Battery Maintenance and Testing

4 Days, 2.8 CEUs

Batteries are critical to modern power supply, as today's energy demand relies heavier on versatility and portability. Batteries perform in a number of applications as stored energy devices, from household flashlights to grid-scale functions. Lead acid, including the subtypes Vented Lead Acid (VLA) and Valve Regulated Lead Acid (VRLA), and Nickel Cadmium (NiCad) batteries are the most common battery types utilized today, and require proper maintenance and testing for guaranteed operation and performance.

Designed for personnel responsible for battery systems in substations, power plants, and other systems that require emergency dc power, this course reviews the outlining principles of VLA, VRLA, and NiCad battery types and the specific testing requirements of each. Students will develop a maintenance plan for a specific battery type with knowledge of maintenance, testing, safety, and battery science. 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 participants will demonstrate that they are able to:

- Apply basic electrical knowledge to battery science and theories of operation.
- Classify battery types and their operating principles.
- Review standard safety procedures and recognize negligence and consequences of misuse.
- Interpret battery maintenance practices and procedures as they apply to individual battery types.
- Develop a maintenance plan designed to troubleshoot, diagnose, and remediate battery and battery-related failures.
- Identify faults and their causes, and the dangers they impose on battery systems.

SCOPE

Day 1* (7 contact hours)

I. Introduction

II. Introduction To Batteries (7 hrs)
- A. Description
- B. Flow Theories
- C. Batteries In Industry
- D. Definitions
- E. Battery Chargers
- F. Battery Banks

Day 2 (7 contact hours)

III. Battery Safety for Technicians (3 hrs)
- A. Battery Safety
- B. Battery Room Requirements
- C. Battery Risk Assessment

IV. IEEE Standard 450-2020 (4 hrs)

Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications

Day 3 (7 contact hours)

V. Battery Maintenance, Testing, and Troubleshooting (7 hrs)
- A. Visual Inspections
- B. Notes on Maintenance Procedures
- C. Lab - Battery Inspection
  - i. NiCad
  - ii. VRLA
  - iii. VLA
- D. Testing
  - i. Specific Gravity
  - ii. Strap Resistance
  - iii. Internal Resistance

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

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SCOPE (cont'd)

Day 4 (7 contact hours)

VI. Troubleshooting (2 hrs)

VII. Ground Fault Tracing (2 hrs)
- A. Causes
- B. Applications and Benefits
- C. Operation
- D. Lab - Ground Fault Tracing (optional)

VIII. Load Capacity Testing (2 hrs)
- A. Performing Test
- B. Calculating Capacity
- C. Applications and Benefits
- D. Operation

IX. Conclusion (1 hr)
- A. Review
- B. Exam

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STANDARD EQUIPMENT LIST

Battery Maintenance & Testing

Course Number: 475A

REVISED: 9/27/2022 BY: Cory Marchant DAYS: 4 DAYS

***ON-SITE COURSES

*CLIENT MUST PROVIDE EQUIPMENT

TEXT (PER 1 STUDENT)	
QUANTITY	**ITEM**
1	*BATTERY MAINTENANCE & TESTING* , 475A
1	*NFPA 70E (CURRENT EDITION)*
1	*IEEE STD 450 (CURRENT EDITION)* ***TO BE RETURNED***

MATERIALS NEEDED (PER CLASSROOM)	
QUANTITY	**ITEM**
*1	PROJECTOR OR TV WITH PROJECTION CAPABILITIES
*1	DRY ERASE BOARD WITH MARKERS AND ERASERS
*10	STUDENT TABLES
*10	STUDENT CHAIRS

EQUIPMENT LIST (PER CLASS)	
QUANTITY	**ITEM**
1	BITE 2 OR 3 (BATTERY IMPEDANCE TESTER) OR EQUIVALENT
1	DLRO W/ LONG LEADS
1	AC/DC CLAMP-ON AMMETER
1	DIGITAL HYDROMETER
1	DIGITAL MULTIMETER (DMM)
1	INSULATED FLASHLIGHT
1	INSULATED FLAT MIRROR
1	ASSORTED INSULATED WRENCHES
*1	BATTERY BANK (VLA, VRLA, AND/OR Ni-Cad)
*1	DC BATTERY CHARGER (RECTIFIER) CONNECTED TO BANK
*1	BODY/EYE WASH STATION

PERSONAL PROTECTIVE EQUIPMENT (PER CLASS)	
QUANTITY	**ITEM**
1	CLASS 00 GLOVES W/ PROTECTORS
1 BOX	DISPOSABLE NITRILE GLOVES
2	SAFETY GOGGLES (HIGH IMPACT, Z87.1+)
2	ACID RESISTANT FACE SHIELD (HIGH IMPACT,Z87.1+)
2	PROTECTIVE (CHEMICAL RESISTANT) GLOVES
1 BOX	CHEMICAL RESISTANT FR RATED APRON

FOR VIRTUAL CLASSES:

CONTENT MATERIAL WILL BE PROVIDED IN DIGITAL FORMAT