



EE176

SUBSTATION

Maintenance & Troubleshooting of Switchgears & SF6



Course Introduction:

We can present this Substation Maintenance Training Course to your electrical engineering and maintenance staff, on your premises, tailored to your specific equipment and requirements.

There is considerable interest among people who operate and maintain Electrical Power Systems in a wide range of topics relating to equipment maintenance and testing. This is because condition and reliability are directly related to maintenance and testing. To obtain maximum life from electrical equipment, maintain its reliability, and minimize repair cost, it is necessary to serve and test it periodically to predict condition.

Proper installation and preventive maintenance of substation will assure continued electrical power supply, it is very important to the consumers especially for industrial sector, where the curtail of electrical power supply is costly.

Course Objectives:

Participants will cover the maintenance and testing requirements for common substation devices, including Power Transformers, Oil, Air and Vacuum Circuit Breakers, Switchgear, Ground Grid Systems, Batteries, Chargers and Insulating Liquids.

This course focuses on what to do, when to do it and how to interpret the results from testing and maintenance.

In additions, Following the attendance at this course, participants will return to their respective organizations equipped with new or refreshed skills to ensure that electrical equipment and control systems which related to Electrical Substations plus identified faults or problems are repaired and the underlying causes are identified and eliminated to reduce further failures.

On successful completion of this course, participants will have:

- A better understanding of Operation and Maintenance Procedures.
- A better understanding of troubleshooting procedures.
- A better understanding of failure modes and failure analysis.
- A refreshed awareness of electrical safety concerns.

Who Should Attend?

The course is designed to Engineers, Supervisors and Technicians who are responsible to the Installation, Operation, Maintenance and Testing of Electrical Substations; those require refreshing their knowledge and enhancing their skills. Likewise, this course is suited for Operations Engineers and Operators of Electrical Substations.

Course Outline:

Module (1) General Overview on Substation

- 1.1 Introduction
- 1.2 Electricity Safety Roles
- 1.3 Factors affecting Substation Expansion
- 1.4 Types of Substation (Transmission/Distribution)
- 1.5 Transformers
- 1.6 HV Isolators
- 1.7 Switches
- 1.8 Circuit Breakers
- 1.9 Protection Relays
- 1.10 Instrumentation and Control Devices

Module (2) Switchgears

- 2.1 Principles of Switchgear
- 2.2 Location of Switchgears, Sub-station Equipment
- 2.3 Types of Switchgears, Low Voltage metal clad Switchgears and Motor Control Centers (MCC)
- 2.4 Low Voltage Circuit Breakers Classification, Rated Quantities, Types of Releases and tests.
- 2.5 Contactors, Contractors Starters for motors, tests on Contactors.

Module (3) Circuit Breaker Maintenance

- 3.1 Function of Circuit Breakers
- 3.2 ARC Phenomena and Circuit Interruption
- 3.3 EHV Gas Insulated Switchgear
- 3.4 Modern Vacuum Distribution Switchgear
- 3.5 Modern SF₆ Distribution Switchgears
- 3.6 Other Types of Circuit breakers
 - 3.6.1 Air Circuit Breakers
 - 3.6.2 Oil Circuit Breakers
 - 3.6.3 Synchronies Circuit Breakers
 - 3.6.4 DC Circuit Breakers
- 3.7 Maintenance Frequencies
- 3.8 Inspection and testing
- 3.9 Troubleshooting

Module (4) SF₆ Gas

- 4.1 SF₆ Gas Properties
- 4.2 SF₆ Metal Enclosed Switchgear

- 4.3 SF6 Apparatus and Components
- 4.4 SF6 Circuit Breakers
- 4.5 Insulation Coordination and Over voltage protection
- 4.6 Handling, Maintenance, Inspection and Testing
- 4.7 General Design Considerations
- 4.8 SF6 Troubleshooting

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

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

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Course Fees:

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

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