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Your International Source for
Electrical Power Training

Electrical Safety and 2012 NFPA 70E - Standard for Electrical Safety in the Workplace

1 Day – 0.8 CEUs

Jim Phillips, P.E. is author of the book: *Complete Guide to Arc Flash Hazard Calculation Studies* and the guide: *How to Perform an Arc Flash Study in 12 Steps.* His Arc Flash Training Courses have become the industry standard. Even instructors from other training companies have attended Jim's classes to see how it's done. In this one day class he shows you how to comply with NFPA 70E including defining approach boundaries, performing the shock and arc flash hazard analysis and determine arc rated clothing and personal protective equipment requirements based on NFPA 70E Table 130.8(C)(15)(1) Get your company into compliance today with this program!

What you *WILL* receive:

- Instructions on how to **Comply with NFPA 70E**
- How to develop an Electrical Safety Program
- Training manual containing over 150 pages
- Jim's 30 page Arc Flash Calculation Guide
- Many examples and problems
- 8 hours of Continuing Education Credit

What you ***WILL NOT*** receive:

- A commercial to sell you PPE or equipment
- A sales pitch to sell engineering study services
- A class that is just an overview or teaser

What is so special about Jim Phillips' Electrical Safety Class?

Jim is not only one of the most popular and sought after instructors in the industry, he is also directly involved with the development of arc flash standards and practices. He is a member of the IEEE working group that develops *IEEE Std. 1584 [tm], IEEE Guide for Performing Arc Flash Hazard Calculations*. This enables him to go well beyond the "typical" arc flash and electrical safety class taking you behind the scenes with information about arc flash tests, interpretations, current research as well as a candid discussion of holes in the current standard and future research.

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Course Agenda
Electrical Safety and 2012 Edition of NFPA 70E Standard for Electrical Safety in the Workplace

INTRODUCTION

HUMAN EFFECTS
Physiological Effects, Tissue Damage, Internal Organ Damage, Burns, Fibrillation, "Curable" 2nd Degree Burn Requirements, Arc Blast Pressure, Sound Pressure, Incident Energy and 1.2 Calories/cm^2

CODES AND STANDARDS
OSHA 29 CFR - Part 1910, Subpart S, NFPA 70, National Electrical Code®, 2012 NFPA 70E, Standard for Electrical Safety in the Workplace, IEEE Standard 1584™, IEEE Guide for Performing Arc Flash Hazard Calculations, Legal Requirements, Liability

CATEGORIES OF ELECTRICAL HAZARDS
Electric Shock, Arc Flash, Arc Blast, Sound Pressure, Shrapnel, UV Light

ELECTRICAL CIRCUIT DYNAMICS
Short Circuit Current, Overcurrent Device Clearing Time, Equipment Type

QUALIFIED PERSON
NFPA 70E Definition, Trained and Knowledgeable Requirements, Understands Hazards,

SHOCK HAZARD ANALYSIS
Defining Limited, Restricted, Prohibited Approach Boundaries, Voltage Exposure, PPE

ELECTRICALLY SAFE WORKING CONDITION
Steps to Establish Condition, Methods Used, PPE to be Worn During Procedure

ARC FLASH HAZARD ANALYSIS
Defining the Arc Flash Boundary and Protective Clothing Requirements

ENERGIZED ELECTRICAL WORK PERMIT
Purpose of Permit, Data Required, Approvals Process

ARC FLASH BOUNDARY
AFB Definition, Purpose, How to Determine, Work Within the Arc Flash Boundary

HAZARD/RISK CATEGORIES
Defining the H/R Category Table 139.8(C)(15)(1), HRC 0, 1, 2, 3, 4 Requirements, Limitations of Tables, Using Calculations Instead, HRC, Tables for DC arc flash

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Course Agenda (cont'd)
Electrical Safety and 2012 Edition of NFPA 70E Standard for Electrical Safety in the Workplace

ARC RATED CLOTHING AND PERSONAL PROTECTIVE EQUIPMENT SELECTION
Protective Clothing, Face Protection, Hand Protection, Foot Protection, Limitations

ARC FLASH WARNING LABELS
NFPA 70E Requirements, ANSI Z535, Signal Words, Information to List on the Label

THE ELECTRICAL SAFETY PROGRAM
Implementing Electrical Safety Practices and Procedures, Sample Problems Using the HRC Tables, Simplify the Program!

ARC FLASH HAZARD CALCULATION STUDY - OVERVIEW
What is an Arc Flash Hazard Calculation Study, IEEE 1584 Overview, Understanding the Labels, Selecting PPE Based on a Study, Boundaries

On Site Training - Have This Course at Your Location!

Hold this class at your location for a greater savings. For an all inclusive fee you receive the following for each attendee:

- Instructions on how to **Comply with NFPA 70E**
- How to develop an Electrical Safety Program
- Training manual containing over 150 pages
- Jim's 30 page Arc Flash Calculation Guide
- Many examples and problems
- 8 hours of Continuing Education Credit

Call Brenda at 800-874-8883 or email at brenda@brainfiller.com ***today*** for an On-Site Training Proposal! Jim's schedule fills up early!

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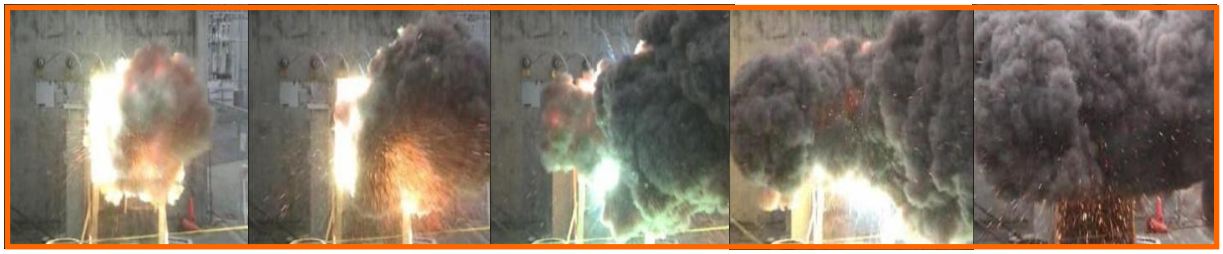

What is an Arc Flash?

An arc flash occurs when short circuit current flows across a gap creating an arc and can be anything from minor embarrassing sparks to a deadly explosion.

The Arc Flash is usually caused by accidental contact between energized conductors from events such as dropping a screw driver or touching a wire. It can produce temperatures in the thousands of degrees, create extreme blast pressure, launch projectiles at hundreds of miles per hour, produce ultra-violet light that can blind. It can and does kill people!

The IEEE 1584 Working Group has been studying the effects of Arc Flash through testing and analysis which lead to the development of:

IEEE Std.1584^{tm}, IEEE Guide for Performing Arc Flash Hazard Calculations

which defines formulas and procedures used to calculate the amount of incident energy that can be released during an arcing short circuit.

Attend this class and see how to:

- **Comply** with OSHA and NFPA 70E
- Perform the Arc Flash and Shock Hazard Analysis required by NFPA 70E when working above 50 Volts
- Define the Limited, Restricted and Prohibited Approach Boundaries
- Create energized electrical work permits
- Determine the Arc Flash Boundary
- Understand AC and DC arc flash protection
- Know how to create arc flash warning labels
- Properly select appropriate protective clothing and PPE
- Establish and electrically safe working condition
- Develop your **Electrical Safety Program**

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NFPA 70E and Arc Flash?

NFPA 70E Section 130.5(B) requires that an arc flash hazard analysis "shall determine, and the employer shall document, the incident energy exposure of the worker (in calories per square centimeter). The incident energy exposure level shall be based on the working distance of the employee's face and chest areas from a prospective arc source for the specific task to be performed. It further states that "…Arc-rated clothing and other personal protective equipment (PPE) shall be used by the employee based on the incident energy exposure associated with the specific task."

NFPA 70E also requires determining the arc flash boundary, which is the distance from a potential arc source where the incident energy is 1.2 cal/cm^2. This value is considered to be the point at which the onset of a second-degree burn occurs. Live work performed outside of the flash boundary does not require PPE, although the risk of some injury still exists.

The concept of these requirements is simple. At each location, the arc flash study is used to determine:

- The prospective incident energy exposure for a worker's chest and face.
- The level of PPE is based on the prospective incident energy.
- The arc flash boundary.

Although NFPA 70E provides more generalized hazard risk tables as a simplified alternative for PPE selection, an arc flash study requires performing calculations to estimate the magnitude of incident energy exposure. These calculations are based on specific details, including the available short circuit current, device clearing time, grounding, arc gap distance, equipment type, and many other factors. The results are used to determine the arc flash boundary and required level of PPE.

This information, as well as data regarding electric shock protection and approach limits, can be included on the arc flash warning labels placed on the equipment under study. Before conducting energized work, a qualified worker can refer to the label and obtain all of the data necessary for the shock hazard analysis and flash hazard analysis required by NFPA 70E.

Although an arc flash study can appear to be complex, it can be more manageable when broken down into basic steps as outlined in this training program.

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What Does OSHA Say About Arc Flash?

According to OSHA 1910.132(d) The employer is responsible to assess the hazards in the work place, select, have, and use the correct Personal Protective Equipment (PPE) and document the assessment. The use of NFPA 70E and other related industry consensus standards has been used to demonstrate whether an employer acted reasonably when there is a possible OSHA enforcement action taken.

So although NFPA 70E is not directly part of OSHA standards, it can be used as evidence of whether an employer acted reasonably in complying with OSHA standards and addressing "recognized hazards".

There are more specific links within the OSHA standards as well. A typical example is found in 1910.335, Safeguards for personnel protection which requires:

> *"(a)(1)(i) Employees working in areas where there are potential electrical hazards shall be provided with, and shall use, electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed."*

This regulation requires that employees must be properly protected from potential electrical hazards, by using adequate PPE, but it does not provide specific detail of what specific personal protective equipment is necessary to achieve the objective. It might be considered that based on this generalized statement, the selection of the correct PPE is open to interpretation however, this would be incorrect and an Arc Flash study should be performed.

Jim, in the high power lab setting up an arc flash test on a pad mounted transformer.

A side trip to the high power lab during an IEC meeting in Frankfurt Germany.

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Receive answers to these questions and more:

- How do I use NFPA 70E Table 130.8(C)(15)(1) for the study?
- How do I address DC arc flash?
- Can I use the tables and calculations?
- What are the limitations of the tables?
- How do I develop an Electrical Safety Program?
- What are Hazard Risk Tables?
- What is a Shock Hazard Analysis?
- What is an Arc Flash Hazard Analysis?
- What is an Energized Work Permit and how do I develop one?
- Who is exempt from needing an Energized Work Permit?
- How do I establish an electrically safe working condition?
- What does Limited, Restricted and Prohibited Approach Boundaries mean?
- What is an Arc Flash Boundary?
- What is significant about 1.2 calories / cm^2?
- Why are there different levels of PPE requirements for the same equipment?
- What equipment really needs labeled?
- Where do I obtain the required data?
- Are detailed arc flash labels with incident energy and boundaries required?
- Are time current curves a reliable way to determine arc flash clearing time?
- How long can an arc sustain itself? - discussion of recent test data.
- What about Arc Blast?
- Is 40 Calories / cm^2 really an upper limit?
- How can current limiting devices reduce the incident energy?
- Should I specify arc resistant equipment?
- How can I convince electrical workers and management of NFPA 70E's importance?
- Why is the L/E ratio tm so important?
- What is IEEE 1584 and how is it used?
- Does any standard require using IEEE 1584?
- How are arc flash tests performed?

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Jim Phillips, P.E.

Member of IEEE 1584 *IEEE Guide for Performing Arc Flash Hazard Calculations*

Vice - Chairman of Task Group - *IEEE 1584.1 Guide for the specification of scope and deliverable requirements for an arc-flash hazard calculation.*

Member of IEC 61482-1-2 Determination of arc protection class of material and clothing by using a constrained and directed arc (box test)

Author of the book: *Complete Guide to Arc Flash Hazard Calculation Studies*

Is a regular contributor to Electrical Contractor

Founder of the internationally known website: www.ArcFlashForum.com

For 30 years, Jim has been helping tens of thousands of people around the world understand electrical power systems design, safety, theory and applications. Having taught over 2000 seminars during his career to people from all seven continents (Yes Antarctica is included!), he has developed a reputation for being one of the best trainers and public speakers in the industry.

Jim does not just talk about arc flash and electrical safety - he is part of the development of the arc flash standards! He is also the instructor that has taught other instructors in the industry. Jim is a member of the IEEE 1584 Committee - *IEEE Guide for Performing Arc Flash Hazard Calculations.* He is Vice-Chairman of the IEEE Task Group - IEEE 1584.1 "Guide for the specification of scope and deliverable requirements for an arc-flash hazard calculation study in accordance with IEEE 1584"

Jim literally wrote the book about arc flash studies with his book titled: ***Complete Guide to Arc Flash Hazard Calculation Studies*** available from brainfiller.com and Amazon.com He also wrote "How to Perform an Arc Flash Study in 12 Steps" published by NFPA.

In addition to being a regular contributor to Electrical Contractor Magazine, he was one of the main contributors for the NEC Digest. He has authored many articles published in Europe and is a regular speaker at conferences around the world.

Jim earned a BS Degree in Electrical Engineering from the Ohio State University. His career began with Square D Company's Power System Analysis Group where he was responsible for system studies, power system software development and training at their engineering programs.

Later, Jim was in charge of the studies group of the System Protection Section of Ohio Edison Company. He was part of the adjunct faculty for Stark State College where he taught evening classes in electrical power systems.

Jim is a Registered Professional Engineer. with experience that includes everything from planning transmission systems, to design and analysis of industrial, commercial and utility power systems, cogeneration plant design, expert witness and forensic analysis.

Jim continues to travel the globe typically flying over 150,000 miles a year to work with various U.S. and international standards organizations and speak at many conferences and training events.