Battery Maintenance and Testing

4 Days, 2.8 CEUs

Proper battery maintenance is an essential component of critical power or power supply systems that cannot be interrupted. 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.

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.

Lab and Classroom Attire

AVO is committed to the personal safety of each participant and requires safety glasses, long pants and ANSI rated “safety-toe” work shoes for lab activities. Lecture courses may involve a tour of a work or shop area and for this reason open-toe shoes and shorts are not considered appropriate attire for the classroom.

Learning Objectives

To receive 2.8 CEUs, participants must attend 4 days of class (28 contact hours) and attain a minimum average grade of 80% (overall grade will consist of 50% lab practice and 50% final exam). Upon completion of this course and lab practice, the participant will demonstrate 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. Introduction (0.5 hr)

II. Introduction To Batteries (2.5 hrs)

A. Battery Hazards

AM Break

B. Types of Batteries

C. Battery Construction

Lunch

III. Standards for Maintenance and Testing (4 hrs)

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)

PM Break

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

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

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Battery Maintenance and Testing

4 Days, 2.8 CEUs

SCOPE (continued)

Day 2

IV. C&D Standby Battery Vented Cell Installation and Operating Instructions (5 hrs)

A. Introduction

B. Receiving and Installing

AM Break

C. Charging and Operation of Battery

Lunch

D. Reference Information, Trouble-Shooting and Extended Maintenance

V. IEEE Std 450™-2010 (2 hrs)

A. Scope

B. Definitions

PM Break

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 (7 hrs)

A. Battery Types

B. Battery Failure Modes

AM Break

C. Maintenance Philosophies

Lunch

D. Battery Testing

PM Break

E. Equipment Available for Battery Testing

Day 4

VII. Lab (6 hrs)

A. Using reference material and class notes develop a battery/cell inspection form

AM Break

A. Using reference material and class notes develop a battery/cell inspection form (cont'd)

Lunch

B. Perform monthly, quarterly, and annual battery inspection and testing in accordance with IEEE Std. 450™- 2010

PM Break

B. Perform monthly, quarterly, and annual battery inspection and testing in accordance with IEEE Std. 450™- 2010 (cont'd)

VIII. Conclusion (1 hr)

A. Review

B. Final Exam

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STANDARD EQUIPMENT LIST
BATTERY MAINTENANCE AND TESTING

REVISED 10/26/16 BY: H.DAVALL/IBH
COURSE NUMBER 475A, REV1
4 DAYS

TEXT & HANDOUTS

1 / STUDENT	*BATTERY MAINTENANCE AND TESTING*, COURSE #475A, JULY 2011
1/ STUDENT	NFPA 70E® 2015 EDITION
1/ STUDENT	IEEE 450™ 2010 TO BE RETURNED

EQUIPMENT

1 / STUDENT	CALCULATOR TO BE RETURNED
1 / STUDENT	CLIPBOARD TO BE RETURNED

TEST EQUIPMENT

1 / CLASS	BITE (BATTERY IMPEDANCE TESTER) W/SPARE ROLL OF PAPER FOR BITE PRINTER **NOTE:** ROPE CT AND PROBE EXTENSION FOR BITE # 3 ONLY
1 / CLASS	DLRO WITH LONG LEADS
1 / CLASS	AC/DC CLAMP-ON AMMETER
1 / CLASS	DENSITY METER (DIGITAL HYDROMETER)
1 / CLASS	FLUKE 179 DMM
1 / CLASS	INSULATED MAG LITE (LIKE THEY USE IN GRILL TECH)
1 / CLASS	INSULATED MIRROR, FLAT

PERSONAL PROTECTIVE EQUIPMENT

1 / CLASS	CLASS 00 GLOVES/WITH PROTECTORS SIZE 9 (TESTED)
1 / CLASS	CLASS 00 GLOVES/WITH PROTECT0RS SIZE 10 (TESTED)
1 / CLASS	BOX OF DISPOSABLE LATEX GLOVES, (EXTRA LARGE)
3 / CLASS	SAFETY GOGGLES (HIGH IMPACT, Z87.1+)
1 / CLASS	ACID RESISTANT FACE SHIELD (HIGH IMPACT, Z87.1+)
1 / CLASS	PROTECTIVE (CHEMICAL RESISTANT) GLOVES
1 / CLASS	PROTECIVE APRON AND CHEMICAL RESISTANT BOOTS

ONSITE EQUIPMENT REQUIREMENTS

EYE WASH FACILITIES
LEAD ACID BATTERIES (BATTERY BANK FOR TESTING)