05/oshas-fatal-four-leading-causes-of-fatalities-in-the-workplace/
4. https://sps.honeywell.com/content/dam/his/en-us/images/gated-content/lp-salisbury-arc-flash/sps-his-electrical-safety-salisbury-pro-wear-plus-arcflash-whitepaper.pdf
5. https://www.rmelecspec.com/wp-content/uploads/2015/03/RFArcFlashOccData-3.pdf
6. https://www.osha.gov/sites/default/files/publications/factsheet-lockout-tagout.pdf
7. https://sps.honeywell.com/content/dam/his/en-us/images/gated-content/lp-salisbury-arc-flash/sps-his-electrical-safety-salisbury-pro-wear-plus-arcflash-whitepaper.pdf

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Workplace Electrical Injuries and Fatalities 2003-2020

By Daniel Majano and Brianne Deerwester, Electrical Safety Foundation International

Each year, the Electrical Safety Foundation International (ESFI) collects information on fatal and nonfatal occupational electrical injuries using the U.S. Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) and Survey of Occupational Injuries (SOII). ESFI then publishes the information in tabular and graphical form to esfi.org. The most recent data covers the 17 years from 2003 to 2020, but focuses heavily on 2011 to 2020 data.

There were 126 electrical fatalities in 2020, a 24% decrease over 2019 and the lowest number of electrical fatalities since ESFI began compiling data in 2003. It is also important to note there was a 10% drop in total hours worked in the United States in 2020, most likely due to the COVID-19 pandemic. There were 2,220 nonfatal electrical injuries involving days away from work, a 17% increase over 2019 and a return to 2017 levels.

FATAL ELECTRICAL INJURIES

Contact with or exposure to electric current accounted for 2.6% of all workplace fatalities in 2020, which was a 19% drop from 2019 and a return to 2017 levels. Electrical fatality rates were 0.09 fatalities per 100,000 workers in 2020, which is a 22% drop from 2019, compared to a rate of 3.5 per 100,000 workers for all fatalities and all occupations. The mining industry had the highest rate of fatal electrical injuries in 2020, 0.8 fatalities per 100,000 workers, followed by the construction industry, 0.6 fatalities per 100,000 workers. The fatal injury rate for all industries was 0.1 fatalities per 100,000 workers. In 2020, 5.3% of all electrical incidents were fatal. "Constructing, Repairing, Cleaning" accounted for the leading worker activity for electrical fatalities at 64%. "Using or Operating Tools, Machinery" accounted for 22% of electrical fatalities.

The occupations involved in electrical fatalities included "Construction and Extraction Occupations" with 44% of the total fatalities, "Installation, Maintenance, and Repair Occupations" with 20%, "Building and Grounds Cleaning and Maintenance Occupations" with 13%, "Transportation and Material Moving Occupations" with 6%, "Management Occupations" with 5%, and "Farming, Fishing, and Forestry Occupations" with 3%.

The number of electrical fatalities varied between age groups in the workforce. Workers aged 25 to 34 had the highest number of electrical fatalities with 33%, followed by workers aged 34 to 44 with 21%, workers aged 45 to 54 had 18%, workers aged 55 to 64 had 17%, and 7% of electrical fatalities occurred in workers aged 20 to 24. Hispanic or Latino workers accounted for 40% of electrical fatalities, a 24% increase over 2019. These workers also account for 18% of the workforce.

Thirty-three percent of all electrical fatalities occurred at a private residence. Industrial places and premises accounted for another 31% of fatalities. Streets and highway accounted for 13%, public buildings accounted for 8%, and farms for 7%. Private industry accounted for 154, or 94%, of the electrical fatalities.

NONFATAL ELECTRICAL INJURIES

A total of 1,176,340 workplace injuries, including electrical and non-electrical injuries, occurred in 2020. Of these cases, 33.2% or 390,020 cases were categorized as other diseases due to viruses not elsewhere classified, which includes reported COVID-19 pandemic-related illnesses. The rate for all nonfatal injuries resulting in days away from work attributed to electricity during 2019 was 0.19%, while in 2020, 0.21% could be

attributed to electricity.

The industries with the leading number of nonfatal electrical injuries included "Accommodation and Food Services" with 22%, followed by "Construction" with 20%, "Wholesale Trade" with 17%, and "Manufacturing" with 14%. Electrical shocks accounted for 1,610 of the nonfatal electrical injuries, while burns accounted for 620.

The occupation with the highest percentage of workers involved in non-electrical injuries was "Installation, Maintenance, and Repair" with 31%, followed by "Service" with 25%, "Construction and Extraction" with 21%, "Production" with 11%, "Transportation and Material Moving" with 5%, and "Management, Business, Financial" with 2%. "Sales and Related," "Healthcare Practitioners," "Technical, Computer, Engineering and Science," and "Office and Administrative Support" all had 1%. Sixty-five percent of fatalities occurred in service-providing industries, while 35% occurred in good-producing industries.

The median number of days away from work for nonfatal electrical injuries was three in 2020, a 66% decrease from 2020. The median days away from work for direct exposure to electricity greater than 220 volts was seven days, followed by five days for indirect exposure to electricity 220 volts or less, and the median days for direct exposure to electricity 220 volts or less was three. Indirect exposure to electricity greater than 220 volts did not incur any injuries.

The number of nonfatal electrical injuries varied between age groups in the workforce. Workers aged 25 to 34 had the highest number of injuries with 24%, followed by workers aged 20 to 24 and 35 to 44 both with 22%, workers aged 45 to 54 made up 16% of the injuries, workers aged 55 to 64 made up 7%, workers 16 to 19 years old made up 2%, and finally workers 65 years and older made up 1%. Thirteen percent of electrical injuries occurred in Hispanic or Latino workers, compared to 40% of fatalities.

The length of service with an employer at the time of the injury also varied among workers. The highest percentage happened to workers who had been with their employer between one and five years at 32%, followed by more than five years at 31%, less than three months at 26%, and finally three months to 11 months at 10%. The weekday with the highest number of nonfatal electrical injuries included Tuesday with 33%, Thursday with 27%, Wednesday with 14%, Monday with 11%, Saturday with 8%, Friday with 4%, and finally Sunday with the lowest amount, 3%. The total shift length also affected when a nonfatal injury occurred. The hours with the highest percentage of accidents were between four to six hours with 32%, followed by two to four hours with 15%, six to eight hours with 10%, one to two hours at 9%, eight to 10 hours at 4%, less than one hour at 2%, and finally 10 to 12 hours at 1%. Twenty-seven percent of incidents did not report the hours worked.

IMPROVING WORKPLACE SAFETY

Each day in the United States, 6.4 injuries happen because of workplace electrical accidents. Sixty-eight percent of these injuries occur in non-electrical occupations. By addressing safety risks and trends that affect these workers, ESFI can create materials to both train and reinforce safety on the worksite to help prevent future workplace injuries and fatalities. Electrical fatalities decreased by 24% in 2020, but nonfatal electrical injuries increased by 17% to 2,220 injuries. With proper electrical safety training for all workers, both electrical and non-electrical alike, these preventable injuries and fatalities can be avoided. ESW

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Who *And What* Do You Trust with Your Electrical Safety?

By Mike Doherty, Contributing Writer

Qualified, competent, and knowledgeable electrical technicians, technologists, electricians, electrical engineers, and powerline technicians (as per their scope of work) deal with a toxic energy (some people describe as electricity) day in and day out while performing their tasks. When it comes to working on or near an energy source that can be so incredibly toxic to humans, you need to ask yourself if you are qualified to do this work, and, who and what do I trust?

Do I trust the safety management systems that are in place where I work, if they even exist? Do I trust my managers and supervisors? Most importantly, do I trust myself to do the right thing regarding my own personal safety—especially when no one is around to see me working?

Do I trust the schooling and training I have received before entering the workplace and afterwards? Do I trust the LO/TO process and programs at my company or where I use them as a contractor to be robust and rigorous? Ask yourself, are the single lines accurate and up to date?

These are tough questions and, typically, everyone I have ever met has had different answers for different reasons.

For anyone in the electrical trades, or who is qualified to work with electricity, the reality is there are different levels of safety management systems, managers, supervisors, and tradespeople everywhere you go. The safety culture (or lack thereof) within your organization or that you have as an individual will most often determine just how effective/ineffective any of these things will be.

Every worker is an extremely valuable asset. Protecting that asset for the sake of themselves, their family, and friends—as well as those who pay their wages—is job number one. Deciding to take or bear inherent risks in electrical work is just not acceptable for anyone at any level in any business.

REDUCING RISK

There are many things that can happen and break down during an electrical task, which can impact personal safety and/or the task itself in the blink of an eye. This toxic energy can be delivered to the worker by means of direct-contact shock and/or arc flash. The human body was never designed for these hazards.

Outstanding job safety planning executed by qualified and competent people will reduce the potential inherent electrical risks to residual levels for any task. While this is always the goal and expectation, it may not be a best practice in your job safety plan.

Electricity is invisible and needs to be identified as a potential lethal hazard to workers at every opportunity within the job safety planning and workflow process. One of the most critical and mandatory workplace electrical safety techniques is quite simply:

Verifying for the absence of voltage by using TEST BEFORE TOUCH (TBT).

Certainly, electrical work shall always be done in the electrically safe work condition unless it is "infeasible" to do so. (See Process for Establishing and Verifying an Electrically Safe Work Condition in Article 120.5 in NFPA 70E-21 and Clause 4.2.5 in CSA Z462-21)

TBT is simple, true, but its general concepts reveal more than meets the eye. Have you been trained to understand why TBT is mandatory in the electrical trades? Has this training been documented and captured in a Learning Management System (LMS) if your company has one? Does your safety managed system ensure that TBT is an embedded culture and risk-reduction control tool used All the Time, Every Time (e.g., regularly documented field audits by those accountable for verification) by all qualified employees and contractors?

Critically and foundationally do you consider all electrical parts to be energized until comprehensively tested "For the Absence of Voltage"?

WHO AND WHAT DO YOU TRUST WITH YOUR ELECTRICAL SAFETY?

Do you believe you need to test every single conductor that could possibly be contacted, even inadvertently, for toxic electrical energy? Anyone who has worked with electricity for some time can recount stories where the risk scenario was not as it first appeared. Have you for example ever opened a 480 / 600 volt disconnect and had "one blade" stay closed? Yes, it happens occasionally. Think about the consequences for those that don't practice TBT or for those that supervise or manage these tasks?

Do you understand the PPE (personal protective equipment) that must be used for the equipment being tested, and use it without question all the time, every time? (Knowledge of that equipment is mandatory.) When the workflow is broken, whatever the reason, you need to start the TBT process anew. Ideally, this process is comprehensively confirmed by another competent, qualified person if possible. OSHA in the United States or Provincial regulators in Canada will be asking these questions, if need be, after significant incidents.

Do you clearly understand how your voltage detection device is to be used safely? Competent electrical tradespeople use the Live-Dead-Live technique all the time, every time. Do you perform comprehensive phase-to-phase, phase-to-ground, phase-to-neutral tests, and do you have a complete understanding of the equipment being tested? Reliable ground test points must be assured, and you should know, as just one example, that some fuses have insulated ferrules, if you test at that location, that may give you a false indication as to the lack of voltage.

So, ask yourself again: Who and what do I trust? If not yourself, then who? None of these best practices take long to get done, so ensure that not only you are doing them, but your work partners, too, and anyone who works with or for you all the time, every time.

If you're not following even the simplest electrical safety best practice of Test Before Touch and Live-Dead-Live, then perhaps the real question you should be asking yourself is: What am I doing in the electrical sector? ESW

A subject-matter expert on electrical safety, Mike Doherty is an independent electrical safety contractor, consultant, trainer, and auditor. He is a licensed electrician, engineering technician and an IEEE senior member and served as the Technical Committee chair for CSA Z462 since its inception in 2006 until Dec. 2018 for the first 4 Editions and continues to serve on Z462. He has also served as a non-voting member of the NFPA 70E Technical Committee since 2007. Doherty is the current TC Chair of CAN/ULC S-801 – Transmission, Distribution and Power Generation Standard of Canada, the Canadian equivalent of the NESC in the U.S.A. His specialties include electrical safety and health & safety management, maintenance, consulting, training, auditing, and electrical incident investigations.

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Understanding Testing and Rating of PPE Rubber Insulating Gloves

By Richard A. Rivkin, Contributor

Tested, arc-rated, shock protection, class, AC, DC, ASTM, OSHA, and more – what do they all mean?

Live line working at distribution voltages up to 34.5 kV AC requires the finest quality protective equipment to keep the line worker safe. In the U.S., OSHA specifically mandates the use of rubber insulating products and related tools and equipment that has been manufactured and tested to specifications developed by ASTM International, a consensus standards organization. Many ASTM standards have also been approved as American National Standards and covered products are often marked with a dual ANSI/ASTM label.

Users of rubber insulating gloves, for example, are accustomed to seeing a color-coded label indicating a voltage class (00 – 4) and a maximum usage voltage when working on AC equipment. The specifications driving that class and voltage data provide for a significant margin of safety. For example, gloves rated class 2 for working voltages up to 17,000 volts AC are 100% proof tested at 20,000 volts AC and samples of each production batch are tested to withstand at least 30,000 volts AC.

AC VS. DC TESTING

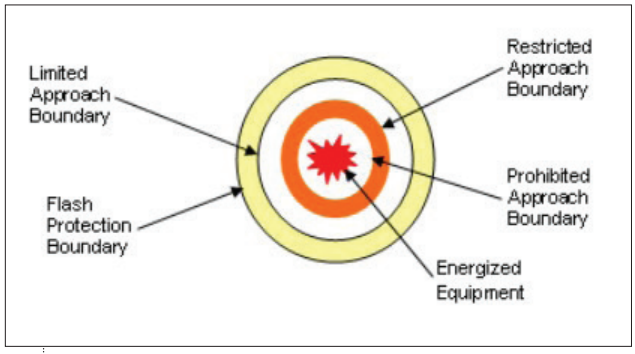
AC vs. DC – A deep dive into the ASTM standards shows test voltages and maximum use voltages for both AC and DC. While there is no fixed formula relating the AC test and working voltage levels to DC test and working

voltage levels, users can choose either. The reasons for having both AC and DC testing are complex. AC testing is both an electrical test and a physical test since the current is passing through the material back-and-forth 60 times per second. This also creates a corona-generating ozone, which is harmful to natural rubber. Among the benefits of AC testing is that manufacturers all test their products using AC and, most importantly, distribution voltages are AC so "test it as you use it" makes sense.

Some engineers postulate that DC testing of rubber insulating products is a purer test because the DC will find the weakest spot in the rubber exclusive of the physical effects of AC testing. In addition, DC testing does not create ozone, thus eliminating a source of potential damage to natural rubber products. Of increasing interest is the "test it as you use it" approach to wearing rubber insulating gloves (and other products) for protection against DC energized circuits and equipment found in EV (electric vehicles including hybrid), public transit systems, and renewable power generation.

ARC PROTECTION

But what about those arc-rated gloves? Back in 2013 ASTM approved a test method for determining arc ratings of gloves used for electrical arc flash protection. Anywhere from five to 10 arc explosions occur every day in the U.S., and as many as 10 workers are killed or injured per day according to some past research. Arc flash events are a clear and present danger. Exposure to their intense heat for 1/10 of a second can cause a 2nd-degree burn. Temperatures of 205° F will cause a 3rd-degree burn, leading to complete skin loss in the exposed areas. A pressure wave blast from a high-amperage arc can travel several feet with a force of up to 1,000 lbs. That's enough to toss a victim backwards, causing injury from falls and impact. It can also cause hearing loss. Most often when there is an arc flash hazard there is also a shock hazard.



This graphic shows the different boundaries from energized equipment. All but the extreme outer boundary have a shock hazard and require rubber insulating gloves.

About 75% of arc flash incidents occur when a worker is near the equipment. NFPA reports 2/3 of workers involved in arc flash incidents were injured when companies failed to conduct an arc flash analysis for selecting PPE. A separate study found 40% of electrical incidents involved 250 volts or less, so it isn't only high voltage that causes injuries. NFPA 70E details areas of protective clothing sometimes neglected by electrical workers. Jackets and rainwear, worn over arc-rated clothing should also be arc-rated. Underwear comprised of meltable fibers such as polyester, nylon, and spandex should not be worn. Sleeves should be fastened at the wrists and shirts tucked into pants. The legs of pants and sleeves of shirts should come completely down to the ankle and wrist, forming total coverage when combined with voltage-rated gloves, protective footwear, safety glasses, hearing protection, and hardhats.

OSHA has required compliance with arc protection standards since 2015. Employers must calculate the incident heat energy of any potential electrical-arc hazard exposures

to employees and implement programs and systems based on the risk assessment. NFPA 70E requires specific levels of PPE for various types and ratings of electrical equipment. OSHA estimates that 80% of electrically related accidents and fatalities involving "Qualified Persons" are caused by arc flash/ arc blast. NFPA 70E is updated every two years (2021 is the latest edition).

While the best way to prevent arc flash and electrical incidents from happening is to de-energize equipment before use, there are many instances where turning off the power is not an option (or it could cause an even greater hazard). As such, employers and facility owners must establish safe practices to protect their workers against arc flash and electrical hazards.

There are hundreds (or more) of products on the market today that have an arc flash rating of some number of calories per square centimeter (cal/cm²). These ratings include determination of ignition withstand levels as well as flame resistance, as well as not melting or dripping. This is certainly useful, life-saving information and, as such, nearly all rubber insulating gloves on the market today have been tested for arc flash, in addition to the inherent shock protection. ASTM recently adopted a new specification for rubber glove protectors that meet specific performance requirements, which include arc ratings as well as resistance to cut and puncture hazards.

In the real world, most arc flash hazards also involve exposure to energized equipment, so solely arc-rated gloves (i.e. leather or fabric or combinations) should only be used outside of the arc flash boundary, which is the minimum "safe" distance from exposed energized conductors or circuit parts that has the potential for an arc flash. Refer to the attached graphic showing the different boundaries from energized equipment. All but the extreme outer boundary have a shock hazard and require rubber insulating gloves.

And that's the (hopefully not) shocking truth! ESW

Richard A. Rivkin is President and Chief Executive Officer of Saf-T-Gard International, Inc., a privately held family-owned and -operated global supplier of industrial safety products based in Northbrook, Illinois. Founded in 1936 as Latex Glove Company, the company carries on the tradition that was started more than 80 years ago: bringing customers the products, training and service they need to keep employees safe in the workplace. The company actively operates the Voltgard® Test Lab, one of the largest, independent, NAIL4PET-accredited test labs for rubber insulating products in the United States. To learn more, visit www.saftgard.com.

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