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ARC FLASH AWARENESS

Information and Discussion Topics
for Electrical Workers



Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health
Office of Mine Safety and Health



Ordering Information

Copies of National Institute for Occupational Safety and Health (NIOSH) documents and information about occupational safety and health are available from:

NIOSH-Publications Dissemination
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DHHS (NIOSH) Publication No. 2007-116D

ARC FLASH AWARENESS

Information and Discussion Topics for Electrical Workers

Kathleen M. Kowalski-Trakofler, Ph.D.

Research Psychologist

Mental Health Advisor, Office for Emergency Preparedness

Edward A. Barrett, CMSP

Mining Engineer

Charles W. Urban

Audio–Visual Production Specialist

Gerald T. Homce, P.E.

Electrical Engineer

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Centers for Disease Control and Prevention

National Institute for Occupational Safety and Health

Pittsburgh Research Laboratory

Pittsburgh, PA

January 2007

What is an arc flash?



An arc flash is the sudden release of electrical energy through the air when a high-voltage gap exists and there is a breakdown between conductors.

An arc flash gives off thermal radiation (heat) and bright, intense light that

can cause burns. Temperatures have been recorded as high as 35,000 °F. High-voltage arcs can also produce considerable pressure waves by rapidly heating the air and creating a blast. This pressure burst can hit a worker with great force and send molten metal droplets from melted copper and aluminum electrical components great distances at extremely high velocities.

Arc flash is sometimes called arc fault or arc blast.

What causes an arc flash?

An arc flash can be spontaneous or result from inadvertently bridging electrical contacts with a conducting object. Other causes may include dropped tools or the buildup of conductive dust or corrosion.

Conditions under which arc flash can occur:

- ▶ Working on an energized circuit
- ▶ Electrical equipment failure

Electrical Safety Regulations

Construction: 29 CFR Part 1926, Subpart K (OSHA)

General Industry: 29 CFR Part 1910, Subpart S (OSHA)

Mining: 30 CFR, Various Parts (MSHA)

Important safety recommendations: NFPA 70E

Establish an “electrically safe work condition” before working on a circuit by deenergizing it.

- ▶ Create an “electrically safe work condition” by... *
 - (1) Identifying all power sources,
 - (2) Interrupting the load and disconnecting power,
 - (3) Visually verifying that a disconnect has opened the circuit,
 - (4) Locking out and tagging the circuit,
 - (5) Testing for voltage, and
 - (6) Grounding all power conductors.

- ▶ Use a written permit system for planning and conducting work on or near energized parts.

- ▶ Use tools, meters, and other equipment that are suitable for the voltage and current levels present when performing all electrical work.

A **permit** contains information such as why and how the work will be conducted, detailed information about the shock and flash hazards involved, safe work practices to be used, personal protective equipment (PPE) to be used, and who authorized the energized work.

** All of these steps require the use of appropriate personnel protective equipment for shock and arc flash protection: safety glasses, voltage rated gloves, fire-resistant (FR) work clothes, arc-rated face shields, flash suits with hoods, and hearing protection.*

Comments from workers injured by an arc flash



Jon, a journeyman electrician, was taking data on circuit breakers that he believed to be deenergized. While closing one of the enclosure doors, an arc flash occurred. The arc flash blew the door open, knocking him back against a wall and causing him to lose consciousness in front of the enclosure, which continued to arc.

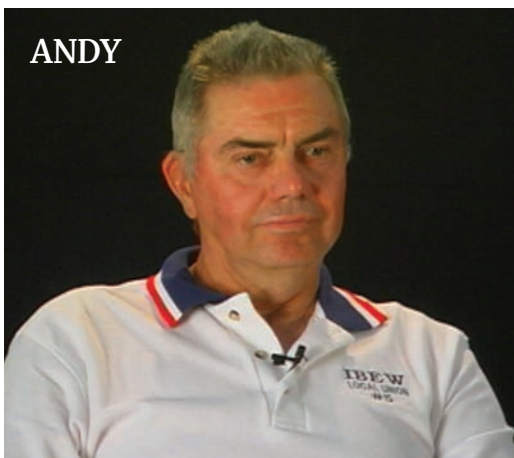
“The truth is an arc flash can happen to you when you least expect it...always wear your PPE.”



Don, a journeyman electrician, was Jon’s working partner that day. Although not initially injured by the arc flash, Don was burned as he rescued an unconscious Jon from in front of the enclosure as it continued to arc.

“Think the job through and know what can happen.”

Andy, a journeyman electrician, was removing a circuit breaker when an arc flash initiated right in front of him. Looking back, Andy realizes that the circuit breaker should have been deenergized before he began to work on it.



“Don’t be complacent...absolutely do not work with the power on!”

Organizational Responsibility

The organization has a responsibility in preventing arc flash injuries. It has the ability to provide a safety analysis of the workplace and develop engineering controls to eliminate hazards. It can engineer new or retrofitted facilities, incorporating the latest safety technology. Organizations have the duty to provide appropriate tools, PPE, and regular maintenance of equipment and training. A commitment to training is a commitment to safety. Partnerships with equipment suppliers can bring innovative and safer technology to the workplace. Most importantly, management can demonstrate the value of safety to their employees, customers, and other stakeholders through their actions, which creates a positive safety climate where people watch out for each other.

Discussion Questions

1. If one of the incidents in the video had happened to you, how would it have changed your life or the life of your family?
2. Have you ever experienced an arc flash? What happened? Did you change any safety practices in your work after the incident? What were they?
3. What are some behaviors that you can change to help prevent an arc flash incident to yourself and/or to your fellow electricians?
4. What PPE is recommended for your task? What are some of the excuses electricians use for not wearing appropriate PPE?
5. In general, as electricians become more experienced, do you think their safety habits change? How?
6. After viewing this video, which, if any, of your own safety work habits would you like to change?
7. Do you have any suggestions for your supervisor that you feel could help prevent an arc flash incident from happening to you or any of your coworkers?
8. What suggestions do you have for your company to help prevent arc flash incidents?

Staged Arc Flash Event



Worker nearing an open electrical panel

Bright, intense flash from the arc engulfs the worker



Non-FR work clothing burns after arc exposure

Photos courtesy of Schneider/Square D Corp. Used with permission.

Additional Resources

NFPA 70E, Standard for Electrical Safety in the Workplace, can be obtained from:

NFPA
1 Batterymarch Park
Quincy, MA 02169-7471
1-800-344-3555
www.nfpacatalog.org

IEEE Std 1584(TM)-2002 Guide for Performing Arc-Flash Hazard Calculations

Acknowledgments

- International Brotherhood of Electrical Workers (IBEW), Local 5, Pittsburgh, PA
- Dennis E. Eicker, IBEW Local 5
- H. Landis (Lanny) Floyd, Principal Consultant, Electrical Safety and Technology, DuPont
- Schneider Electric/Square D, North American Operating Division
- Miller Electric Construction, Inc., Pittsburgh, PA
- Brown and Powell Electric Supply, Inc., Bethel Park, PA
- James C. Cawley, P.E., Electrical Engineer, NIOSH
- David L. Caruso, DVD Author/Print Design & Layout, Health Communications Fellow, NIOSH
- Charles D. Taylor, Narrator, NIOSH
- Mine Safety and Health Administration (MSHA)

For more information on Arc Flash and Electrical Safety
Contact the NIOSH Pittsburgh Research Laboratory:

Kathleen M. Kowalski-Trakofler, Ph.D.

Research Psychologist

412-386-4531

KKowalski@cdc.gov

Gerald T. Homce, P.E.

Electrical Engineer

412-386-5097

GHomce@cdc.gov



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DHHS (NIOSH) Publication No. 2007-116D