

Circuit Breaker Maintenance, Low Voltage

4.5 Days, 3.6 CEUs

Low-voltage power circuit breakers are one of the most critical and neglected overcurrent protection devices in any power system. Increased exposure to moisture and contaminants makes this type of circuit breaker very susceptible to failure. With proper maintenance, technicians can prevent nuisance trips, and ensure tripping operations execute as required. In addition to improving electrical system reliability, by ensuring optimum fault clearing times, well maintained circuit breakers minimize the arc flash hazard energy levels that technicians can be exposed to during a fault.

Every overcurrent device and circuit breaker combination has its operation indicated on time current characteristic curves provided by the manufacturer. A good portion of this course deals with reading a wide variety of overcurrent trip devices and their corresponding time characteristic curves.

Participants in this class will visually and electrically inspect circuit breakers according to manufacturer and NETA MTS requirements. Based on results of the tests, technicians should be able to make pass/fail decisions on circuit breakers.

Who Should Attend

This hands-on course is intended for new or experienced electricians and technicians that install, maintain, repair or troubleshoot power circuit breakers, rated less than 1,000 VAC, equipped with electromechanical or solid state tripping devices. The participant should have basic knowledge of AC/DC electricity.

Participants must wear long pants and safety toe shoes to complete the lab portion of this course.

Learning Objectives:

Upon completion of this course, the participant will be able to:

- Describe the different types of circuit breakers, their components, and functions.
- Perform circuit breaker and cabinet maintenance service in a safe and successful manner.
- Practice all standard tests performed on a circuit breaker.

SCOPE

Day 1*

I. Introduction

- A. Pretest
- B. Schedule
- C. Course Outline

II. Introduction To Circuit Breaker Maintenance

- A. The Need for Maintenance
- B. Technical Literature
- C. Trained Personnel
- D. Spare Parts
- E. Tools
- F. Maintenance Justification

III. Circuit Breaker Fundamentals

- A. Definitions
- B. Nameplate Data
 1. Voltage
 2. Frame Rating
 3. Continuous Current Rating
 4. Interrupting Rating
 5. Control Power

C. Components

1. Main Stabs or Disconnects
2. Auxiliary Stabs or Secondary Disconnects
3. Ground Stab
4. Interference Interlock
5. Seismic Positioner
6. Cell Switch
7. Bell Alarm and Lockout
8. Undervoltage Trip Device
9. High-Fault Protectors
10. Blown Fuse Indicators
11. Padlocking Device
12. Arcing Contacts
13. Intermediate or Secondary Contacts
14. Main Contacts
15. Auxiliary Contacts
16. Arc Chutes

Day 2

D. Operating Principles

1. Mechanical Operation
2. Electrical Operation

IV. Circuit Breaker and Cabinet Service

- A. Circuit Breaker Removal
 1. Removal Procedure
 2. Racking Position
- B. Cabinet Service
- C. Circuit Breaker Service
- D. Testing
- E. Labs (7 Hours)
 1. CB Maintenance and Disassembling (4 Hours)
 2. Electrical Test and Mechanical Adjustments (3 Hours)
- F. Restoration of Service

*Class scheduling times may vary based on discussions and size of class

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SCOPE (Cont)

Day 3

V. Overcurrent Devices

- A. Overcurrent Device Development
- B. Overcurrent Devices
 - 1. Electromagnetic Overcurrent Device
 - 2. Long-Time-Delay Device
 - 3. Short-Time-Delay Device
 - 4. Instantaneous Device
 - 5. Solid-State Overcurrent Devices
- C. Practical Exercises (4 to 5 Hours)
 - 1. Reading Overcurrent Devices
 - 2. Calculating Device Operating Times

Day 4

- D. Malfunction Causes
- E. Setting Overcurrent Devices
- F. Interpretation of Low-Voltage Power Circuit Breaker Curves
- G. Overcurrent Testing Procedures
- H. Timing Tests

VI. Miscellaneous

- A. Records and Record Keeping
- B. New Circuit Breakers
- C. Storage of New Circuit Breakers
- D. Checkout and Testing of New Circuit Breakers
- E. Storage of Spare Breakers

VII. Labs (4 to 5 Hours)

- A. High Current Testing of Trip Devices (Primary Injection Method)

Day 5 (Half Day)

VIII. Conclusion

- A. Review Material
- B. Pickup Lab Equipment
- C. Final Exam
- D. Completion of Course Paperwork