Training Program:

Safe Operation & Maintenance Of Circuit Breakers & Switchgears

Introduction:

Circuit breakers, fused switches and switchgear in the form of motor Control Centers (MCC) are necessary system items for the electrical control of electrical plant. The safe use of these devices and associated equipment requires correct initial selection, operation and maintenance. It is also necessary to have a detailed understanding of how these devices should be installed, the local substation and system ratings, and how the various breakers operate, in order to enable accurate troubleshooting and subsequent repair.

Safe Operation and Maintenance of Circuit Breakers and Switchgear will equip participants with new or refreshed skills to ensure that circuit breakers and switchgear are installed, operated safely and maintained in a fashion that ensures safe and stable operation. Also they will be able to identified faults and ensure the underlying causes are identified to reduce possible further failures.

Who Should Attend?

Electrical Engineers, Electrical Supervisors and Senior Electrical Technicians engaged in the operation, maintenance and troubleshooting, of circuit breakers, interruptive devices and switchgear control centers.

Course Objectives:

By the end of this course delegates will be able to:

- Greater personal confidence in approaching working safely with power switchgear

- Understanding competence and Health and Safety at work
- Awareness of the fault level and fault currents within equipment
- Detailed understanding of the various interrupting mediums, air, vacuum and SF6
- Understanding protection, isolation and switching.
- Appreciating the differences between earthing and bonding.
- Understanding of the need to carry out appropriate maintenance, inspection, test and certification of installations, equipment and appliances

Accreditation:

BTS attendance certificate will be issued to all attendees completing a minimum of 80% of the total course duration.

Course Outline

The Technology of Circuit Breakers and Switchgear

- Typical substation arrangements
- Definitions and terminology
- Fault level calculations
- Motor and generator fault contributions
- Low voltage equipment
- Medium voltage equipment
- High voltage equipment
- Name plate ratings - interpretation

- Basic protection requirements

Operation of Various Types of Interrupting Equipment

- Fuses - motor starting types
- Fused switches
- Moulded case type breakers
- Air break switches
- Vacuum contactors - fused
- Vacuum circuit breakers
- SF6 puffer, rotating arc devices
- Special insulating requirements for 36kV
- Solid and gaseous insulation - problems!

The Operation & Maintenance of Circuit Breakers & Switchgear

The Use of Test Equipment

- Digital voltmeter (DVM)
- Oscilloscopes, Megger
- Frequency meter
- Temperature probes IR pyrometers
- Ammeters, Power meters
- Load banks, Cable fault locators

Special Techniques

- Troubleshooting of Electrical Equipment
- Methods, Terminology
- Principles, Special techniques
- Single line drawings

The Interpretation and Use of Drawings

- Single-line electrical drawings
- Control schematics
- Basic generic wiring lists
- Name plate information
- Logic and standard symbols.
- Step and touch potential?

The Development of a Job Plan

- Identification of the troubleshooting step-by-step sequence
- Procedure preparation, Documentation
- Follow-up, Safety considerations and training

The Identification and Repair of Problems Failures

- Common mode failures, Phase imbalance - lost phase
- Phase sequence checkout, Contact pitting arcing - why?
- Load and fault rating, Electronic component failure
- Fusing, Switches, Control circuits

- Ground faults - cable and bulbar faults
- A review of Safety Requirements
- Area classifications, NEC electrical codes, Safety information