Battery Maintenance and Testing

4 Days, 3.2 CEUs

Proper battery maintenance is an essential component of critical power or uninterruptible power supply systems. This course provides an understanding of battery backup failures such as: excessive or micro cycling, improper charging, poor temperature control, installation errors, manufacturing deficiencies and operational/maintenance errors.

A detailed look at battery, battery room safety requirements and inspection methods is also discussed. Manufacturer installation and maintenance requirements are major components of this training. Personal protective equipment (PPE) will be reviewed.

Who Should Attend

This course is designed for personnel responsible for battery systems in substations, power plants and in other systems that require emergency DC power. This course requires working knowledge of basic electricity, resistance and ohmic testing.

Learning Objectives:

Upon completion of this course and lab practice, the participant will demonstrate by attaining a minimum average grade of 80% (between lab and final exam), that he/she is able to::

- List types of batteries and their operating principles.
- Demonstrate battery maintenance and testing techniques.
- Utilize correctly the various types of test equipment and hand tools.
- Use NFPA 70E, IEEE 450, Megger® *Battery Testing Guide* and battery installation and operating instructions to develop a battery/cell inspection form.
- Perform correct maintenance of vented lead-acid batteries using the IEEE Standard 450, IEEE Recommended Practice for Maintenance, Testing and Replacement of Vented Lead-Acid Batteries for Stationary Applications.
- Identify battery and battery room installation requirements per IEEE guidelines and NFPA 70E.

SCOPE

Day 1*

I. Course Introduction

II. Introduction To Batteries
- A. Battery Hazards
- B. Types of Batteries
- C. Battery Construction

III. Standards for Maintenance and Testing
- A. NFPA 70E® to include info from 2015 Changes
  1. Definitions
  2. Approach to Boundaries
  3. Protective Equipment and apparel
- B. IEEE Standards
  1. Std. 450™ -2010
  2. Std. 484™ -2002
  3. Std. 485™ -2010
  4. Std. 1106™ -2015
  5. Std. 1184™ -2006
  6. Std. 1187™ -2002
  7. Std. 1188™ -2014
  8. Std. 1375™ -2007
  9. Std. 1657™ -2009
  10. Std. 1491™ -2009
- C. OSHA Standards
  1. 29 CFR 1926.441
  2. 29 CFR 1910.305(j)
  3. 29 CFR 1910.151(c)
  4. 29 CFR 1910.331-335
- D. ANSI Standards
  1. Z358.1-2014
  2. Z87.1-2015
  3. Z89.1-2014
- E. Definitions
- F. Discharge Rates
- G. Safety Procedures
- H. Abnormal Battery Conditions
- I. Ventilation for Battery Rooms
- J. Battery Room Requirements
- K. Arc Flash and Shock Hazards

Day 2

IV. C&D Standby Battery Vented Cell Installation and Operating Instructions
- A. Introduction
- B. Receiving and Installing
- C. Charging and Operation of Battery
- D. Reference Information, Trouble-Shooting and Extended Maintenance

V. IEEE Std 450™-2010
- A. Scope
- B. Definitions
- C. Precautions
- D. Inspections
- E. Monitoring
- F. Corrective Actions
- G. Cell/Battery Problems
- H. Charging
- I. Test Scheduling
- J. Procedures
- K. Annexes

Day 3

VI. Megger® Battery Maintenance and Testing
- A. Battery Types
- B. Battery Failure Modes
- C. Maintenance Philosophies
- D. Battery Testing
- E. Equipment Available for Battery Testing

Day 4

VII. Lab
- A. Using reference material and class notes develop a battery/cell inspection form
- B. Perform monthly, quarterly, and annual battery inspection and testing in accordance with IEEE Std. 450™ -2010

VIII. Conclusion
- A. Questions and Answers
- B. Supplemental Material Discussions
- C. Review
- D. Final Exam

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