

Training Title

ELECTRICAL SAFETY

Training Duration

5 days

Training Venue and Dates

REF EE099	ELECTRICAL SAFETY	5 days	03 – 04 March, 2024	\$6,500	London, UK
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In the below 5 star hotel as mentioned. The exact venue will be informed once finalized.

1. Events at Marble Arch

Central Cluster Meetings, Events and Group Sales - The Cumberland Hotel and Thistle Marble Arch

T. +44 (0) 207 523 5060

W. clermonthotel.group | A. Thistle Marble Arch, Bryanston St, Marylebone, London, W1H 7EH

Training Fees

\$6,500 per participant for Public Training including Course Materials/Handouts, Tea/Coffee, Refreshments & International Buffet Lunch

Training Certificate

Define Management Consultancy & Training Certificate of course completion will be issued to all attendees.

TRAINING OVERVIEW

Electrical safety plays an important role in electrical power systems in maintaining the safety to human being and equipment. Also, it will maintain the continuity of power supply and power quality to the industrial and commercial consumers. A properly plan, design and operation of the electrical power system should ensure the safety and reliability of the system. Understanding the steps and procedures employed in a good electrical safety program requires an understanding of the nature of electrical hazards. Understanding the nature of the hazards is useless unless protective strategies are developed to protect the worker. This course includes a synopsis of the types of protective strategies that should be used to protect the worker. This course covers all aspects of safety issues of Electrical power system including regulatory and environmental requirements, general design considerations, application of switching and power equipment, and safe grounding design according to NFPA 70E, OSHA, IEC and IEEE.

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COURSE OBJECTIVES

1. To present the recommended practices, and guides, of which NFPA 70E contained, which are developed through a consensus standards development process approved by the American National Standards Institute.
2. To provide The Safety Standards.
3. To provide a practical understanding of electrical power system safety.
4. To declare the regulatory and legal safety requirements.
5. To demonstrate the earthing systems Safety.
6. To explain the relation between maintenance activities for various equipment and safety.
7. To select and maintain the electrical equipment in hazardous areas and its standard.
8. To indicate arc flash hazard and mitigation.
9. To introduce main recommendations for electrical safety.
10. To review of general work and plant safety rules.

WHO SHOULD ATTEND?

Electrical power generation systems and distribution engineers and technicians in utilities and industrial plants, managers of private electricity producers and large power consumers, substation engineers, consulting engineers, manufacturers of power equipment and technologists and other technical personnel involved in the design, operation and maintenance of high/medium/low voltage power systems.

TRAINING METHODOLOGY:

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions, and motivate everybody find the right answers. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

All presentations are made in excellent colorful power point. Very useful Course Materials will be given.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Group Work& Practical Exercises
- 20% Videos& General Discussions

COURSE OUTLINES

1. Hazards of Electricity

1. Hazard Analysis

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2. Shock
3. Arc definition, description and characteristics
4. Arc Burns
5. Blast
6. Affected Body Parts (Skin, The Nervous System, Muscular System Heart, The Pulmonary System)
7. Summary of Causes—Injury and Death
8. Shock Effect
9. Arc Flash Effect
10. Causes of Injury
11. Causes of Death
12. Protective Strategies

2. Earthing Systems Safety

1. Equipment Earthing

2. System Earthing

- Unearthed systems
- Solid earthing
- Resistance earthing
- Reactance earthing

3. Classification of Supply / Installation System Earthing

4. Earthing Via Neutral Earthing Compensator

- Distribution transformers
- Zig Zag transformers

5. Comparison of Methods (Advantages/Disadvantages)

- Evaluation of earthing methods

6. Touch and Step Voltage

7. Effect of electric shock on human beings

8. Electric shock and sensitive earth leakage protection

9. Sensitive earth leakage protection

3. Arc Flash Hazard Analysis and Mitigation

1. Short history of arc flash research
2. NPFA-70E-2004 application
3. Calculating the Required Level of Arc Protection (Flash Hazard Calculations)
4. Arc flash hazard assessment
5. Traditional methods for reducing arc flash
6. New strategies for reducing arc flash hazards and suggestions for Limiting Arc-flash and Shock Hazards
7. Standardizing Arc Flash Hazard Labels
8. The Role of Over-current Protective

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4. Electrical Safety Equipment

1. General Inspection and Testing Requirements for Electrical Safety Equipment
2. Flash and Thermal Protection (Clothing and materials)
3. Head, Eye, and Hand Protection
4. Rubber-Insulating Equipment (Gloves, Mats, Covers,....)
5. Hot Sticks (description, application , testing)
6. Insulated Tools
7. Barriers and Signs
8. Safety Tags, Locks, and Locking Devices
9. Voltage-Measuring Instruments
10. Safety Grounding Equipment
11. Ground Fault Circuit Interrupters
12. Safety Electrical One-Line Diagram
13. The Electrician's Safety Kit

5. Electrical Protection Basics

1. The Reasons for Protection
2. Principles of protection
3. Disconnection Devices
4. Protection and system design
5. Nature of short circuit currents
6. Sources of Short Circuits
7. Short Circuit Protection Philosophy and simple Calculations
8. Categories of Protection
9. Instrument Transformers and its safety issues

6. Power system arrangements, layout and security

1. Power System Supplies
2. Generation System Layout
3. Standby Power
4. Main and Standby Power
5. Emergency and Basic Power Services
6. Distribution System Design (Interlocking And Inter-tripping ,)
7. Distribution system lay out (Simple radial system, expanded radial system, Primary loop system, Closed-loop operation,)

7. Safety Procedures and Methods

1. The Six-Step Safety Method
2. Pre-Job Briefings
3. Energized or De-Energized?

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4. Safe Switching of Power Systems
5. Energy Control Programs
6. Lockout-Tag-out
7. Voltage-Measurement Techniques
8. Placement of Safety Grounds
9. Flash Hazard Calculations and Approach Distances
10. Tools and Test Equipment

8. Safety-Related to Maintenance Requirements according to NFPA 70E

1. General Maintenance Requirements
2. The Safety-Related Case for Electrical Maintenance
3. Relationship of Improperly Maintained Electrical Equipment to the Hazards of Electricity
4. Hazards Associated with Electrical Maintenance
5. The Economic Case for Electrical Maintenance
6. Reliability Centered Maintenance (RCM)
7. Impact of RCM on a Facilities Life Cycle
8. The Eight Step Maintenance Program
9. Frequency of Maintenance
10. Substations, Switchgear Assemblies,
11. Switchboards, Panel-boards, Motor Control
12. Centers, and Disconnect Switches
13. Premises Wiring
14. Controller Equipment
15. Fuses and Circuit Breakers
16. Rotating Equipment
17. Hazardous (Classified) Locations
18. Batteries and Battery Rooms
19. Portable Electric Tools and Equipment
20. Personal Safety and Protective Equipment

9. Review of General Work and Plant Safety Rules

1. **Substations and Switchgear Rooms**
 - The basic rules for substations and switchgear rooms
 - Requirements for identification.
2. **Access to High Voltage Enclosures and Equipment**
3. **Responsibilities for Power Systems**
4. **Responsibilities for Operations in Power Systems**
5. **Electrical Safety Documents**
6. **Switching of Power Systems under Normal Circumstances**
 - Switching Under Emergency Conditions

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7. **Circumstances Requiring Isolation and/or Earthing**
8. **Isolation**
9. **Other Earthing Methods on High Voltage Electrical Equipment**
10. **Earthing of Low Voltage Electrical Equipment of an Earthed System**
11. **Recording of HV and LV Earth**
12. **Work on Electrical Equipment**
13. **Work on Overhead Lines**
14. **Work on Electrical Equipment Operated by or Containing Compressed Air**
15. **Work on Electrical Protection Relays**
16. **Work on Remotely or Automatically Controlled Electrical Equipment**
17. **Work on Enclosures Protected by Fixed Fire Fighting Equipment**

10. Safety-Related Work Practices

1. **Definitions**
2. **General Requirements for Electrical**
3. **Safety-Related Work Practices**
4. **Establishing an Electrically Safe Work Condition**
5. **Work Involving Electrical Hazards**
6. **Selection and use of work practices**
7. **Use of equipment**
8. **Safeguards for personnel protection**

11. Safety Requirements for Special Equipment

1. Safety-Related Work Practices for:

- **Electrolytic Cells**
- **Batteries and Battery Rooms**
- **Use of Lasers**
- **Power Electronic Equipment**

1. Safety-Related Work Requirements: Research and Development Laboratories

2. **Limits of Approach**
3. **Incident Energy and Flash Protection Boundary Calculation Methods**
4. **Electrical Safety Program**
5. **Hazard/Risk Evaluation Procedure**
6. **Sample Lockout/Tag-out Procedure**
7. **Simplified, Two-Category, Flame-Resistant (FR) Clothing System**
8. **Job Briefing and Planning Checklist**
9. **Energized Electrical Work Permit**
10. **General Categories of Electrical Hazards**
11. **Typical Application of Safeguards in the Cell Line Working Zone**
12. **Layering of Protective Clothing and Total System Arc Rating**
13. **Example Industrial Procedures and Policies for Working Near Overhead**

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- 14. Electrical Lines and Equipment
- 15. Safety-Related Design Requirements

12. Electrical Equipment In Hazardous Areas

1. Properties of hazardous / Flammable Materials.
2. Methods of Making Electrical Equipment Safe for use in Hazardous Environments (EX p, EX m, EX o, EX d, EX e, EX i , EX n, EX q).
 - Exclusion of hazardous gas
 - Exclusion of heat.
 - Exclusion of air.
 - Selection of electrical apparatus according to zone of risk
3. Installation, Inspection & Maintenance.
4. International Standards Related To Hazardous Area
5. Ingress Protection "IP"
6. New classification of group/categories (Directive ATEX 94/9/EC)

13. Recommendations For Electrical Safety

- Essential Requirements For Electrical Safety
- Responsibilities For Electrical Power Systems
- Authorization of personnel
- Switching, isolating and earthing procedures
- Electrical safety documents
- 6. Precautions before working on or testing high voltage electrical Equipment
- Precautions before working on low voltage electrical equipment
- Additional precautions to be taken on specific types of electrical Equipment
- Electrical work at construction sites
- The use of portable/transportable electrical equipment

NOTE:

Pre & Post Tests will be conducted.

Case Studies, Group Exercises, Group Discussions, Last Day Review & Assessments will be carried out.

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MEETING ROOM PICTURES:



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