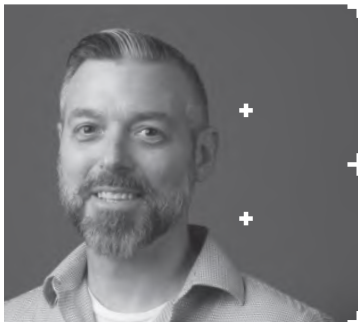


Tragedy & Expense: The High Cost of Low Electrical Safety

by **Michael Riccio**



The electrical industry is one of the most dangerous work environments for employees. The risk of injuries and fatalities is high due to the nature of the work and the amount of interaction workers have with dangerous equipment and conditions. Electrical incidents happen daily, putting lives and operational continuity at risk. However, there are ways companies can reduce the occurrence of these incidents and protect everyone concerned from the physical, financial, and statutory consequences.



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Every year, OSHA puts out their list of top 10 violations, and every year the electrical industry is one of the big "winners". To make things worse, these are not new violations making the list because highlighting the previous year's violations led to vast, industry-wide corrections. It's the same offenses year after year. Patrick Kapust of the National Safety Council stated at the 2019 NSC Expo "these are common violations we're finding – they've been in place for a lot of years. The answers are out there, and employers shouldn't feel like these are complex issues."

Mr. Kapust is correct, the issues aren't complex. But unfortunately, multiple daily news stories reflect excessive failures around the world to keep workers, customers, and the general public safe. A great example of these failures is that during 2021's "National Electrical Safety Month" there were multiple reported injury events every day of the month. These injuries reflect the neglected roles by both management and workers in the safety process.

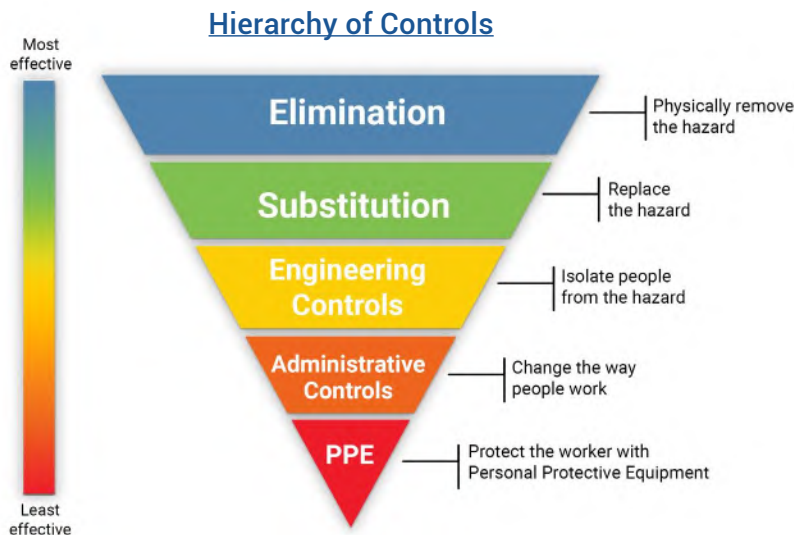
Under NFPA 70E, both employers and employees have very defined responsibilities as members of a team tasked with keeping safe practices and procedures in mind while accomplishing their tasks. At the heart of NFPA 70E and OSHA initiatives are concepts such as the Hierarchy of Control. This concept attempts to mitigate risk wherever possible, preferring the elimination of hazards as the ultimate goal.

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Whether or not the responsibilities of workers and management alike are strictly adhered to also has major financial implications, not just from an operational and safety standpoint, but from insurance rates and litigation fees/judgements as well. Statistics are heavily studied in the electrical industry, as safety should be the priority for everyone involved. Gambling with this isn't just dangerous, it's expensive.

Recently, charges were brought against a utility company over the death of a power station worker in 2018. During a scheduled routine maintenance, where the employee was found to be doing his job exactly as trained, he was severely burned by an arc flash and later passed away at the hospital, and investigations brought about three separate charges against the utility.

The loss of life is beyond tragic, though not at all a rare case. Unfortunately for companies who have these fatalities and injuries as a result of electrical accidents, this is just the beginning of their problems. OSHA fines can reach deep into the pockets of a company, of hundreds of thousands of dollars in possible costs. The wrongful death cases or lengthy Worker's Comp litigation, as well as associated personnel-driven costs, will most likely lead to a major financial impact on the company. According to Falcon Power Consultants, 5-10 arc flash incidents occur every day in the United States, resulting in 1-2 deaths per day. The average litigation costs for a general industry accident range from \$10M to \$15M.





as an arc flash add to this with the cost of repair or replacement of the asset(s) involved. Additional costs may also come into play with time required for staff to go through new or refresher safety training and replacing the injured parties with other workers will involve more expense and time.

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Not only does it damage a company's operational and fiscal health, but also its reputation and earnings potential with current or prospective customers. What it comes down to is simple: not only does risk lead to great tragedy, but also great expense.

The issue, then, is to figure out how to remove or minimize human error and human risk wherever possible. While that is a difficult task for most industries, the electrical industry faces a much steeper challenge. Risk-based activity is the driver for incident, injury, and fatality. In the electrical world, these behaviors are 30 times more likely to lead to death.

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Work Comp claims and insurance expenses bring another level of cost. One of the main factors that determines a company's workers' compensation premium is referred to as loss history. This is an analysis of insurance losses associated with workers' compensation claims and plays a key role in causing an increase in premiums. Underwriters calculate premiums using these numbers to determine a company's *experience modification factor* (or *e-mod*). Depending on the results of their assessment, which considers

three years of claim history (not including the most recent policy year), your premium can either go up or down.

With over 3,700 non-fatal electrical accident injuries occurring each year, the average cost of hospitalization for electrical accidents ranges from \$200,000 to over \$1 million (according to the Workplace Safety Awareness Council). Once out of the hospital, as part of the fallout from these claims, the time away from work averages 8-12 months. These incidents will not affect the premium calculations in a positive way, nor will it look favorable for the manager to executive management or help the company's fiscal health.

Operationally, things don't get better in these situations. Unplanned downtime from an electrical incident is expensive on the operational level, such as in a data center where estimates show each minute down averages \$8000 in loss. A study by Aberdeen Research found 82% of companies that experienced unplanned downtime lost an average of \$2 million in revenue. Physical damage resulting from incidents such

The simple answer is to eliminate the risks completely. The best option is to remove the human factor from as many threats as possible. This is not to say that humans should be replaced with technology, but instead we should eliminate the numerous risk-based behaviors that occur in the workplace through technology. The entire work environment must be approached as "function follows form". This means the physical environment drives the operational environment, with technology guarding and assisting the worker.

Traditional electrical maintenance practices tend to rely on calendar-based models that include intrusive and dangerous activities that put both workers and assets at risk. From the equipment and operations side, every time an unnecessary time-based task is completed the infant mortality clock is reset and the risk of failure increases. These tasks also increase the odds of a worker experiencing risk while performing their duties. By minimizing the interaction between asset and personnel through technology and structure, the odds of incidents occurring drops sharply. As do the odds of a very expensive outcome.

Switching to a condition-based program leads to asset interaction only occurring when it is absolutely necessary. This involves remote monitoring of asset health, safe and guarded inspections of equipment at full load (overcoming the OSHA Top Ten violation of machine guarding), and the trending/analysis of collected data to create a clearer picture of an asset's operational health.

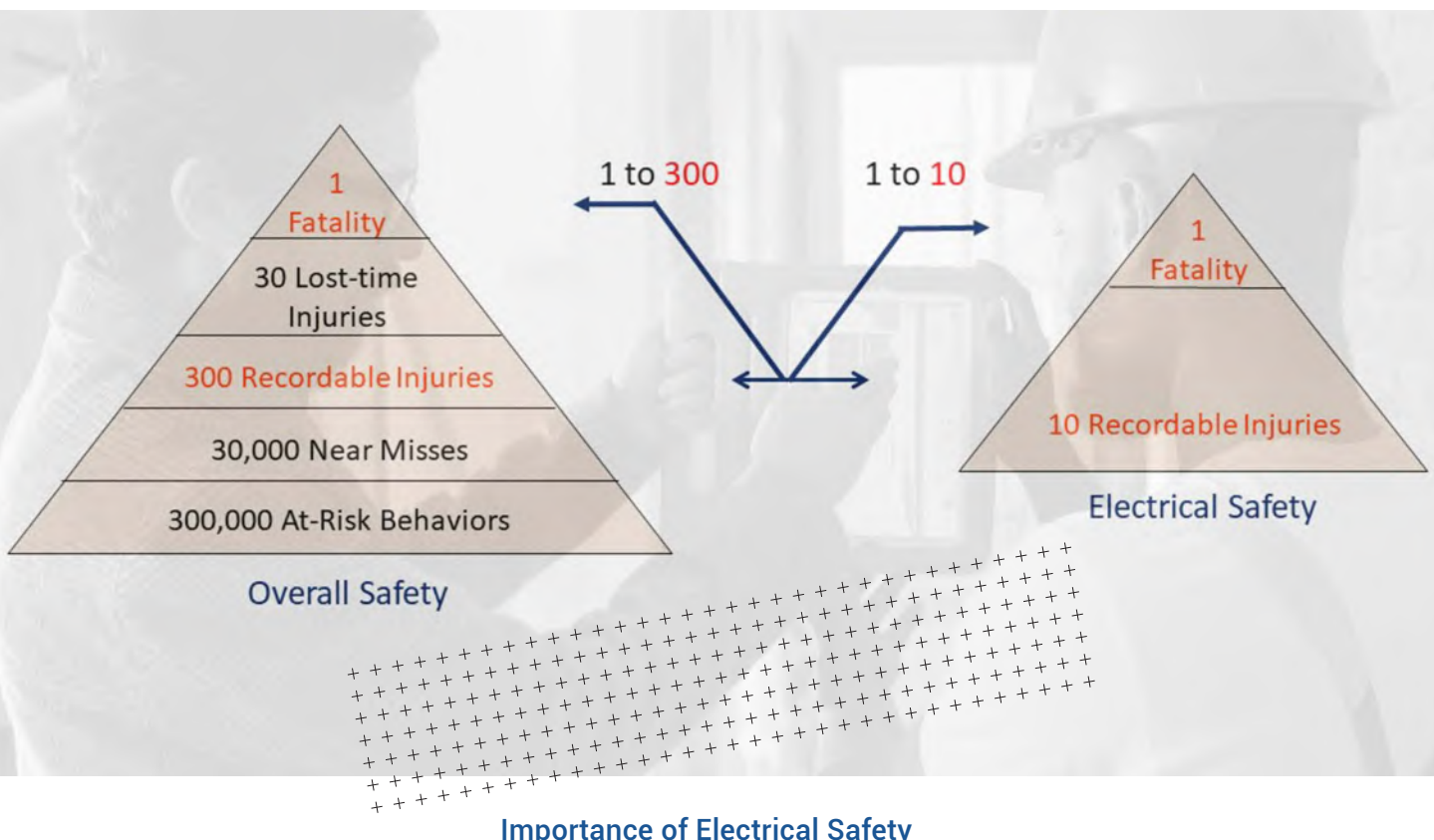
With the use of an online monitoring system on electrical equipment, asset conditions can be continually collected, trended, and assessed. Monitors feed data through a gateway to software and apps, allowing the information to be continuously accessed from workstations and mobile devices. When the asset condition data exceeds the custom parameters, alarms can notify electrical technicians of a possible issue that may require inspection. Keeping human interaction with equipment to only instances where inspections of potential faults are deemed necessary minimizes workers' exposure to risk.

Once the wireless monitoring system notifies technicians of a possible

issue, the use of inspection windows on the asset allows a safe, efficient method of inspecting and assessing any possible issue in an energized condition. Once solely designed for thermographic inspections using infrared cameras, advancements in manufacturing have led to the inclusion of ports that allow for ultrasound and partial discharge technologies to be incorporated into the inspection. Visual, infrared and ultrasound inspections can be done simultaneously by a single employee.

This design protects inspectors from arc flash/electrocution risk, removes the need for bulky and expensive personal protective equipment, and allows the inspection to be accomplished more efficiently. Not only does this represent a significant process improvement driven by original design, but it also falls in line with the most recent NFPA 70E updates and continues to protect critical assets from human interaction/mistakes that may cause failure.

The data collected during inspection can be stored through intelligent asset management tags attached to the pre-installed inspection windows.



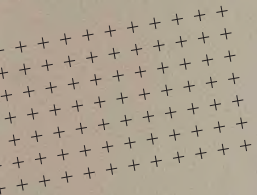
Importance of Electrical Safety

From the asset location, information can be transmitted into a dashboard system accessible from workstations and mobile devices. Customizable routes can be established before, and condition reports generated after, data analysis to further increase efficiency. These design aspects allow managers to assess operations and limit the amount of "scheduled exposure to risk" that so many archaic, yet still employed, systems cause.

The proper tools are only as useful as the hands wielding them. Shifting to an engineered reliability system for the electrical maintenance team means training new and veteran staff alike. The use of technology allows single individuals to accomplish safe inspection and maintenance tasks with minimal training. Online learning systems offer on-demand educational and training resources that teach the use of these specific technologies.

The physical environment of any factory, plant, facility, etc. is the setting where risk-based behaviors take place, with both machinery and power systems posing the highest threats to worker safety. Structuring out hazards through technology drastically reduces the opportunities for incidents/injuries/fatalities to occur, and as an added bonus, increases the reliability of assets and efficiency of the team.





Keeping human interaction with equipment to only instances where inspections of potential faults are deemed necessary will minimize workers' exposure to risk.