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Protecting Your Workforce from Electrical Hazards

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Introduction

Electricity has become a modern-day convenience for the American consumer. It is hard to imagine how modern life would exist without the invention of electricity as we know it today. Electricity has never been a stagnant technology, and this still holds true today. In today's age, electrical power and generation are continually being defined. If the last revolution was the industrial revolution, then we are clearly in the midst of an electrical revolution today. We have gone from solar to wind, hydro-electric plants to nuclear power plants, and all of these technologies are continually competing to become part of tomorrow's energy source.

As consumers demand more sustainable and economical alternatives to electrical power generation and distribution, the old technology clashes with the new. Are electrical hazards new or are they an old dog with a different bone? Electrical hazard have always been the same; the problem lies in treating new technologies just as new, but this cannot be further from the truth. If it generates electricity, connects to the grid or even to an electrical system, then the hazards are the same electrical hazard. Dealing with electricity requires extensive training, both on an off the job in order to conquer and dominate. Most importantly, if electricity is dangerous to a well-seasoned veteran, then it is increasingly dangerous to other trades. Where the electrical hazard becomes lethal is in company policy, as industry groups continue to claim market share and forget about the importance of protecting the workforce.

Problem

According to the Bureau of Labor Statistics, 3,378 workers died on the job due to electrical injuries from 1992-2002. An even more alarming number is that an average of 4,100 workers were treated for nonfatal electrical injuries from 2003-2007, according to study conducted by the Electrical Safety Foundation International (ESFi). We now know

that electrical injuries are not only mis-categorized in the workplace but also in the medical field. Why? A service technician, working on running conduit through a junction box that is energized, makes contact with 277 volts that results in a fall from a height of 12 feet, leading to a fatality. What is the listed cause of the fatality—a “fall?” There thousands of cases like this one that continue to skew that data regarding electrical injuries, giving the false impression that the problem is not severe enough. As safety professionals, we must be wary of the problem and ensure that we are getting to the root of it.

The solution lies in raising awareness of what is an electrical hazard, and how can we identify injuries or fatalities that could have been caused by an electrical hazard. The sad new is that, like many safety and health injuries that occur in the workplace, only fatalities are closely documented and investigated. The 4,100 workers identified by ESFi in their study with nonfatal injuries due to electrical shock can quickly escalate to over 10 times that figure. Even though the electrical hazard is still a focus four with the Occupational Safety and Health Administration (OSHA), it is still widely misunderstood by the building trades.

Interesting enough, workers’ exposure to electrical hazards could be greatly reduced by proper design and retrofitting, maintenance, understanding of personal protective equipment (PPE) capabilities, and training. During my research I have explored some of the key ways to reduce the employee’s exposure through design, de-energizing and selecting the proper PPE.

Engineering the Hazard Out

Contrary to popular belief, electrical hazards could be substantially reduced through proper design and retrofitting. So where does the hazard lie in some or the electrical systems? There is a combination of factors at work; some of the most important include sound, temperature, distance and time. Time is very important because installing current-limiting fuses in facilities could greatly reduce the time the arc is going to burn. This is important because the longer the arc, the more severe the burn. Installations are just one component in the process to effectively mitigate this hazard but maintenance is equally important.

Arc Flash Study

Arc flash studies have proven to be instrumental when it comes to increasing awareness levels. The arc flash analysis, when conducted by qualified electrical contractors, would give facility managers a tool for better understanding electrical hazards. This assessment includes a complete study of the electrical system and a creation of a one-line diagram, along with the proper labeling of electrical panels.

The field assessment is important because it accesses the facility’s conditions. Once the arc flash analysis is conducted, facility management can be presented with a

clear understanding of what some of the hazards are and how to better protect the workforce. A one-line diagram should always be part of the arc flash analysis.

Establishing Electrically Safe Working Conditions

After design considerations are accounted for in the reduction of electrical hazards to levels as low as reasonably possible (ALARA), de-energizing is the next logical option. For service or maintenance personnel, de-energizing is always inconvenient. The truth is that shutting the power off is becoming increasingly popular. Prior to commencing work, the host and contract employer should have had an exchange of information. Key information should be exchanged between the host employer and the contract employer that pertains to any knowledge of hazardous conditions pertinent to the electrical hazard. It is at this point that the contract employer must instruct all affected employees on the hazard communicated by the host employer. This hazard communication should be in addition to the basic training required by the NFPA 70E standard (NFPA 2009).

Justification for Energized Work

The justification component for energized work has become a cat-and-mouse game. What safety and health practitioners have to take into account is that if de-energizing creates a greater hazard, then and only then is it justified. Great examples of this include hospitals and public utilities. This doesn't mean that work in hospitals must be done live; electrical contractors' experiences have been that if the work is well-planned out, a scheduled shut down is achievable. Not only is it achievable but it is also a profitable move because it reduces the loss potential for the facility owner.

If and only if electrical work must be performed live, then an energized electrical permit must be created. The energized electrical permit must contain information such as: description of work to be performed, justification for the work, a description of safe work practices, shock hazard analysis, and so on. One key component is the actual approval from the owners, electrical contractors, and the safety practitioner.

Personal Protective Equipment

There are lots of good alternatives to personal protective equipment (PPE) but as regulatory language begins to shift, the definition of what is PPE begins to fade. From a safety perspective, we know that if the exposure is present, we have a duty to protect our workforce. When workers are performing work on equipment that has not been placed an in electrically safe working condition, a clear understanding of the electrical hazard and PPE capabilities are crucial.

Take, for example, a worker in a motor control center where 600 volts has been tasked to remove bolted covers. This employee faces a hazardous risk category of 4, which is the maximum exposure that is allowed. Protection for this task would require FR clothing (long-sleeved shirt, pants, jacket and hood) with a minimum arc rating of 40 cal,

leather work shoes, and insulated tools. Yes, insulated tools have protective characteristics that are instrumental in ensuring the worker exposure is minimized. If the exposure is present, employers might be required for employers to provide it. This would have to be an internal decision from management but all angles have to be reviewed.

PPE is important but one must not forget that when working live, no matter how much we protect the workforce there is still a very high level of exposure. For example, FR clothing protects against burns, but what about molten metal that, in a blast, acts as a projectile? Would clothing protect this employee? This is why it is extremely important to convey the message that PPE does not make us invincible.

Training Requirements

Training requirements must be met for all employees exposed to electrical hazards. The training should center on some key requirement, such as electrical hazard, safety-related work practices, potential of injury, or use of PPE. Training requirements should be completed prior to employees being exposed to the electrical hazard. Some other important training requirements that need be included are emergency procedures and the difference between a qualified and unqualified worker.

Summary

The electrical hazard continues to haunt our workplace. The most frightening part is that we don't know to what extent workers are being crippled by this hazard. As safety practitioners, we must constantly strive to ensure that our management is aware of the methods and tools to mitigate this hazard. There needs to be a clear distinction between what the law is (OSHA) and what is the employer's role in improving workers' safety (NFPA 2009). As the industry continues to conduct further studies, safety practitioners must continue to provide a pivotal role in creating awareness of the electrical hazard.

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