



EE019

Electrical System Safety: Hazards and Safeguards

Course Introduction:

This course covers the knowledge and skills needed to safely work with energized high-voltage high-energy electric power systems. Principles and procedures for the safe operation and maintenance of high voltage systems are covered. Insulated hand tools, "hot-sticks", proper grounding procedures, proper protective clothing, and thorough job-planning procedures are stressed throughout the course. Properties of electric charge, energy, electric potential, dielectric stress, capacitive and inductive coupling, and material behavior in electromagnetic fields are covered. The effects of electrical energy on humans and various protection concepts are addressed, as are basic first aid practices. Differential protection schemes, insulation materials, Faraday cages, equipotential grounding, live-line tools, and isolation techniques are covered from both the technical and practical perspectives.

This course is designed to train all electrical staff on the proper care, maintenance, inspection and utilization of the power distribution system. It is also designed to ensure that delegates are instructed to work within the guidelines of Electrical Utility Safety Association and OSHA safety regulations. It will help employees and companies reduce the risk of personal injury and equipment damage due to mishandling. The course is also designed to ensure that, under emergency conditions, the proper steps are taken to restore power in an efficient and safe manner.

Course Objectives:

Upon successful completion of this course, the delegates will be able to:

- Explain the electrical safety standards and regulations including voltages
- Understand the hazards of electricity at the power system supply level
- Review the principles, governmental regulations, work practices and specialized equipment relating to electrical safety

Who Should Attend?

This course is valuable for those Industrial and commercial electrical maintenance personnel, engineers, supervisors, and safety personnel who work on or near energized and de-energized electrical equipment and systems, and other personnel classified as "qualified".

Course Outline:

Day 1:

- **Understand the Law and Regulations Applying to Electrical Work**
 - Occupational Health & Safety Act
 - Electrical Utility Safety Association
 - Internal Safety Rules & Regulations
- **Power System Hazards**
- **Power System Faults**
- **Facts and Figures:**
 - Major Causes: Act of God, Human or Operator Error, Equipment Breakdown
 - Short Circuits
 - Overloads
 - Fires
 - Electrocution
 - Important Definitions
 - Short Circuit Analysis
 - Flash Hazard Analysis
 - Incident Energy and Flash Barrier Distances

Day 2:

- **Understand When to Use and How to Select the Proper Personal Protective Equipment**
 - Introduction
 - Personal Body Protective Equipment
 - Testing and Grounding
 - Live Line Tools
 - Glasses
 - Gloves & Rubber Equipment
 - Clothes
 - Boots
 - Head Protection
- **Temporary Grounding**
 - Introduction
 - Purpose

- Work Methods

Day 3:

- **Hazards of Isolated Equipment**

- Induction
- Accidental Energization
- Wind
- Lightning
- Grounding Equipment for Overhead Lines - General
- Adequate Capacitance Clamps
- Adequate Capacity Cables
- Overhead Grounding Sets
- Installation of Temporary Grounds

- **Potential Indicating Devices**

- Introduction
- Purpose
- Potential Indicators: Volt Meters, Clip-on Ammeter, Clip-on Watt Meter, Phase Rotator, Preparation of Temporary Grounding

- **Isolation and Switching Procedures**

- Introduction
- Self-Protection
- Work Protection Guarantees
- Work Permit
- Work and Test Permit

- **Switching Practices**

- **Lockout Procedures**

- Individual Lockout
- Lock Box Method
- Sign In Method
- Removal of a Personal Safety Lock

Day 4:

- **Understand the Risks Around Energized Equipment**

- Ground Grid, Step & Touch Potentials
- Equipment Failure
- **Understand Your System, Know Your System**
 - Single Line Diagram
 - Maintain Good System Nomenclature
 - Protection & Control System
 - Equipment Types & Operation
 - Maintenance Records
- **Develop a Job Specific Safety Plan**
 - Hazard Assessments
 - Switching Plans
 - Lock out & Tag Out systems
 - Test Plans/Tailboard Meetings

Day 5:

- **Safe Operation and Maintenance Procedures**
- **Electrical Power Systems**
 - Importance of accurate drawings
 - Transformer Operation and Maintenance Safety
 - Maintenance Testing Safety practices
 - Switchgear Operation and Maintenance Safety
 - Grounding Practices and Principals
 - Safety in Maintenance Testing
 - Operating HV and MV Breakers and Switches
 - Electrical System Safety
 - Control systems, CTs and PTs
 - Capacitors and Reactors
 - Power Cables

Course Fees:

To be advised as per the course location. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session
10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session