

Substation Maintenance

This five-day lecture and demonstration course is a comprehensive overview of the maintenance requirements of power and distribution substations. It begins with an introduction to power distribution schemes and explains the purpose of substations in these schemes. The course features a large variety of modern test equipment, including circuit breaker high current test sets, cable fault locators, hi-pots, polarization index testers, micro-ohmmeters, oil dielectric testers and other common test gear. The course covers the maintenance and inspection requirements of station relays, transformers, breakers, station batteries, and grounding.

I. Introduction

- Review of Electrical Power Systems
- Types of Substations
- Substation Components
- Maintenance Considerations
- Electrical Equipment Testing

II. Protective Relay Maintenance

- Power System Faults
- Relay Operating Principles
- Instrument Transformers
- Relay Testing
- Overcurrent and Voltage Relays
- Directional Overcurrent Relays
- Transformer and Bus Differential Relays

III. Transformer Maintenance

IV. Circuit Breaker Maintenance

- Circuit Breakers
- Switchgear
- Arcs and Arc Interruption
- Circuit Breaker Contacts
- Operating Mechanisms
- Air Circuit Breakers
- Vacuum Circuit Breakers
- Oil Circuit Breakers
- Gas Circuit Breakers
- Circuit Breaker Maintenance
- Circuit Breaker Testing

V. Substation Battery Maintenance

- DC Auxiliary System Design
- Battery Maintenance and Testing

VI. Substation Safety

- Safety Philosophy
- Switching Practices
- Safety Grounding

VII. Instrument Transformer Testing

- Testing Current Transformers
- Testing Potential Transformers

VIII. Insulating Oil Testing

- Insulating Oil
- Oil Sampling
- Insulating Oil Testing
- Insulating Oil for Circuit Breakers
- Dielectric Breakdown Voltage Testing
- Power Factor Testing
- Color Testing
- Acidity Testing
- Moisture Content Testing
- Gas Testing

IX. Insulation Resistance Testing

- Transformers
- Circuit Breakers
- Cables

X. Maintenance Records

- Initial History
- Routine Maintenance Records