



How Understanding the Hierarchy of Controls can Lead to Reduced Electrical Incidents



The Importance of Understanding the Hierarchy of Controls

The National Fire Protection Agency updates its standard for electrical workplace safety every three years. In the most recent edition, and for the first time, NFPA 70E includes the Hierarchy of Controls in its mandatory text and not just as an informational note¹.

The Hierarchy of Controls is not a new concept, but this emphasized inclusion in the top source for best practices and procedures for electrical work underscores how critical it is for organizations to have a firm understanding of the hierarchy. Previous editions of NFPA 70E have guided future regulations, and the Occupational Safety and Health Administration (OSHA) considers it a recognized industry practice, meaning a more universal adoption and focus on this hierarchy is imminent.

Still, misconceptions on what the Hierarchy of Controls is exists. According to a new study conducted by EHS Today and Panduit, only 75% of the safety and EHS leaders surveyed describe themselves as very or extremely familiar with the Hierarchy of Controls, compared to 93% with the proper use of lockout/tagout equipment and 91% with OSHA².

40% OF COMPANIES OVER THE PAST 5 YEARS HAVE REPORTED ELECTRICAL INCIDENTS

The Hierarchy of Controls offers a systematic process for reducing the likelihood of an electrical incident, but new data shows electrical incidents are still happening at high rates. If the benefits of adhering to the Hierarchy of Controls were understood, and they were being implemented correctly, the expectation would be

for these numbers to be lower. Yet, the study also shows that 40% of companies have reported electrical incidents over the past five years, and nearly seven out of ten having reported near misses – not to mention what isn't being reported. And when asked if they're comfortable identifying electrical hazards, 18% of

¹Fact Sheet: NFPA 70E®, 2018 Edition. <https://tinyurl.com/yy2dtdf8>

²EHS & Panduit: Industry Insights: Electrical Safety Considerations: <https://bit.ly/2W3XHID>



the respondents either said “no” or “probably not.”³ It’s no wonder then that OSHA says roughly 350 electrical-related deaths occur every year in the workplace⁴. Understandably, electrical safety in the workplace is a major, ongoing concern for companies.

350 ELECTRICAL-RELATED
WORKPLACE DEATHS
ANNUALLY IN THE US

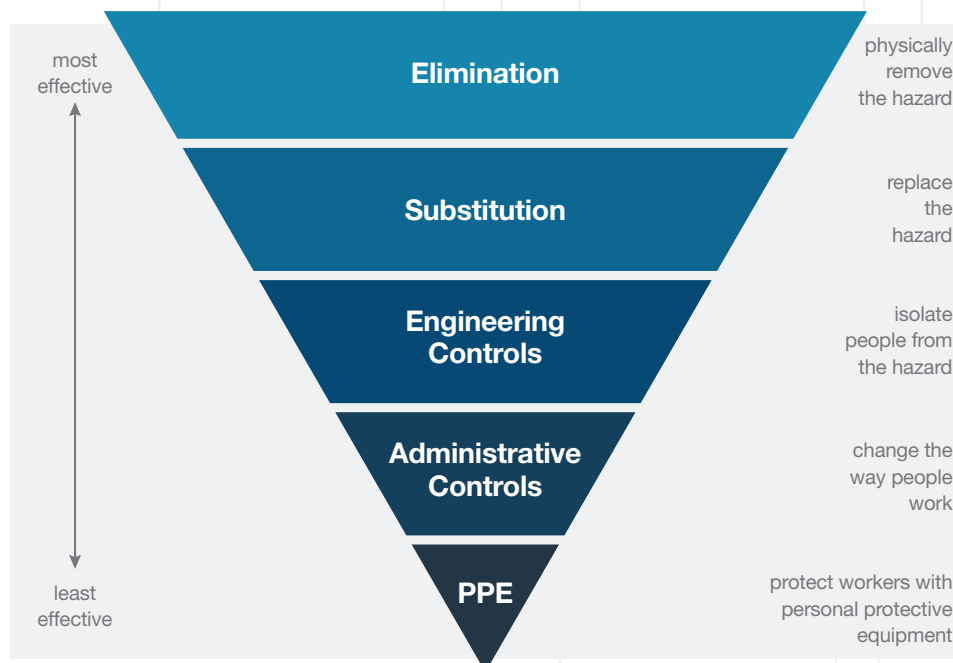
The objective of all safety and health professionals is to identify and mitigate exposure to occupational hazards before work begins, and a firm grasp of the Hierarchy of Controls can help them effectively alleviate the potential for workplace injuries and the financial ramifications that come with them. The Hierarchy of Controls is intended to control hazards and substantially reduce the risk of workplace injuries, but for it to be used effectively it must first be fully understood.

The five hierarchy tiers start at the bottom with the controls perceived to be the least effective, and move up to those considered the most effective. Based on studying workplace safety protocols and as part of its Prevention through Design program, the National Institute for Occupational Safety and Health (NIOSH) lays out the tiers across five levels.

³EHS & Panduit: Industry Insights: Electrical Safety Considerations: <https://bit.ly/2W3XHID>

⁴Occupational Safety and Health Administration: <https://bit.ly/1U4yRHf>

Hierarchy of Risk Controls



Personal Protective Equipment

Personal protective equipment (PPE), defined by OSHA as equipment worn to minimize exposure to hazards, is a go-to choice to improve safety for employees. The Centers for Disease Control and Prevention reports it is used by 20 million workers⁵, and according to Global Market Insights the PPE market will hit \$67.6 billion by 2023⁶.

78%

EHS SURVEY
RESPONDENTS WHO USE
PPE IN THE WORKPLACE

Used in a variety of industries, including manufacturing, construction, oil and gas, chemicals, transportation, mining, food, and pharmaceuticals, the most common examples of PPE for electrical hazards include voltage-rated gloves, safety glasses, face shields, hard hats, safety shoes, hearing protection, flame-resistant clothing, and arc-rated clothing

such as hats, coveralls, vests, and full body suits. OSHA suggesting PPE use at all times, considering tiers above it in the hierarchy don't always eliminate the hazard, yet only 78% of surveyed respondents claim to apply PPE to electrical hazards in the workplace⁷.

When working in tandem with other levels of the hierarchy PPE can be effective, and it undoubtedly contributes to the prevention of injuries and fatalities. However, hazards are still present, making it imperative that PPE is inspected before each use and used appropriately in order to be effective. An established training program should cover when and how to use the PPE, and monitoring the program and PPE effectiveness should be ongoing. Personnel should fully understand their work task, even if controls mitigate arc flash hazards, but shock hazards may still be present, making the use of PPE an essential component of any safety program.

Not every hazard can be eliminated through design methods, making PPE extremely important.

⁵Coyne, Judi. "NIOSH Meeting on Worker Safety." <http://tinyurl.com/y4cvjhwu>

^{6,7}ISHN Magazine. "Global PPE market size forecast to be \$67.6 billion by 2023." <http://tinyurl.com/yy3yqse8>





Administrative Controls

According to OSHA, administrative controls are meant to change the behavior of workers, with examples including things like training, procedure, policy, and installation of signs and warning labels to reduce the threat of workplace hazards. Like PPE, they are mainly used alongside existing protocols where hazards are not well controlled, and in any industry where electricity is present. Mostly inexpensive to implement and establish, they too often require effort from workers in order to be effective. When implementing electrical safety policies, 32% of survey respondents said the main challenge workplaces face is safety culture resistance to change. Furthermore, 30% said a lack of understanding of electrical standards and compliance requirements was the main struggle⁸. Administrative controls can only be effective when the staff expected to implement them understands and accepts them.

For many organizations, these are the primary approach to reducing workplace injuries. As a result, the safety of workers in these settings relies on them being properly designed, maintained, and implemented by the staff.

32% RESIST CHANGE TO SAFETY CULTURE

30% LACK UNDERSTANDING OF STANDARDS & COMPLIANCE REQUIREMENTS

Panduit recognizes that for any safety program to be effective it must first be understood and implemented correctly. Panduit has developed an extensive line of products to fit in this tier of the hierarchy. A lockout/tagout program is an example of an administrative control, such as warnings and signs to mitigate hazards

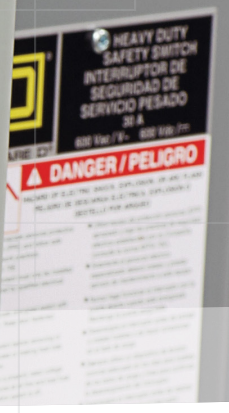
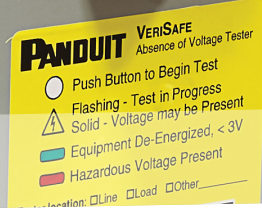
for workers. Additionally, Panduit offers other facility identification signs, labels, printers, and tags to help prevent workplace injury.

Administrative controls are usually simple, but they can be effective when used in partnership with other elements of the hierarchy.

To remain an asset, they should continually be audited and improved. To prevent deviation and deter the use of shortcuts, organizations should continuously train and retrain personnel on their administrative controls.

⁸EHS & Panduit: Industry Insights: Electrical Safety Considerations: <https://bit.ly/2W3XHID>

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Engineering Controls

At the midway point of the tiers, engineering controls are defined as the protection of workers by removing hazardous conditions or by placing a barrier between the worker and the hazard. Typically favored over administrative controls and PPE, they prevent access or act as a barrier to keep personnel away from electrical hazards.

Well-designed engineering controls, such as Panduit's VeriSafe™ Absence of Voltage Tester, can be highly effective in protecting workers without interfering with productivity. By nature, they are less susceptible to human error, and over time often provide a cost savings by eliminating certain workplace processes and the potential for financial ramifications that result from workplace injuries. VeriSafe AVT, for example, in about 10 seconds automates the NFPA 70E verification step in the process of establishing an electrically safe work condition, enabling plants to operate faster, safer, and more efficiently.

10 SECONDS

TIME IT TAKES VERISAFE™ AVT TO CONDUCT AUTOMATED NFPA 70E VERIFICATION PROCESS

Controls at or above this level often introduce innovations or technologies as an approach to Prevention through Design (PtD).

NIOSH defines PtD as addressing occupational safety and health needs in the design process to prevent or minimize the work-related hazards and risks associated with the construction, manufacture, use, maintenance, and disposal of facilities, materials, and equipment. Several PtD product innovation examples include permanently mounted voltage indicators, voltage portals, data access ports, infrared windows for thermal inspection, and absence of voltage testers. Unfortunately, when implementing electrical safety technologies like these, 32% of respondents indicated that a main challenge workplaces face are employees resistant to change⁹.

It has been well documented that mitigating hazards through design efforts are more effective and reliable for protecting workers from electrical hazards, rather than relying solely on administrative controls and PPE. The process of de-energizing and verifying equipment in an electrically safe work condition before beginning work can prevent electrical incidents and even death, is a prime example of engineering controls and PtD in action working cohesively.

⁹EHS & Panduit: Industry Insights: Electrical Safety Considerations: <https://bit.ly/2W3XHID>

Substitution

A top tier, substitution, is what it sounds like – replacing something that is hazardous to workers with something that is not. One of the two most effective methods for reducing hazards, substitution can apply to a process, tool, or circuit element. For example, unguarded circuit parts can be replaced with alternatives that are IP20 finger-safe. The three tiers below it should not be considered until this tier has been ruled out as a possible safety solution.

A good example of this is arc-resistant equipment. Rather than specifying and installing traditional equipment such as switchgear and motor-control centers, arc-resistant versions of this equipment can be utilized. This substitution incorporates arc-resistant material and reduces the exposure to the arc flash hazard by directing the energy away from a worker that is performing a task, such as operating or racking a circuit breaker in or out with the doors closed.

60% SITE COST AS A KEY CONSIDERATION WHEN PURCHASING ADVANCED SAFETY TRAINING

With more advanced technology often comes a higher cost. When purchasing new products for electrical safety, respondents said cost (60%) and the ability to standardize throughout the workplace (47%)¹⁰ were key considerations, but the big picture shows it pays off in the long run.

Substitutions may not show an immediate cost savings, but organizations should consider the total cost of ownership. While the initial capital cost may be increased, productivity savings will emerge over time, in addition to avoiding the costs associated with incidents and their corresponding injuries.

With this in mind, it is critical to remember that utilizing a substitution doesn't mean the hazard no longer exists.

Elimination

The top tier, elimination, is as simple as it sounds – the complete removal of a material or process that causes hazards. But while the definition may be simple, the actual achievement of it is more complex. If available, elimination is the measure that must be chosen. However, to eliminate electrical hazards, electricity and electrical energy sources would need to be eliminated, which is not practical or feasible in most industrial and manufacturing settings. NIOSH recommends that employers examine any job or activity that puts employees at risk of injury¹¹. More often than not, it's impossible to accomplish entirely when it comes to electrical work because of feasibility.

¹⁰EHS & Panduit: Industry Insights: Electrical Safety Considerations: <https://bit.ly/2W3XHID>

¹¹NIOSH: <https://bit.ly/2M1cVTt>





Finding a Solutions Partner that Helps Mitigate Workplace Hazards

Electrical incidents can result in damaged equipment, serious injuries, or worse. According to the U.S. Bureau of Labor Statistics, electrocution is the fifth leading cause of workplace fatalities in the US. According to Electrical Safety Foundation International, between 1992 and 2010, an average of 268 people annually died on the job from electrocution. Thousands more suffered injuries such as shocks and burns from electrical accidents. While a safety manager's job is challenging, a firm understanding of the Hierarchy of Controls, and utilizing a trusted and dependable solutions partner like Panduit, can help alleviate workplace risk and create environments where electrical hazards, like shock and arc flash, can be mitigated.

With the advancement of technology, those responsible for workplace safety should continue to explore new technology and leverage innovation to mitigate risk to workers, with the ultimate objective of creating safer work environments.

This includes products, equipment, tools, processes, work methods, organization, and a continual pursuit to climb the Hierarchy of Controls. Because of the nature of the industry, not all hazards can practically be eliminated. However, many hazards may be mitigated through engineering controls or substitution, including the task of verifying the absence of voltage.

When it comes to protecting against electrical hazards, it is possible to significantly reduce the chances of a dangerous event by following safety best practices and using the right equipment. Panduit is a \$1 billion global manufacturer of leading-edge physical, electrical, and network infrastructure solutions for enterprise-wide environments that invests 8% of its top line revenue in R&D to maintain its status as an electrical safety and connectivity industry leader and to ensure performance and cost-efficiency. Given the risks, electrical safety requires serious attention, and Panduit has a consistent history—more than 60 years—of working with organizations to help them mitigate risks.



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Since 1955, Panduit's culture of curiosity and passion for problem solving have enabled more meaningful connections between companies' business goals and their marketplace success. Panduit creates leading-edge physical, electrical, and network infrastructure solutions for enterprise-wide environments, from the data center to the telecom room, from the desktop to the plant floor. Headquartered in Tinley Park, IL, USA and operating in 112 global locations, Panduit's proven reputation for quality and technology leadership, coupled with a robust partner ecosystem, help support, sustain, and empower business growth in a connected world.

For more information

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