Arc Flash Hazard Analysis
May 3–5, 2011
Las Vegas, Nevada

- NFPA 70E, IEEE 1584, and NESC 410A3 Standards
- Arc flash calculations
- Safe work practices
- Personal protective equipment
- Arc-resistant switchgear
- Coordination with faster trip times
- Utility compliance with NESC 410A3

Enrollment limited!

Save time and money! Inquire about on-site & online courses. Call 800-462-0876 today!
Arc Flashes Pose Serious Hazards!
The National Fire Protection Association (NFPA) defines an arc flash as “a dangerous condition associated with the release of energy caused by an electric arc.” Five to ten arc flash explosions occur daily in electrical equipment in the United States. Injuries from arc flash events range from minor to life threatening to fatal. An arc flash event can, in addition, cause serious equipment damage, resulting in an interruption of facilities operation.

An arc flash is essentially an electrical short circuit through the air. In an arc flash incident, concentrated radiant energy explodes outward, resulting in pressure waves, a high-intensity flash, and a superheated ball of gas. The potential for physical injury is extreme.

This proven course will show you how to mitigate arc flash hazards.

Ensure Worker Safety
Learn about new industry standards establishing safe practices to protect electrical workers from the hazards of shock, electrocution, arc flash, and arc blast. These standards include:

- OSHA 29 Code of Federal Regulations Part 1910, Subpart S
- NFPA 70-2008, National Electrical Code
- NFPA 70E-2009, Standard for Electrical Safety Requirements for Employee Workplaces
- NESC 410A3, which required that by January 1, 2009, a potential arc exposure assessment shall be performed

At this course you will examine these standards, gain an understanding of their significance, and learn how to apply them in your workplace.

Comply with NESC 410A3
The 2007 revision of the National Electrical Safety Code includes flame retardant clothing as a requirement. Rule 410A3 states, “Effective January 1, 2009, the employer shall ensure that an assessment is performed to determine potential exposure to an electric arc for employees who work on or near energized parts or equipment. If the assessment determines a potential employee exposure greater than 2 cal/cm² exists, the employer shall require the employee to wear clothing or a clothing system that has an effective rating at least equal to the anticipated level of arc energy.”

Sections 8 and 9 of this course will deal extensively with utility concerns including:

- NESC/OSHA requirements
- Medium-voltage arc flash test results
- Computer simulations
- Case studies

Learn How to Perform Arc Flash Calculations
The arc flash calculations taught in this course will enable you to estimate incident energy exposure from potential arc sources. A bolted fault creates high current that flows through the network. Traditional fault studies are used to select equipment that can withstand and interrupt these short circuit currents. Arcing faults follow a path through a vapor between two conducting materials. The arcing fault current is smaller than a bolted fault current, but the potential for human injury is much greater.

Arc flash calculations follow the NFPA 70E 2009 and IEEE 1584-2002 methods for determining arc flash hazard distance and incident exposure energy. These calculations incorporate short circuit calculations, empirical equations, and protective device operating times.

Attend and Benefit
This course will assist plant and design engineers responsible for ensuring a safe work environment in industrial electrical distribution systems. This includes plant, facility, and corporate electrical engineers dealing with one or more company distribution systems and consulting and utility engineers dealing with clients’ systems. Utility engineers with responsibilities for NESC compliance will become familiarized with arc flash hazard analysis. Experienced electrical contractors will also benefit from this course.

There are a number of computer programs that are excellent tools for the analysis of arc flash hazards. We invite providers to send literature and/or demo CDs for distribution to the class.

Course Faculty

Steven R. Potter, PE
Principal
SRP Engineering
Pasadena, California

James Dungar, PE
Principal Engineer
Power Systems Engineering
Square D/Schneider Electric
Greenville, Wisconsin

Benny E. May, PE
Principal Engineer/Owner
BICE Engineering and Consulting
Frisco, Texas

Thomas A. Short
Senior Engineer
Electric Power Research Institute
Burnt Hills, New York

John Gingrass
Regional Manager
Salisbury by Honeywell
Waukesha, Wisconsin

Program Director
Willis F. Long, PE
Professor Emeritus
Department of Engineering Professional Development
University of Wisconsin–Madison
What Students Say…

“I CAME TO HEAR FROM EXPERTS ABOUT HOW TO PERFORM ARC FLASH STUDIES AND WHAT TO BE AWARE OF. THE INSTRUCTORS WERE EXPERTS AND PROVIDED THE INFORMATION I WAS LOOKING FOR.”

“We have relied on outside consultants over the years. This info provides a very good overview of what others are doing, thinking, and interpreting.”

“GREAT INSIGHT FROM A FULL SPECTRUM OF PRESENTERS. GOOD INTERACTION BETWEEN STUDENTS AND PRESENTERS.”

“I WAS LOOKING FOR A GOOD INTRODUCTION TO THE TOPIC, FROM BOTH THE COMMERCIAL/INDUSTRIAL AND UTILITY PERSPECTIVE. THE COURSE EXCEEDED MY EXPECTATIONS.”

“This has been a very informative and eye-opening experience.”

“I FEEL MUCH MORE CONFIDENT THAT I CAN MOVE FORWARD WITH IMPLEMENTATION AT WORK.”

Course Outline

Tuesday, May 3

7:45 Registration
The Riviera Hotel and Casino
2901 Las Vegas Boulevard South
Las Vegas, Nevada

8:15 Introduction to the Program: Bill Long
- Welcoming remarks
- What you can expect to learn

1. An Overview of Fault Current Analysis: Steve Potter
- Fault current sources
- Short circuit current parameters
- Actual fault types
- Balanced fault analysis
- Impedance diagrams
- Fault current calculations

2. An Introduction to Arc Flash Calculations: Steve Potter
- Causes of electrical flash events
- Why perform arc flash studies
- Who should perform arc flash calculations

3. Relevant Arc Flash Standards: Steve Potter
- OSHA 29
- NFPA 70-2008
- NFPA 70E-2009
- IEEE Standard 1584-2002
- NESC 410A3
- Significance of standards

4. Arc Flash Calculation Procedure: Steve Potter
- Arc flash equations
  - arcing fault current
  - incident energy
  - arc flash boundary
  - default values

Wednesday, May 4

5. Calculation Methodology: Steve Potter
- Overview of protective device coordination
- Understanding time-current curves
- Fault current vs. energy released
- Calculating with uncertainty
- Protective device trip time

6. Arc Flash Calculations Continued: Steve Potter
- Accumulated energy
- Minimum and maximum faults
- Use of tolerances
- Current-limited devices

7. Computer Demonstration of Arc Fault Calculations: Steve Potter
- Data needed
- Options available
- Typical calculations

8. Utility Arc Flash Analysis Approaches and Test Results: Tom Short
- Review utility industry approaches to calculating arc flash
- NESC/OSHA requirements
- Medium-voltage arc flash tests
- Low-voltage arc flash in utility equipment

- Graphical comparison of computing methods
- NESC Rule 410A3
- Impact of system impedance on incident energy
- Distribution line example
- Case studies

10. Personal Protective Equipment: John Gingrass
- Determining PPE requirements
- Hazard risk categories
- Characteristics of clothing and other equipment
- Clothing and other equipment available for inspection

Thursday, May 5

11. Equipment Issues Relating to Arc Flash Hazards: Jim Dungar
- Overview of electrical equipment
- How to reduce arc flash levels
- Fuse-protected vs. non-fuse-protected circuit breakers
- Arc-resistant switchgear
- Effective data collection
- Arc flash label issues
- Safety: the overriding concern

12:00 Final Adjournment

Daily Schedule

7:45 Coffee and conversation

8:00 Class session

9:30 Break–coffee and rolls

9:50 Class session

10:50 Break

11:00 Class session

12:00 Lunch

1:00 Class session

2:15 Break–soft drinks

2:30 Class session

3:30 Break

3:45 Class session

5:00 Adjournment

Accreditation

This three-day course is accredited in all states for 18 Professional Development Hours (PDH) toward PE registration continuation. It is also approved for 18 hours credit for Journeyman and Master Electrician Certification by the Safety and Buildings Division, Wisconsin Department of Commerce.
Four Easy Ways to Enroll

Course Information

❑ Please enroll me in Arc Flash Hazard Analysis Course #M508 May 3–5, 2011 in Las Vegas, NV Fee: $1295
❑ I cannot attend at this time. Please send me brochures on future courses.

Note: Enrollment is limited.

Personal Information (Please print clearly.)

Name _________________________________________
Title __________________________________________
Company _______________________________________
Address ________________________________________
City/State/Zip __________________________ Fax _________
Phone _______ Fax _______
E-mail ______________________

Additional Enrollees

Name _________________________________________
Title __________________________________________
E-mail _________________________________________
Name _________________________________________
Title __________________________________________
E-mail _________________________________________

Billing Information

❑ Bill my company ❑ P.O. or check enclosed (Payable in U.S. funds to UW-Madison)
❑ Credit card __________________________
Card No. __________________________
Expire _______/_______
Cardholder’s Name ________________________

UW# __________________________

Need to Know More?

Call toll free 800-462-0876 and ask for
Program Director: Willis F. Long PE
willis@engr.wisc.edu
Program Associate: Debbie Benell
benell@engr.wisc.edu
Or e-mail custserv@epd.engr.wisc.edu

General Information

Fee Covers Notebook, course materials, continental breakfasts, break refreshments, two lunches, and certificate.
We do not publish proceedings. Course materials are distributed only to participants.
Cancellation If you cannot attend, please notify us by April 26, and we will refund your fee. Cancellations received after that date and no-shows are subject to a $150 administrative fee. You may enroll a substitute at any time before the course starts.
Location Riviera Hotel and Casino, 2901 Las Vegas Boulevard South, Las Vegas, Nevada.
Accommodations We have reserved a block of sleeping rooms at the upgraded Signature Level ($55/single; $55/ double) for course participants at the Riviera Hotel & Casino, 2901 Las Vegas Blvd. South, Las Vegas, NV. A deposit equal to the room rate for one night is charged at time of booking. This deposit is refundable if the reservation is canceled 48 hours prior to scheduled arrival. Room block rates may not be available for Friday or Saturday night stays. To reserve a room, call 800-634-6753 or 702-794-9412 and indicate that you will be attending this course under group code University of Wisconsin-Madison. Room requests made later than April 11 will be subject to availability.

Companion Course

Be sure to watch for our companion course, Coordination of Industrial and Commercial Electric Power Distribution Systems. Offered September 13–16, 2011, the course focuses on systematic, step-by-step procedures for completing comprehensive coordination studies. Participants spend time practicing and applying learned concepts and using state-of-the-art coordination software to illustrate solutions for real-world problems. For additional information contact program director Willis Long, 800-462-0876 or 608-262-1199, or e-mail willis@epd.engr.wisc.edu.

Related Courses

Course #L574
Understanding High-Voltage Direct-Current Power Transmission May 17–19, 2011, Madison, WI
Course #L577
Course #L578
Communications for Power System Protection, Automation, and Smart Grid Technology June 13–16, 2011, Madison, WI
Course #L579
Power System Operation in the Age of the Smart Grid June 20–24, 2011, Madison, WI
Course #L580

Bring UW–Madison Expertise to Your Organization!

On-site training can equip your employees in skill areas critical to your success. We can:
- Assess training needs and design learning programs tailored to your situation
- Deliver course content, customized for your needs, in person or online
- Empower your employees to quickly translate practical knowledge into productive work

UW–Madison can help you meet your training goals! Contact Corporate Education Director Carl Vieth (608-263-7424 or vieth@wisc.edu) to discuss your opportunities. Or see http://epd.engr.wisc.edu/onsite

Continuing Education Credit

Earn 18 Professional Development Hours (PDH) when you attend this course.