Electrical Safety Should Never Take a Holiday

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In the day-to-day operations of electrical maintenance, routine tasks are performed to minimize or eliminate unscheduled shutdowns. The following incident is based on an actual event that resulted in tragic consequences for the workers involved. I have modified some of the details of this incident to respect the confidentiality of the parties involved. What makes this story so significant is that, according to Department of Labor statistics, this type of injury happens at least five times each day and never takes off weekends or holidays.

The Incident

A large industrial company scheduled annual preventive maintenance on their electrical distribution equipment to enhance reliability and avoid a costly production shutdown. The electricians and plant utilities personnel had just completed an annual cleaning of the electrical substation. As part of the maintenance procedure, the plant was switched from outside, utility-supplied power to power supplied from an on-site emergency generator. After the substation was cleaned, the process to switch from generator power back to utility power was initiated.

During the powering down of the generators to facilitate the switch back to utility power, the automatic switching mechanism would not transfer power from the generator to the outside power supply. Two electricians and an instrumentation mechanic were dispatched to investigate this problem. The three workers determined that the switching problem was isolated to the outside power distribution switchgear. The electricians opened the outside switchgear door that housed a three-phase, in-feed power supply of 13.2 kilovolts and a 120-volt, four-ampere switchgear motor. During the troubleshooting process to transfer power from the emergency generator to utility power, a ground fault or phase-to-phase fault occurred causing an arc flash and arc blast to occur. The electrical supervisor, lead electrician, and instrumentation mechanic were engulfed in flames.

A company security camera filmed the entire incident. The beginning of the film shows the three workers in front of the outdoor switchgear. The door is open. Two of the workers were standing in front of the switchgear and one worker was working on the switch motor that was located in the bottom of the compartment. The next scene shows a ball of flame totally engulfing the three workers. As the film progresses, one of the workers standing in front of the equipment is thrown to the ground by the arc blast and engulfed in flames. The other worker standing in front of the equipment is propelled 15 feet backwards and lands on his back with his feet in the air. The worker who was at the bottom of the compartment can be seen crawling away from the equipment with his clothing on fire.

The camera then pans to the right following two of the three workers. One of the workers is frantically tearing his coveralls from his body. As he is doing this, one can see that the workpants he is wearing underneath his coveralls are on fire. After tearing off his clothes, he runs around in a state of shock. His undershirt is melted to his upper body.

Injuries and Aftermath

All of the workers were hospitalized with extensive injuries. One of the workers received second and third degree burns over 60 percent of his body. The other two workers received extensive second and third degree burns. Not only were the workers not wearing appropriate personal protective equipment for the hazard, their burns were exacerbated by polyester blend clothing, which melted and adhered to their skin. The severity of their injuries could have been substantially reduced had they avoided wearing clothing made of meltable or flammable fibers. Sadly, the company had taken no preventive measures to analyze the task or provide training for the workers.

What were the legal consequences of this accident? The incident was reported to OSHA, initiating an investigation that resulted in numerous citations and penalties for the employer. The citations included the following:

- The employer did not provide training nor required safety-related work practices, as required by OSHA regulations.
- Employees working on energized electrical equipment were not trained in, nor familiar with, the hazards involved with the work task.
- The exposed parts were not de-energized, and other safety-related work practices were not employed to protect the worker from the hazards involved.
- Neither safety signs, safety symbols, nor accident prevention tags were used to warn employees.
- Employees working in areas where potential electrical hazards existed were not provided with, and did not use, electrical protective equipment appropriate for the safety of employees.
- Employees working near exposed circuit parts did not use insulated tools that might come in contact with such parts.

Five of the citations were classified as serious and two as willful. The company paid fines in excess of $100,000 as a result of this incident. In addition to these fines, there are also litigation and medical costs that cannot yet be quantified, due to the injuries of the employees. Aside from all of the legal consequences, the families of the three workers are in disarray and will never be the same again — all because of a lack of consideration for employee safety.

How Could This Have Been Prevented?

Following OSHA regulations could have prevented this incident. OSHA 29 CFR 1910.333 requires that safe work practices be utilized when working on or near exposed energized parts. Employers must also comply with Section 1910.132(d), requiring that employers assess the workplace to determine if hazards are present, and, if present, must select proper personal protective equipment to protect the employee. In addition to these requirements, the employer must provide training necessary to the worker for the use of this personal protective equipment.

Why do we continue to minimize or ignore electrical hazards? Culture seems to play an important role in the perpetuation of these incidents. The OSHA regulations require employers to provide a workplace free from recognized hazards likely to cause death or serious physical harm to the worker. It is amazing that workers exposed to electrical hazards are not provided the same consideration for their safety and protection as other types of work tasks.

For example, workers do not handle harmful chemicals without proper personal protective equipment, but at the same facility the company may expect a worker to perform hazardous electrical tasks without proper protection. Why is there a double standard?

The recovery process from this type of injury is long, painful, and, in many cases, the patient is disfigured and has some level of permanent disability. In the human resources aspect of this, the worker's life is forever altered. This includes his ability to earn a living, have normal physical activities, and in some cases even his relationship with his loved ones is changed forever.

Final Thoughts

The facts are indisputable. According to government statistics, a worker gets electrocuted in the workplace every day. In addition, at least five workers are admitted daily to burn centers as a result of incidents similar to the case study described in this article.

The real tragedy of this situation is that electrical injuries are among the most preventable types of injuries. Proper task assessment, equipment, and training are the keys to providing worker protection. Alternatives can be employed, such as de-energizing the equipment or designing systems to reduce or eliminate the hazard. Isn't the real goal to allow every worker to be able to go home at the end of his or her shift in the same physical condition he or she was in upon arriving at work in the morning? We will continue to lose one worker each day through electrocution and have five workers admitted to burn centers every day until cultural change is implemented to provide the protection to which each person exposed to electrical hazards is entitled.

After viewing the footage taken by the security camera, I cannot imagine anyone trying to minimize the effects of electrical hazards. The arc flash, arc blast, and pain these workers endured were horrific. What is really sad is that these workers could have avoided injury through proper assessment, techniques, and training.

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