

Are you OSHA Compliant?

An Arc Flash Checklist

Inside you will read about:

- Why should I have an Arc Flash Risk Assessment?
- Are your Electrical Systems Compliant?
- Thompson Knows Arc Flash
- Keep your Electrical Gear Clean and Tight
- OSHA's Most Cited Violation in 2017 was Training
- FR/Electrical Safety-NFPA 70E Standard
- Safety in Welding and Metalworking

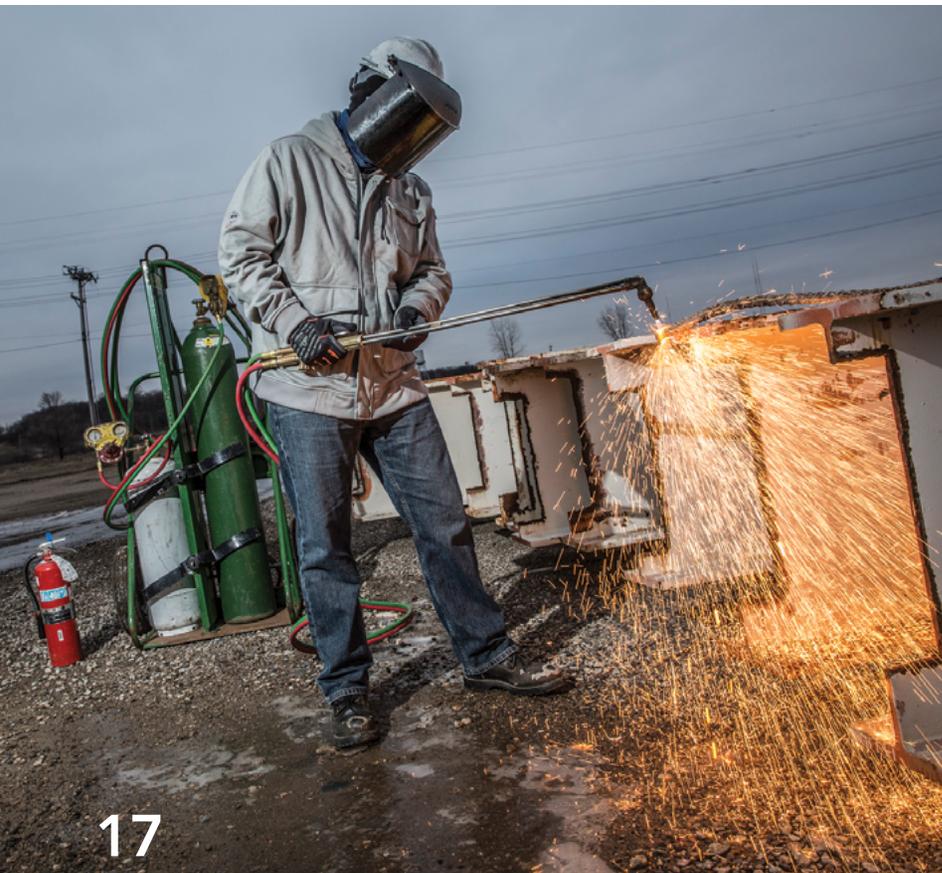
SPONSORED BY:



Contents

Features

- 15** FR/Electrical Safety-NFPA 70E Standard
- 17** Safety in Welding and Metalworking



17



10

Sponsored Content

- 3** Why should I have an Arc Flash Risk Assessment? *(And other facts you should know about an arc flash risk assessment)*
- 6** Are your Electrical Systems Compliant?
- 9** Thompson Knows Arc Flash
- 10** Keep your Electrical Gear Clean and Tight
- 13** OSHA's Most Cited Violation in 2017 was Training

WHY SHOULD I HAVE AN ARC FLASH RISK ASSESSMENT?

(AND OTHER FACTS YOU SHOULD KNOW ABOUT AN ARC FLASH RISK ASSESSMENT)

Often one of the first questions asked is “What is an arc flash?” An arc flash is a dangerous condition associated with an electrical explosion or the release of energy caused by an electrical arc. The flash causes an explosion with temperatures up to 35,000-degrees F, dangerous pressure and sound waves, thermal radiation and shrapnel.

The first reason for having an Arc Flash Risk Assessment completed is that arc flash explosions are known to cause serious damage to your facility and personnel. Given the extreme temperatures (hotter than the sun), burns account for about 80% of the injuries from electric arc explosions. Employees not wearing the proper Personal Protective Equipment (PPE) are at risk of electric shock, severe burns, blindness, shrapnel wounds, lung blast injuries, ruptured eardrums and pressure wave injuries. The damage caused by an arc flash explosion can cause significant damage to your facility; damage where you may be dealing with lengthy downtime, extensive repairs, loss of profit and even expensive regulatory fines.

Numerous workers are injured and/or killed each year while working on energized equipment. Many of these casualties are a result of arc flash.

A good Arc Flash Risk Assessment can be used to determine the Incident Energy Value and proper hazard/risk categorization of your equipment. This helps workers understand the kind of energy they are working around, the necessary flash protection boundaries and the appropriate Personal Protective Equipment (PPE) they need to keep themselves safe. In addition, a good Arc Flash Risk Assessment can help mitigate the risk and damages from an arc flash explosion. Often times, simple adjustments to your electrical system, like the adjustment of breaker settings or installation of a breaker disconnect, can significantly improve electrical safety and reduce your risk of an accident.



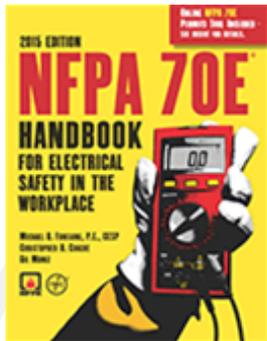
The second reason to have an Arc Flash Risk Assessment completed is that it is required by OSHA. In 2014, OSHA began considering arc flash as a ‘recognized hazard’ and therefore, the OSHA General Duty Clause began to cover arc flash explosions. All employers need to implement and document an electrical safety program that directs activity appropriate to the risk associated with

OSHA ARC FLASH REQUIREMENTS:

- 1. OSHA General Duty Clause which states:**
Each employer shall furnish to each of his employees’ employment and a place of employment, which are free from recognized hazards that are causing or are likely to cause death or serious physical harm.
- 2. OSHA 29 CFR1910.333 (a)(1) states:**
Qualified electrical workers shall not be asked to work on equipment that is “hot” or “live” except for two reasons:
 - A. De-energizing introduces additional or increased hazards such as cutting ventilation to a hazardous location
 - B. Due to equipment design or operational limitations such as doing voltage testing for diagnostics
- 3. OSHA 29 CFR 1910.335 states:**
“Employees working in areas where potential electrical hazards exist shall be provided with and shall use personal protective equipment.”

electric hazards. The electrical safety program needs to be implemented as a part of the employers overall occupational health and safety management system.

After a period of transition in which companies were allowed a grace period to become complaint, all companies now must comply and have an Arc Flash Risk Assessment completed every five years.



The way that OSHA expects companies to conduct Arc Flash Risk Assessments is by following standard and recognized best practices. The leading standard and recognized industry best practice in electrical safety is the NFPA 70e Handbook. Simply stated, the employer

is required to conduct an assessment in accordance with CFR 1910.132(d)(1). Then, if an arc flash hazard is likely to be present, the employer must select and require employees to use Personal Protective Equipment (PPE). Employers who conduct the hazard/risk assessment provide and require their employees with the appropriate PPE are deemed in compliance with the Hazard Assessment and Equipment Selection OSHA standard. The most accurate way to determine the arc flash risk is by

conducting an Incident Energy analysis. While other methods can be used, the Incident Energy method provides the most accurate information for the equipment to be labelled and provides the greatest level of safety to the employee.

An arc flash and the resulting explosions can be devastating to your organization and the employee that is not properly prepared or protected against it. Whether your motivation is to protect your employees or meet the OSHA requirements, having an Arc Flash Risk Assessment completed by qualified and trained professionals is important. An arc flash can happen in the blink of an eye, but the long term impacts can last forever. Contact the experienced arc flash specialists at Thompson Specialty Services today to perform an arc flash analysis for your facility, complex, office or campus.

Thompson Innovation provides automation and controls support and specialty electrical services to help our customers operate their facilities more efficiently, keep in compliance with government and safety standards, run electrical systems at optimal energy efficiency levels and help reduce the ever-growing energy costs.

Contact us today for more information on how we can help your business operate safely, energy efficiently, cost effectively and in compliance for years to come.



Thompson Knows

Electrical Safety • Automation & Robotics Life Safety & Security • Managed IT & Software

Contact us for more information!

thompsoninnovation.com 866.258.8462 sales@thompsoninnovation.com

About Workplace Material Handling & Safety



Workplace Material Handling & Safety is a monthly publication that connects facilities & operations with EHS. Many times, they are under the same department. Our monthly subscribers include 20,000 print and 70,000 digital in the manufacturing and construction industries focusing on the top 5 high hazard markets: Construction, Primary Metals, Fabricated Metals, Transportation and Food Processing.

We recognize the operational challenges of productivity in a plant or on a construction site and keeping workers safe at the same time, no matter the facility. We are the only publication that covers the most up-to-date productivity solutions, safety in material handling, along with current safety regulations, trends and new products in both markets. We reach industrial executives, directors and managers that are looking to protect their workers with the current equipment, supplies and PPE gear. We are a one-stop shop for the EHS markets, so do not wait to jump on board to reach these manufacturing and construction decision-makers. *Workplace Material Handling & Safety* is a great opportunity to get in front of the people looking to buy your products through our many different print and digital opportunities.

Who are WMHS's readers?

- They are your customers! 94% of *Workplace Material Handling & Safety* respondents have purchasing influence over material handling or safety equipment/PPE purchases.
- The majority of *Workplace Material Handling & Safety* respondents work at a company doing more than \$50MM in sales annually meaning bigger purchasing power.
- *Workplace Material Handling & Safety* job titles include mostly Corporate, Plant Manager, Safety/EHS, Engineering, HR and Industrial Hygiene.



EMPLOYER RESPONSIBILITY



— Thompson Knows —

ARC FLASH REQUIREMENTS

ARTICLE 105.3 (A) EMPLOYER RESPONSIBILITY

- (1) Establish, implement and document the safety related work practices and procedures required by this standard.
- (2) Provide employees with training in the employer's safety-related work practices and procedures.

ARTICLE 130.5(F) ARC FLASH PPE

One of the following methods shall be used for the selection of arc flash PPE:

- (1) The incident energy analysis method in accordance with *NFPA70E – Chart 130.5(D)*
- (2) The arc flash PPE category method in accordance with *NFPA70E – Chart 130.7(C)(15)(a)*

ARTICLE 110.2 TRAINING REQUIREMENTS

The training required by this section shall be classroom; on the job, or a combination of the two. The type and extent of the training shall be determined by the risk to the employee.

CONTACT US FOR MORE INFORMATION!

thompsoninnovation.com **866.258.8462** sales@thompsoninnovation.com

Electrical Safety • Automation & Robotics  Life Safety & Security • Managed IT & Software

ARE YOUR ELECTRICAL SYSTEMS COMPLIANT?

NAVIGATING OSHA, NFPA, IEEE, NEC CODES AND REQUIREMENTS CAN BE DIFFICULT, BUT STAYING COMPLIANT IS CRITICAL.

We know the top causes of failure in electrical systems: loose connections, improperly installed parts, defective/ inadequate insulation, foreign objects causing short circuiting, overloading inadequate capacity and the accumulation of dust, dirt and oil. Electrical failures often can be avoided, and good preventative maintenance programs can help predict the imminent failure of equipment. According to the Institute of Electrical and Electronics Engineers (IEEE), the failure rate of electrical equipment is three times higher when electrical preventive maintenance programs are not performed.

Electrical Safety is not just about preventative maintenance programs; it also involves compliance with regulatory groups that are responsible for establishing safe work practices and implementing best practices. In the case of Electrical Safety as an example, OSHA, NFPA, IEEE and NEC codes and requirements document hundreds of rules and best practices that need to be followed. The NFPA 70E is often referred to as the 'how-to-comply instruction manual' for OSHA's regulations regarding electrical hazard assessments and how to select the appropriate PPE for live electrical work. As a result, companies can be cited by OSHA for non-compliance of NFPA 70E.

To ensure your electrical systems are in compliance with the NFPA 70E requirements, there are five key things that you should be doing.

1. Have an Arc Flash Risk Assessment completed
2. Annually perform a Thermal Imaging scan
3. Conduct routine inspections
4. Keep your electrical gear clean
5. Make sure employees are trained and qualified

1 ARC FLASH RISK ASSESSMENT

An arc flash or explosion is produced by the flow of electrical current through ionized air after an initial flashover or short circuit. Things that can cause an arc flash are a spark discharge, accidental touching, accidental dropping of tools, mechanical failure, dust and impurities buildup, corrosion, condensation and over-voltage stress. The NFPA 70E guidelines are very clear, and an Arc Flash Risk Assessment should be performed on any electrical gear that has a likelihood to be worked on live.

The Arc Flash Risk Assessment is used to determine the voltage to which personnel will be exposed, the boundary requirements of the electrical gear and the PPE necessary to minimize the possibility of electric shock to personnel should there be an accident. An arc flash study does not remove the possibility of an accident, but rather should help minimize the damage and exposure if there is one. If your organization has not had an Arc Flash Risk Assessment completed, you should.

2 THERMAL IMAGING

While there is not a single EPM program or field of study that would catch all problems, the most reliable and cost-effective inspection to have conducted is Thermal Imaging. Thermal Imaging is a non-contact, non-destructive technology proven effective in the early detection of imminent failure in electrical and mechanical system. When properly conducted, a Thermal Imaging inspection can identify "hot spots" or areas of potential problems that necessitate further investigation and maintenance. Thermography (infrared scanning) is a common way to identify areas that need to be repaired but must be done while the gear is energized. There are reputable thermographic testing firms available with certified thermographers that know and understand the equipment and testing procedures. Since thermal imaging must be done while the gear is energized and under a load, you should have a trained and certified thermal imaging expert that is qualified to work on live gear. All electrical work, which includes thermography studies, should be performed by qualified electrical personnel, as defined by the NFPA 70E. In most cases, any correction action or repairs that need to be done are left for you, the equipment owner, to worry about at another time. In addition to a certified thermographer, it is also suggested that you look for a contractor that can test and implement recommendations while on site and before leaving

the premises. Why pay someone to come back later and fix what can be done on the spot?

3 ROUTINE INSPECTION

Routine inspections, periodic checks and cleaning of gear all help mitigate the risk of unplanned down time between planned shutdowns. Electrical systems, just like mechanical systems, are prone to failure over time due to age, poor maintenance and the stress of over use. People often assume that because electrical systems lack moving parts there is not a need for electrical preventative maintenance. An idea that couldn't be further from the truth. In fact, the resulting impacts of electrical failures can lead to larger and more costly problems than mechanical failures alone.

Electrical equipment should be:

- Free from signs of moisture contamination
- Free of debris on or around the equipment
- Inspected for signs of arcing, corrosion and excessive heat
- Checked for proper tightness
- Filters changed according to manufacturer's recommendations
- Have seals and gaskets Inspected and replaced as needed

4 CLEANING

Keep your gear clean. The buildup of dirt and metal debris in an electrical enclosure can cause arcing and arc flash explosions. A second issue brought about by the buildup of dirt and debris is an increase in heat and the temperature of electrical equipment. Restricted

airflow and an increase in the temperature of gear decreases the quality and usable life of equipment. A dirty environment also creates a hospitable home for rodents and vermin.

While the gear is off and being cleaned, why not take an extra minute to check and tighten those loose connections? Cleaning is a great time for getting inside de-energized equipment to check cable connections, wear and tear and torque bus connections. Loose connections are a major cause of electrical failures.

5 TRAINING

Given the nearly 5,000 recorded OSHA violations in 2017 related to training, it's time to look at your companies training programs and make sure you are covered and not in violation of an OSHA rule. Not only are nearly one fifth of all OSHA violations in 2017 related to training, the #9 reason for citations alone was improper training related to fall protection. OSHA is sending a very clear message to all employers; train your employees!

If you are wondering where to start with training, the first place to start is with education and an understanding of what OSHA is asking of you. OSHA requires explicitly that the employer must train employees in the safety and health aspects of their job. One place to find this information is in the Training Requirements in the OSHA Standards book.

It provides a general overview of training standards, requirements and related topics to assist employers, safety and health professionals and training directors with what they need to know regarding OSHA's training-related requirements. You could also just start by looking at the list of most cited violations.

The implications of an electrical accident can be tremendous. The cost of downtime, injury, insurance premium increases, fines and penalties can add up quickly. Thankfully electrical accidents can be avoided. By following OSHA, NFPA, IEEE, NEC codes and requirements, you can reduce the likelihood of an accident and help reduce the possibility of a costly accident. For more information and help on staying compliant, be sure to contact a contractor that specializes in safety and compliance.

Thompson Innovation provides automation and controls support and specialty electrical services to help our customers operate their facilities more efficiently, keep in compliance with government and safety standards, run electrical systems at optimal energy efficiency levels and help reduce the ever-growing energy costs.

Contact us today for more information on how we can help your business operate safely, energy efficiently, cost effectively and in compliance for years to come.



Thompson Knows

Electrical Safety • Automation & Robotics Life Safety & Security • Managed IT & Software

Contact us for more information!

thompsoninnovation.com 866.258.8462 sales@thompsoninnovation.com



GET HOME SAFE



Thompson Knows

ELECTRICAL SAFETY & TRAINING

Thompson Innovation understands that electrical safety, safe workplace practices and employee training are critical to preventing injury, downtime, profit loss, and avoiding regulatory fines. Navigating OSHA and other regulatory guidelines can be a challenge. Our team of experts develop safety and maintenance programs and customized training to effectively reduce employer and employee risks.

-  **Arc Flash Risk Assessment**
-  **Electrical Preventative Maintenance**
-  **Safety Training**
-  **Infrared Thermal Imaging**
-  **Risk Mitigation**
-  **Breaker Testing & Coordination**

CONTACT US FOR MORE INFORMATION!

thompsoninnovation.com **866.258.8462** sales@thompsoninnovation.com

Electrical Safety • Automation & Robotics  Life Safety & Security • Managed IT & Software

Thompson Knows

ARC FLASH



What Is Arc Flash?

An arc flash is a dangerous condition associated with the release of energy caused by an electrical arc. The flash causes an explosion with temperatures up to 35,000° F, dangerous pressure and sound waves, thermal radiation and shrapnel. This can cause serious injury to your personnel and facility, lengthy downtime and expensive regulatory fines.

An Arc Flash Risk Assessment is required by OSHA and is used to determine:

- Calculate Incident Energy Value
- Determine Flash Protection Boundaries
- Identify Appropriate Personal Protective Equipment (PPE)
- Set Proper Hazard Categorization of Equipment
- Develop Arc Flash Risk Mitigation Strategies

Why Thompson?

The Arc Flash Risk Assessment performed by Thompson Innovation will be done by trained licensed electricians in compliance with the NFPA 70E standards. Upon completion of the Arc Flash Risk Assessment, Thompson will prepare a professional report summarizing the findings, install new equipment labels in compliance with NFPA 70E standards, and provide an updated one-line diagram of the electrical system, as well as access to a secure on-line database for storage of your report and one-line diagram. In addition, Thompson offers training for employees conducted by a qualified OSHA trainer on the dangers of Arc Flash and the proper use of Personal Protective Equipment (PPE) in compliance with OSHA and NFPA 70E.



Why have an Arc Flash Risk Assessment?

1. OSHA General Duty Clause states:

Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm.

2. OSHA 29 CFR 1926.960(g)

The employer shall assess the workplace to identify employees exposed to hazards from flames or electric arcs. For each employee exposed to hazards from electric arcs, the employer shall make a reasonable estimate of the incident heat energy to which they would be exposed.

3. OSHA 29 CFR 1910.335

Employees, working in areas where potential electrical hazards exist, shall be provided with and shall use personal protective equipment.

4. NFPA 70e 110.A

The employer shall implement and document an overall electrical safety program that directs activity appropriate to the risk associated with electric hazards.

CONTACT US FOR MORE INFORMATION!

thompsoninnovation.com **866.258.8462** sales@thompsoninnovation.com

KEEP YOUR ELECTRICAL GEAR CLEAN AND TIGHT

Electrical failures often can be avoided, and good preventative maintenance programs can help predict the imminent failure of equipment. According to the Institute of Electrical and Electronics Engineers (IEEE), the failure rate of electrical equipment is three times higher when electrical preventive maintenance programs are not performed. This tells us that electrical failures can be avoided.



But, what should be included in a good electrical preventative maintenance (EPM) program? There are so many things that could be done. Equipment maintenance, cleaning and thermal imaging are just a few of the things to be considered. However, where does one put the priority? Just consider the top causes of failure in electrical systems: loose connections, improperly installed parts, defective/inadequate insulation, foreign objects causing short circuiting, overloading inadequate capacity and the accumulation of dust, dirt and oil. All these things can be prevented with routine and systemic electrical inspections.

Common in many causes of electrical equipment failure is gear not being clean and well maintained.

Four things to keep in mind when developing an Electrical Preventive Maintenance Program.

1 Keep your gear clean. The buildup of dirt and metal debris in an electrical enclosure can cause arcing and arc flash explosions. A second issue brought about by the buildup of dirt and debris is an increase in heat and the temperature of electrical equipment. Restricted airflow and an increase in the temperature of gear decreases the quality and usable life of equipment. A dirty environment also creates a hospitable home for rodents and vermin.



2 Cleaning is not just about cleaning. A solid EPM program should include de-energized maintenance at least every three years on electrical equipment. The perfect time for routine exercising of your breakers and oiling and lubricating moving parts is while you are already there cleaning during a de-energized state. Cleaning is a great time for getting inside de-energized equipment to check cable connections, wear and tear and torque bus connections.

3 Keep your gear tight. Loose connections are a major cause of electrical failures. Greater than 75% of the problems uncovered during routine thermal imaging inspections are loose connections. Thermography (infrared scanning) is a common way to identify areas that need repair, but must be done while the gear is energized. While the gear is off and being cleaned, why not take an extra minute to check and tighten those loose connections?

4 Cleaning is not an expense, rather a good investment. What would an accident cost you? EPM programs are not just about risk avoidance, they can also be associated with a positive return on investment (ROI). EPM programs are investments that pay back in reducing downtime and unplanned plant shut downs; improving the operation efficiency and life of motors, bearings and pumps; and relieving out of phase and stressed switchgear, breakers and electrical connectors. All things that have been shown time and time again to save money over time.



If you have more questions, or are looking for ideas and more information on best practice electrical preventative maintenance programs, give the experts at Thompson Innovation a call today. Given their 85 plus years of experience as an electrical contractor, Thompson specializes in the development of custom electrical preventative maintenance programs for customers across the country. Thompson understands the importance of keeping facilities safe, efficient and operating at peak performance and can custom tailor a program for you.

Thompson Innovation provides automation and controls support and specialty electrical services to help our customers operate their facilities more efficiently, keep in compliance with government and safety standards, run electrical systems at optimal energy efficiency levels and help reduce the ever-growing energy costs.

Contact us today for more information on how we can help your business operate safely, energy efficiently, cost effectively and in compliance for years to come.

Routine inspections, periodic checks and cleaning of gear all help mitigate the risk of unplanned down time between planned shutdowns. Electrical systems, just like mechanical systems, are prone to failure over time due to age, poor maintenance and the stress from over use. People often assume that, because electrical systems lack moving parts, there is not a need for electrical preventative maintenance. An idea that couldn't be further from the truth. In fact, the resulting impacts of electrical failures can lead to larger and more costly problems than mechanical failures alone. The question, then, when deciding on the value of a preventative maintenance program is not the cost of the program but rather the return on the investment.



Thompson Knows

Electrical Safety • Automation & Robotics Life Safety & Security • Managed IT & Software

Contact us for more information!

thompsoninnovation.com 866.258.8462 sales@thompsoninnovation.com

Want more eBooks?

WMHS has published other informative ebooks chock-full of current, useful information on Construction Safety, Arc Flash Protection, and OSHA Compliance.

Visit www.workplacepub.com/ebooks to access all of the available eBooks. While you are there be sure to bookmark the page and come back often because we will be adding new eBooks throughout the year.



ELECTRICAL SAFETY & 2018 NFPA 70E UPDATES



Thompson Knows

COMPLIANCE QUIZ: CAN YOU ANSWER YES?

Yes No **Arc Flash Analysis Completed**

Yes No **Equipment Labeled**

Yes No **Proper PPE On Site**

Yes No **Risks Identified and Mitigated**

Yes No **Electrical Safety Program Updated**

Yes No **NFPA 70E Electrical Safety Training**

Are you compliant with the new NFPA 70E 2018 Edition Changes?

Electrical Safety has long been recognized as a serious workplace hazard by OSHA that can cause burns, shocks and even death. Thompson knows how to help you manage the complicated NFPA 70E compliance process.

CONTACT US FOR MORE INFORMATION!

thompsoninnovation.com **866.258.8462** sales@thompsoninnovation.com

OSHA'S MOST CITED VIOLATION IN 2017 WAS TRAINING

Given the nearly 5,000 recorded OSHA violations in 2017 related to Training, it's time to look at your companies' training programs, and make sure you are covered and not in violation of an OSHA rule. Not only are nearly one-fifth of all OSHA violations in 2017 related to training, but the ninth reason for citations alone was also improper training related to fall protection. OSHA is sending a very clear message to all employers; train your employees! So, where do you start if you don't have an in-house health and safety team to consult?

1 EDUCATION

The first place to start is with education and an understanding of what OSHA is asking you to do. OSHA requires explicitly that the employer must train employees in the safety and health aspects of their job. You might be wondering what that means. You are asked to provide education and training for managers, supervisors, and workers, so they have:

1. The necessary knowledge and skills needed to do their work safely, and avoid things that could put themselves and others unnecessarily in harm's way.
2. An awareness and understanding of work place hazards. Include how to spot them, report hazards, and eliminate them.
3. Further specialized training when the work is new or involves unique hazards.

2 CONTENT

The second thing employers should consider is what kind of training an employee needs. OSHA has published Training Requirements in OSHA Standards, a 270-page book that provides a general overview of training standards, requirements and related topics. The book is to assist employers, safety and health professionals, and training directors with what they need to know regarding OSHA's training related requirements. One can also just start by looking at the list of most cited violations. Ask yourself: Do your employees handle or work around dangerous chemicals? Are we properly locking out when we work on electrical gear? Have we conducted the proper electrical safety training or taught our employees on the proper use of fall safety equipment? If the answer is 'Yes' and you are not conducting training – you better start.

3 GET STARTED

The third thing to do then is just that; get started and keep track of what you are doing. One of the first questions an OSHA incident investigator will ask you is whether or not the employee(s) received adequate training to do the job and to do the job safely. Having started a program is better than not. While you might think of training as an expense, you should really think of it as an investment. An investment in your team to reduce the risk of injury and lost work time, to lower insurance costs and, most importantly,



to improve the morale of your team. Keeping track allows you to show that you have started a program and, while an accident can never be undone, you are trying to have a safe work environment, and the employee was trained on the proper procedures.

As a nationally recognized leader of electrical safety and electrical preventative maintenance testing, Thompson Training is also a leader in electrical safety, preventative maintenance and technical training. Thompson Training offers more than 60 specific courses in the areas of electrical safety and electrical preventative maintenance.

This breadth of courses provides us the opportunity to design a unique curriculum for your staff's specific needs. Whether the course is Electrical Safety for Non-Electrical Personnel, OSHA 30 or training on the most recent NFPA 70E 2018 updates, our expert trainers will connect with your team to deliver an impactful training session that increases your teams' knowledge.



Contact us for more information! thompsoninnovation.com 866.258.8462 sales@thompsoninnovation.com

COMPLIANCE TAKES TRAINING



Thompson Knows **SAFETY TRAINING**

Thompson Innovation is a recognized leader of electrical safety, preventative maintenance testing and risk mitigation. With 20+ years of training experience, Thompson can provide a variety of training classes to meet your team's needs. Compliance training, basic skill development, advanced training or a custom-made curriculum are all delivered with highly qualified and certified instructors who engage participants with real-world experiences. Courses are available in a variety of settings - traditional classroom, online and through an on-demand portal.

 **On Site**  **Online**  **On Demand**

CONTACT US FOR MORE INFORMATION!

thompsoninnovation.com **866.258.8462** **sales@thompsoninnovation.com**

Electrical Safety • Automation & Robotics  Life Safety & Security • Managed IT & Software

FR/Electrical Safety-NFPA 70E Standard

HISTORY:

According to the U.S. Bureau of Labor Statistics' Census of Fatal Occupational Injuries and Survey of Occupational Injuries data compiled by Electrical Safety Foundation International (ESFI), there were 154 electrical fatalities in the U.S. during 2016, a 15% increase over the 2015 total.

Exposure to electric current increased one place, to sixth on the list of occupational exposures leading to fatal injuries on the job. And electrocutions constituted the vast majority of electrical fatalities, while electrical burns of all degrees were responsible for four fatalities in 2016.

Despite these bleak numbers, decades ago, the grim statistics of fatalities and serious injuries stemming from electrical accidents were even worse. This is why on February 16, 1972, the Occupational Safety and Health Administration (OSHA) incorporated the 1971 edition of the National Fire Protection Association's (NFPA) National Electrical Code (NEC), NFPA 70-1971, as the electrical standard for general industry. On January 16, 1981, OSHA revised its electrical installation standard, replacing the incorporation by reference of the 1971 NEC with relevant requirements from Part 1 of the 1979 edition of NFPA 70E. This revision simplified and clarified the electrical standard.

In 1981, safety-related work practice requirements were added, and in 1995, the concepts of "limits of approach" and "arc flash" were introduced. The last two decades have concentrated on personal protective equipment (PPE) requirements and the development of electrical safety programs and policies by employers.

The current emphasis is on a business' duty to have a comprehensive electrical safety program that is integrated with the occupational health and safety management system. The 2015 edition defined risk-management terminology and aligned the standard's requirements to risk management principles.

WHY STANDARD IS IMPORTANT:

The previous fatality statistics give additional support to the widely recognized characterization of electricity being a serious workplace hazard. The human body will conduct electricity if direct body contact is made with an electrically energized part, while similar contact is made at the same time with another conductive surface.

Simply put, electricity will find the fastest and easiest way to the ground, even if that is through a human body. Currents at levels as low as 3 milliamperes traveling through the body can cause serious, even fatal, injuries.

The NFPA created the NFPA 70E standard to address the electrical safety requirements for employees. Also titled as Standard for Electrical Safety in the Workplace, NFPA 70E was originally developed at OSHA's request. In fact, some suggest OSHA writes the safety decrees companies are required to follow and NFPA describes to businesses how they should follow them.

NFPA 70E assists companies in complying with OSHA 1910 Subpart S and OSHA 1926 Subpart K. The standard helps companies and employees avoid workplace injuries and fatalities due to shock, electrocution, arc flash and arc blast.

Burns due to electrical accidents can be very serious. There are three basic types: electrical, which are the result of electric current flowing through the tissues; arc burns, which are the result of high temperatures produced by electric arcs or explosions close to the body; and thermal contact burns, which are typically caused by skin coming into contact with hot surfaces, such as electric conductors, conduits or other energized equipment. Any of these burns can happen simultaneously with each other.

Additionally, electric arcs can start fires and cause damage to equipment. In environments that have

explosive gases or vapors or combustible dust in them, electric arcs can cause explosions.

Electrical accidents are usually caused by unsafe conditions of some variety due to unsafe equipment and installations, unsafe work environments or work practices, or a combination of all three.

KEY COMPLIANCE REQUIREMENTS:

As in 2015, the 2018 edition of NFPA 70E continues to focus on risk management principles. Some of the major changes for 2018 are:

- **Risk Assessment Procedure:** This requirement emphasizes addressing human error and its negative consequences.
- **Hierarchy of Risk Controls Methods:** Listed according to their priority, they are the following:
 1. Elimination
 2. Substitution
 3. Engineering controls
 4. Awareness
 5. PPE
- **Establishing an Electrically Safe Work Condition:** These are a set of instructions on how to logically set up an electrical safety program.
- **Estimating the Likelihood of Occurrence of an Arc Flash Incident:** This is a table to help assess the risk of an arc flash and applies to the incident energy analysis method.
- **Selection of Arc-Rated Clothing using Incident Energy Analysis Method:** This is a table providing guidance on how to select gear when using the incident energy analysis method.

COMPLIANCE ASSISTANCE:

Copies of the standard can be purchased here. For more information, please visit: www.nfpa.org

ARE YOU WEARING THE PROPER PPE?



Thompson Knows

ELECTRICAL SAFETY PPE GUIDE

LEVEL 1

- 4 cal rated long sleeve shirt and pants or coveralls
- 100% cotton undergarments
- Heavy duty leather gloves
- Arc Rated face shield with safety glasses
- Hearing protection
- Leather footwear
- Hard hat



1.2 to 4 cal/cm²
Minimum Arc Rating of 4 cal/cm²

LEVEL 2

- 8 cal rated long sleeve shirt and pants or coveralls
- 100% cotton undergarments
- Class 00 rubber gloves w/ leather shock protectors
- Arc Rated face shield with safety glasses
- Balaclava
- Hearing protection
- Leather footwear
- Hard hat



4.1 to 8 cal/cm²
Minimum Arc Rating of 8 cal/cm²

LEVEL 3

- 25 cal rated flash suit jacket, pants & hood
- 100% cotton undergarments
- Class 00 rubber gloves w/ leather shock protectors
- Safety glasses
- Hearing protection
- Leather footwear
- Hard hat



8.1 to 25 cal/cm²
Minimum Arc Rating of 25 cal/cm²

LEVEL 4

- 40 cal rated flash suit jacket, pants & hood
- 100% cotton undergarments
- Class 0 or higher rubber gloves w/ leather shock protectors
- Safety glasses
- Hearing protection
- Leather footwear
- Hard hat



25.1 to 40 cal/cm²
Minimum Arc Rating of 40 cal/cm²

This PPE guide is for reference only and it is not meant to replace any regulation, code or standard. Please refer to the NFPA 70E - 2018 Edition for more information.

CONTACT US FOR MORE INFORMATION!

thompsoninnovation.com 866.258.8462 sales@thompsoninnovation.com

Electrical Safety • Automation & Robotics  Life Safety & Security • Managed IT & Software

Safety in Welding and Metalworking

By: **Barbara T. Nessinger**,
Chief Editor



Photo courtesy Ergodyne

According to the American Welding Society, an estimated 50% U.S. gross national product is affected by welding. Anything made of metal, no matter how big or small, can be welded. Welding is the most common method used to join metal parts in large structures and equipment, due to its strength. Soldering and brazing are similar processes to welding, but they are used on electronic and other small equipment and use lower temperatures to melt the filler metal.

Most welding today falls into one of two categories: arc welding (the use of an electrical arc to melt the work materials) and torch welding (the use of an oxyacetylene torch to melt the working material and welding rod). There are more than 100 welding processes; most involve a skilled worker using a high-heat torch, filler material that is usually in wire or stick form, and pressure to permanently bond metal pieces.

Welding, cutting, brazing and grinding all create significant fire and explosion risks. This type of work generates hot sparks and slag. Those can then come into contact with nearby combustibles and flammable gases.

Most welding safety practices and equipment are universally applicable. Welding exposes everyone to similar hazards, from a welding-intensive manufacturing company; a billion-dollar engineering and construction firm; a small independent fabricator; or someone responsible for safety-at-large in the workplace. Wearing the proper PPE equipment is extremely important to keep welders and watchers safe from multiple hazards.

Implementing good welding/hot-work safety practices can help do more than just save lives. When welding safety becomes an ingrained part of the corporate culture, there can be fewer reduced lost-time incidences and improved productivity.

[See sidebar "Preventing Hot-Work Accidents."]

SAFETY MATTERS: PROPER CLOTHING

It was stated above, but it bears repeating: Wearing the proper gear for any welding activity is of paramount importance. Even quick work, such as tack welding, requires the proper safety gear, including helmet, gloves and clothing. Note: shorts and short-sleeved shirts

PREVENTING HOT-WORK ACCIDENTS

According to OSHA, between 2005 and 2015, there have been 85 fire-related deaths in the oil and gas industry. Of those, 28 occurred due to improper hot-work practices. RMI's blog titled "Preventing Fires with a Hot-Works Program," provides some general guidance on ways to prevent hot-work incidents, even for those not working in oil/gas. Here are some basic ways to prevent hot-work incidents:

HAVING AND USING A HOT-WORK PERMIT

A written permit is required in certain situations. But, it's a good idea to use them for all your hot-work activities anyway. The permit ensures that all necessary safety precautions are in place. It also helps lower the risk of fire or explosion.

PERFORMING HOT-WORK IN A SAFE LOCATION

Remove all combustibles from the area before conducting hot-work. Whenever possible, perform the work in an area that won't interfere with other workers.

WEARING THE PROPER PPE

Always wear FR clothing when performing hot work. It is the responsibility of the employer to provide this to the employee. Furthermore, FR clothing should be maintained and kept in good condition.

USING FIRE BLANKETS TO PROTECT NEARBY EQUIPMENT FROM SPARKS AND SLAG

If you cannot move combustibles or nearby equipment out of the way, lay fire blankets over them. This will protect them and prevent them from catching fire.

Continued on page 18



Photo courtesy Ergodyne

Ergodyne Njord safety glasses are the most economically priced style Ergodyne has to offer, but they still meet ANSI Z87.1 and U.S. military spectacle impact requirements.

should never be worn in a welding cell or doing any hot-work tasks.

Workers should wear only flame-resistant clothing, such as denim pants and a shirt made from tightly woven material or a welding jacket. Makers of safety gear now produce lightweight clothing from flame-resistant cloth, pigskin leather or combinations of the two that offer

better protection and increased ease of movement than welding jackets/clothing of the past. Such work gear is no longer cumbersome to wear nor too heavy, hot or restricting.

Proper footwear is also important. High-top leather shoes or boots provide the best foot protection. Pants legs should go over the shoes. Shoes should never be made of cloth.

Welding gloves are available with ergonomically curved fingers and come in different designs for specific welding processes. MIG welding is the most popular weld for a broad range of applications. The heat levels are less than in Stick welding, and the user operates a welding gun with a trigger requiring more dexterity. MIG gloves tend to be lighter weight than Stick gloves and, most importantly, have enhanced dexterity.

Heavy-to-medium duty MIG/Stick gloves and TIG gloves that provide added dexterity and touch are just some of the options available. However, gloves are not sufficient to pick up just-welded material: Pliers should always be used to avoid burns.

HEAD CASES

Welding helmets are an obvious must-have piece of PPE equipment for any welding task, starting with light exposure. It takes only a moment of exposure to a welding arc's rays for unprotected eyes to experience "arc flash," which is a painful condition that may not appear until hours after the worker is exposed. Welding helmets also should be fitted with a proper filter shade to protect the operator's face and eyes.

Auto-darkening welding helmets are also available; they can reduce operator fatigue. The sensors on an auto-darkening helmet darken the lens in a fraction of a

The panoramaxx helmet, by Optrel, allows for brightness and clarity of the welder's view from setup to welding and grinding. It features Optrel's patented Autopilot function, which has a unique, five-sensor array that measures the brightness of the welding arc and automatically adjusts to the correct shade level. (photo courtesy of Optrel)

HAVING FIRE EXTINGUISHERS NEARBY AND READY TO USE

Employees should always know where to find the nearest fire extinguisher. This is even more critical when performing hot-work. Hoses and other suppression equipment can work too.

ASSIGNING A FIRE WATCH FOR ALL HOT-WORK ACTIVITIES

A fire watch should always be present for hot-work activities. The fire watch should know how to sound the alarm in the event of a fire. They should also know to only extinguish a fire when it is small and contained to one area. OSHA requires the fire watch remain in place for at least 30 minutes after the work is complete.

[For the complete blog, go to: <http://blog.rmi-wyoming.com/fire-prevention-for-the-oil-and-gas-industry.>]



second. All auto-darkening helmets must meet ANSI standards, the most recent being ANSI Z87.1-2003. Industrial-grade helmets react at speeds of 1/10,000 to 1/20,000 of a second and have adjustable shades settings of #9 to #13 for welding. Industrial-grade helmets also have adjustable sensitivity and delay controls to adjust how long the lens stays dark after the arc stops. Auto-darkening helmets that darken with a reaction time of 1/2,000 to 1/3,600 of a second should generally be avoided for industrial applications. Cold weather also delays the reaction time of auto-darkening helmets. Higher-end helmets are rated for use to 14° F. However, lower-end helmets have slower reaction times and might not darken quickly enough in cold weather.

Clearer vision improves the welder's safety, comfort and efficiency. The panoramaxx helmet, by Optrel, allows for brightness and clarity of the welder's view from setup, to welding and grinding, all the way through inspection. The panoramaxx also features Optrel's patented Autopilot function, which features a unique, five-sensor array that measures the brightness of the welding arc and automatically adjusts to the correct shade level (5-12). If the welding parameters change, the Autopilot detects the changes and automatically corrects the shade level. Thus, the welder can better focus on his/her work, without interruption or having to adjust the shade setting. The helmet's unique nose cut-out allows positioning of the auto-darkening display closer to the eyes; this enlarges the field of vision without adding extra weight.

Some of the newer helmets have different modes, allowing the same helmet to be used for welding, cutting



photo
courtesy
of Optrel

or grinding. The most recent development is a mode that senses the arc electromagnetically, offering full protection when the sensors are obstructed, such as when pipe welding or welding out-of-position.

EYES HAVE IT

Approved safety glasses with side shields and ear protection should also be worn under a welding helmet. The lens shade should be appropriate for the welding application; OSHA offers a guide for choosing the correct lens based on certain welding criteria. If weld parameters and materials don't vary, a fixed-shade lens could be the best choice.

Welding glasses or goggles are used by welders to provide protection to their eyes from heat, intense ultraviolet or infrared light, and flying debris during welding and cutting operations. If these are not used, it may lead to a severe burn of the cornea known as Photokeratitis or welder's flash. Welding glasses provide a degree of eye protection against some types of welding and

cutting. These are however, not suitable for arc welding operations.

Welding is a common workplace task that requires a great deal of knowledge, training and patience to perform properly and safely. Most welders fully understand how to perform their jobs properly—it is the employer's responsibility to make sure they also understand the inherent hazards and how to implement proper welding safety protocol—beginning with the proper PPE for each employee.

Stay Informed on What Matters to Your Business!

For informative industry videos, visit WMHS's extensive video library at www.workplacepub.com/category/videos



ADDITIONAL RESOURCES:

NIOSH CHECKLIST FOR ARC-WELDING SELF-INSPECTION

The National Institute for Occupational Safety and Health (NIOSH) has many self-inspection check-lists, including for welding operations. This Self-Inspection Checklist covers regulations issued by the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) under the general industry standards 29 CFR 1910.254 and 1910.306, and the construction standards 1926.351 and 1926.353. It applies to the use of arc-welding and cutting equipment. [Go to <https://www.cdc.gov/niosh/docs/2004-101/chklists/r1n64w~1.htm> for more information.]

OSHA AND ANSI EYE-PROTECTION GUIDELINES

Many excellent sources exist for understanding and referencing eye protection guidelines. Some of those used for this article include: 29 CFR 1910.132, General Requirements; 29 CFR 1910.133, Eye and Face Protection; American National Standard Institute (ANSI)/ANSI/ISEA Z87.1-2015. Also, see the April 2018 issue of *Workplace Material Handling & Safety*, page 28, for a complete list of "Eye and Face Protection Device Definitions in ANSI/ISEA Z87.1-2015."



ARE YOU COMPLIANT?



Thompson Knows

ARC FLASH & OSHA COMPLIANCE

Why Thompson?

The Arc Flash Risk Assessment is performed by our trained, licensed electricians in compliance with the NFPA 70E standards. A comprehensive report summarizing the findings is provided at the completion of the assessment. The assessment includes installation of NFPA 70E compliant equipment labels, a one-line diagram of the electrical system, and access to our secure, online client portal for electronic access to their reports and drawings. Thompson also provides training for employees conducted by a qualified OSHA trainer on the dangers of Arc Flash and the proper use of Personal Protective Equipment (PPE). **This comprehensive assessment ensures in compliance with both OSHA and NFPA 70E requirements.**

CONTACT US FOR MORE INFORMATION!

thompsoninnovation.com **866.258.8462** sales@thompsoninnovation.com

Electrical Safety • Automation & Robotics  Life Safety & Security • Managed IT & Software

THANKS TO OUR SPONSOR



An RDG Media Inc. Publication
822 Central Ave., Suite 340, Fort Dodge, IA 50501
(888) 247-2007 | www.workplacepub.com