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## Arc Flash Analysis Training

Contact us Today for a FREE quotation to deliver this course at your company's location.

<https://www.electricityforum.com/onsite-training-rfq>

An arc flash analysis study is usually performed through the collection of data from existing electrical equipment and systems, followed by the proper calculation of arc flash hazards and requirements by an experienced electrical engineer. This can be done using either the manual method using IEEE 1584 calculations or using popular arc flash study/short circuit study analysis software.

An effective arc flash analysis training program should provide electrical engineers with the knowledge and understanding of how to perform such an analysis/study.

Performing arc flash hazard analysis study on an electrical distribution system is crucial to understanding the potential arc flash hazard of electrical equipment.

An arc flash analysis study is not a one-time event, but rather it is just a snapshot of the electrical system at one specific point in time. Any changes to the electrical system can potentially affect the accuracy of the arc flash analysis.

But once arc flash analysis study in place, it must be maintained if it is to remain effective. Updating the Arc Flash Analysis Study program maintenance involves two critical elements:

the study itself and electrical worker safety training.

Section 130.5 of NFPA 70E Standard for Electrical Safety in the Workplace specifies that arc flash hazard analysis shall be updated whenever there is a major modification or renovation to the electrical system (e.g., changing a feed or adding large motors). Even in the absence of such changes, NFPA 70E still mandates reviewing the arc flash study a maximum of every five years to account for the many little changes that can have a big impact on study results.

### **“Retraining” in NFPA 70E/CSA Z462**

Like as in the case of the arc flash analysis study, proper training of qualified electrical workers in NFPA 70E/CSA Z462 is not a one time event. Workers leave; new ones are added; people simply forget what they have learned.

NFPA 70E section 110.2(D)(3) specifies additional as-needed worker training under certain conditions, but it also mandates retraining all qualified workers at an interval not to exceed three years. Some companies have adopted a yearly retraining policy, due to the importance of the NFPA 70E electrical safety concepts.

Arc flash analysis training educates electrical professionals about the existence, nature, causes and methods to prevent electrical hazards. Arc flash is a serious hazard with potentially devastating potential injury. Our arc flash analysis training course includes information on arc flash awareness, standards and codes, understanding of arc flash quantities, selection and use of appropriate PPE, reading and following warning signs and labels, methods to reduce risk while working on live exposed parts, arc flash hazard assessment and documentation. This is done to ensure electrical worker safety and meeting the challenges of the arc flash safety requirements can be a difficult task. From arc flash analysis and labeling to personal protective equipment and training.

### **Who Needs Arc Flash Analysis Training?**

Most commercial, institutional, and industrial electrical systems have arc flash hazards. In the United States, OSHA requires that those systems be individually analyzed and, if hazards

exist, labeled to identify the arc flash boundary, the incident energy at the working distance, and the required personal protective equipment (PPE).

**Our Arc Flash Analysis Training course teaches arc flash analysis in the following areas:**

- Arc flash hazard analysis
- Arc flash hazard labeling plan
- Site review / compliance assessment
- Mitigation services
- Single-line diagrams
- Short circuit and coordination studies
- Preventative maintenance
- Electrical safety program review / development
- Arc Flash Training
- Personal protective equipment plan
- Documentation
- Arc flash hazard analysis

**Arc Flash Hazard Analysis**

Canadian Standards Association (CSA) Z462 guidelines require facility owners to perform an arc flash hazard analysis prior to allowing a worker or contractor to perform a task on energized equipment. The arc flash analysis identifies the presence and location of potential hazards and provides recommendations for personal protective equipment (PPE), boundaries for limited, restricted and prohibited approaches, recommendations for flash protection and safe work practices.

The Electricity Forum recommends that arc flash calculations be completed in conjunction with short circuit study calculations and protective device coordination to achieve the most accurate arc flash hazard results. Short circuit and coordination studies verify protective devices and arc hazard ratings, calculate momentary interrupting and relay currents,

establish settings for all types of protective devices and coordinate your entire power distribution system to minimize downtime.

## **COURSE OBJECTIVES**

Learn about arc flash hazards, standards, safety and calculations. This course is designed to educate participants about all aspects of arc flash studies.

## **LEARNING OBJECTIVES**

Upon completion of this course, the student will learn how to:

- Develop A Realistic Risk Assessment, Ensuring Proper Personnel Safety And Increased Compliance By Workers
- Eliminate Hours Of Engineering Time And Prevent Costly Mistakes
- Assure Electrical System Reliability
- Provide Documentation And Labeling For Your Arc Flash Hazard Safety Program
- Avoid Unnecessary Costs From Over Specification Of Gear, Providing Higher Potential Worker Productivity — Savings Thousands Of Dollars On An Annual Basis!
- Understand Short Circuit Study Fundamentals
- Understand Arc Flash Study Fundamentals
- Comply With Standards For Limits Of Approach
- Produce Arc Flash Labeling
- Perform Arc Flash Approach Boundary Calculations And More!

## WHO SHOULD ATTEND

This Arc Flash Analysis Training Course is intended for electrical engineers, plant supervisors, electrical maintenance professionals and electricians who are involved with industrial, commercial and institutional electric power distribution systems: Plant, facility, and corporate electrical engineers dealing with one or more company distribution systems, and consulting and utility engineers dealing with clients' systems. Consultants, architect-engineers will also find this course very beneficial.

## STUDENTS RECEIVE

- FREE 100-Page Digital Electrical Safety Handbook (Value \$20)
- \$100 Coupon Toward Any Future Electricity Forum Event (Restrictions Apply)
- 1.4 Continuing Education Unit (CEU) Credits
- FREE Magazine Subscription (Value \$25.00)
- Course Materials In Paper Format

## **COURSE OUTLINE**

### **COURSE CONTENT**

#### **POWER SYSTEM FUNDAMENTALS**

Power System Fundamentals  
Balanced Three-Phase Loads  
Unbalanced Three-Phase Loads  
Power distribution systems  
Effects of frequency  
Single-phase power loads  
Three-phase balanced and unbalanced power loads  
Short Circuit Theory, Terminology and Studies  
Fault Current Sources and Characteristics  
Power System Configurations  
Typical System configurations  
Design considerations  
Radial systems, loop systems, selective systems

#### **POWER SYSTEM SUBSTATION CONFIGURATIONS**

Functions of a substation  
Design considerations  
Radial, loop, and selective systems  
Introduction  
Why do the calculation?  
When to do the calculation?

#### **ELECTRICAL FAULTS**

Definitions and Terminology  
Arcing Faults vs. Bolted Faults

Causes  
Effect of Current on Overcurrent Device Clearing Time  
Current Limiting  
Effects on Personnel and Equipment

### **NFPA 70e/CSA Z462 and ELECTRICAL SAFETY PROGRAMS**

Safe Approach Distances  
Qualified vs. Unqualified Workers  
Work on or Near Energized Electrical Equipment  
Energized Electrical Work Permit  
Safe Work Practices and Procedures  
Calculation Methodology  
Step 1: Construct the System Model and Collect Equipment Parameters  
Step 2: Calculate Equipment Short Circuit Impedances  
Network Feeders  
Synchronous Generators and Motors  
Transformers  
Cables  
Asynchronous Motors  
Fault Limiting Reactors  
Static Converters  
Other Equipment  
Step 3: Referring Impedances  
Step 4: Determine Thévenin Equivalent Circuit at the Fault Location  
Step 5: Calculate Balanced Three-Phase Short Circuit Currents  
Initial Short Circuit Current  
Peak Short Circuit Current  
Symmetrical Breaking Current  
DC Short Circuit Component  
Step 6: Calculate Single-Phase to Earth Short Circuit Currents

### **Worked Examples**

Step 1: Construct the System Model and Collect Equipment Parameters

Step 2: Calculate Equipment Short Circuit Impedances

Step 3: Referring Impedances

Step 4: Determine Thévenin Equivalent Circuit at the Fault Location

Step 5: Calculate Balanced Three-Phase Short Circuit Currents

Initial Short Circuit Current

Peak Short Circuit Current

Computer Software

## **DAY TWO**

### **MODELING AN ELECTRICAL SYSTEM IN PER-UNIT**

Modeling methods

Data collection and modeling

Per-unit impedance calculations

Complex impedance diagrams

### **SHORT CIRCUIT STUDIES**

Purposes of fault calculations

Effects of short circuits

Fault current sources

Machine reactance modeling

Fault current characteristics

Types of faults/magnitudes

Fault calculation procedures

### **PROTECTIVE COORDINATION**

Typical Device Curves and Settings

Transformer Protection



Feeder Protection  
Motor/Generator Protection  
Type 2 Coordination  
Fault Let-Through  
Approved Series Combinations

### **LOW VOLTAGE EQUIPMENT RATINGS AND SELECTION CRITERIA**

Low voltage fuses  
Molded case circuit breakers  
Busway and conductors

### **SWITCHGEAR RATINGS AND SELECTION CRITERIA**

Low voltage power circuit breakers  
Power fuses  
Load interrupters  
Medium voltage power circuit breakers  
Equipment Ratings and Asymmetrical Factors  
Analysis of a Computerized Fault Study

### **COURSE TIMETABLE**

#### **Both days:**

Start: 8:00 a.m.  
Coffee Break: 10:00 a.m.  
Lunch: 12:00 noon  
Restart: 1:15 p.m.  
Finish: 4:30 p.m.

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