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Practical

# ELECTRICAL SUBSTATION

# SAFETY for Engineers & Technicians



## YOU WILL LEARN HOW TO:

- Identify the hazards in O&M work in different parts of electrical installations
- Identify the various statutory and legal regulations and acts dealing with electrical safety at work
- Appreciate the basic theoretical aspects involved in electrical safety
- Understand the importance of proper design of electrical equipment in ensuring safety
- Gain a clear understanding of the procedures and practices adopted for safe working
- Appreciate the role of regular inspection and condition-based maintenance in ensuring safe operation
- Gain an insight into the organisational aspects of safety
- Become familiar with the electrical safety rules (applicable to on-site training)

## WHO SHOULD ATTEND:

- Consulting Engineers
- Electrical Engineers
- Project Engineers
- Maintenance Engineers
- Power System Protection and Control Engineers
- Building Service Designers
- Data Systems Planners and Managers
- Electrical and Instrumentation Technicians
- Master Electricians



## THE WORKSHOP

Electrical substation safety is an important issue in utility networks as well as large industrial installations and requires adequate attention in the stages of system planning, design, installation, operation and maintenance. A number of serious accidents including fatalities occur every year in industrial establishments due to accidents involving electricity, resulting in huge financial losses and wasted man-hours. Electrical safety is a well-legislated subject and the various Acts and Regulations enacted lay a lot of stress on the responsibility of both employers and employees in ensuring safe working conditions.

In this workshop, we will take a look at the theoretical aspects of safety as well as the practical and statutory issues. Safety is not simply a matter of taking precautions in the workplace. It has to start at the stage of equipment design. Safety should be built into the design of electrical equipment and it is the responsibility of each manufacturer of electrical equipment to remove every possible hazard that can arise from its normal use. Correct selection and application of electrical machinery is also important for ensuring safety. A thorough inspection during initial erection and commissioning as well as on a periodic basis thereafter is also very essential to ensure safety. Batteries used in substations need particular attention since they contain toxic materials such as lead, corrosive chemicals such as acid or alkali.

Electrical safety is not just a technical issue. Accidents can only be prevented if appropriate safety procedures are evolved and enforced. This includes appropriate knowledge of equipment and systems imparted through systematic training to each and every person who operates or maintains the equipment. We will cover all these aspects in detail.

### PRE-REQUISITES

Some working knowledge of basic electrical equipment is required, although this will be covered at the beginning of the workshop. Real-life experience with such equipment and hands-on testing will enable the workshop to be placed in context.

## ON-SITE TRAINING

- ✓ **SAVE** over 50% by having an IDC workshop presented at your premises.
- ✓ Customise the training to **YOUR** workplace.
- ✓ Have the training delivered when and where you need it.

Contact us for a **FREE** proposal.

## THE PROGRAM

### DAY ONE

#### OVERVIEW

- Hazards of a general nature in industrial installations
- Electrical hazards
- Direct and indirect electric shock
- The deadly combination of heights and electric shock
- Hazards due to arcing/flashover
- Hazards from use of electrical equipment in explosive environment
- Hazards due to high temperature in electrical equipment
- Need for periodic inspection and maintenance for safe operation of electrical equipment

#### BASIC THEORY OF ELECTRICAL SAFETY

- Electrical shock - why does it happen?
- Touch and step potential (voltage)
- Direct and indirect contact
- Role of electrical insulation in safety
- Avoiding electric shock - different approaches
- Earth leakage circuit breakers
- Earthing of power supply systems and its safety implications
- Role of earthing of equipment enclosures (protective earthing) in human safety
- Earthing in outdoor installations
- Earthing of buildings and structures for safety during a lightning strike
- Dangers due to arc flash in electrical equipment

### DAY TWO

#### REGULATORY ASPECTS OF ELECTRICAL SAFETY

- Tracing the evolution of factory regulations
- Acts and regulations dealing with electrical safety
- Health and safety regulations (general)
- Electricity related regulations
- For electricity suppliers
- For electricity consumers
- Wiring rules as applicable for LV/HV installations
- Safety aspects of electrical equipment for use in hazardous areas

#### SAFETY ASPECTS IN ELECTRICAL EQUIPMENT DESIGN

- Objectives of safe design
- Insulation and its role in safety
- Enclosures for safety
- IP classification
- Adverse thermal effects and prevention
- Isolation and blocking of switching to prevent hazards
- Role of standards in safety

### DAY TWO continued

#### SAFE OPERATION AND MAINTENANCE OF ELECTRICAL EQUIPMENT

- Key safety issues in O&M of electrical installations
- Isolation and earthing of equipment
- Use of warning signs for operation and maintenance
- Safety while working in outdoor switchyards and overhead lines
- Work on underground cable systems
- Use and upkeep of safety appliances in substations and other electrical premises
- Gas safety and ventilation
- First-aid for burns and electric shock

### DAY THREE

#### INSPECTION OF ELECTRICAL SYSTEMS FOR SAFETY

- Objectives of inspection
- Stipulations regulations
- Inspection of new installations
- Checklists of items/aspects to be inspected
- Periodic inspection
- Documentation of inspection
- Planned and condition-based preventive maintenance

#### SAFETY IN BATTERY INSTALLATIONS

- Hazards involved in lead-acid battery installations
- Premises used for housing lead acid batteries
- Transportation and storage
- Installation and commissioning
- Charging and storage
- Dismantling and disposal
- Protective clothing
- First-aid measures

#### ORGANISATIONAL ASPECTS OF SAFETY

- Legislative aspects of safety
- Role of an organisation in ensuring/improving work safety
- Functional requirements
- Intra-organisational safety implementation
- External interfacing and compliance

#### SUMMARY, OPEN FORUM & CLOSING