

1. APTA PR-IM-S-001-98, Rev. 1 Standard for Passenger Rail Equipment Battery System Periodic Inspection and Maintenance

Originally Approved January 22, 1998

Revision 1 Approved May 23, 2003

APTA PRESS Task Force

Originally Authorized March 17, 1999

Revision 1 Authorized September 28, 2003

APTA Commuter Rail Executive Committee

Abstract: This standard describes the basic inspection functions for battery systems on passenger rail equipment.

Keywords: battery, battery maintenance, battery system, battery system maintenance, battery system periodic inspection and maintenance

Copyright © 2003 by
The American Public Transportation Association
1666 K Street, N. W.
Washington, DC, 20006, USA

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of The American Public Transportation Association.

Introduction

(This introduction is not a part of APTA PR-IM-S-001-98, Rev. 1 Standard for Passenger Rail Equipment Battery System Periodic Inspection and Maintenance.)

This introduction provides some background on the rationale used to develop this standard. It is meant to aid in the understanding and application of this standard.

This standard describes the basic inspection functions for battery systems on passenger rail equipment. It is intended for the following:

- a) Individuals or organizations that maintain battery systems on passenger rail equipment;
- b) Individuals or organizations that contract with others for the maintenance of battery systems on passenger rail equipment;
- c) Individuals or organizations that influence how battery systems are maintained on passenger rail equipment.

This standard is designed to help individuals and organizations incorporate safety considerations during the maintenance process.

This standard is intended to satisfy the following objectives:

- Identify those maintenance practices and inspection criteria that provide a high level of passenger safety;
- Identify those maintenance practices and inspection criteria that provide a high level of crew safety;
- Identify the skills and training requirements necessary for maintenance personnel to apply these recommended practices.

CAUTION--Rail properties using non-standard batteries (or batteries not covered by this standard) should follow the recommendations of the original equipment manufacturer (OEM) until future practices can be established and included in this standard.

Participants

The American Public Transportation Association (APTA) greatly appreciates the contributions of the following individual(s), who provided the primary effort in the drafting of the *Standard for Passenger Rail Equipment Battery System Periodic Inspection and Maintenance*:

Chuck Prehm

Michael Dorsi

At the time that this standard was completed, the Passenger Rail Equipment Safety Standards (PRESS) Maintenance Committee included the following members:

Rich Conway, Chair

John Condrasky
Ken Donnelly
Michael Dorsi
Tom Grant
Tom Lutz
Chuck Prehm
Tom Rowbottom
Robert Scarola

Michael Scutero
James Stoetzel
Mark Christensen
Tom Clark
Greg Sinn
Michael Yaeger
Scott Krieger

Table of Contents

| | |
|---|-----|
| 1. Overview | 1.4 |
| 1.1 Scope..... | 1.4 |
| 2. References | 1.4 |
| 3. Definitions, abbreviations, and acronyms | 1.5 |
| 3.1 Definitions..... | 1.5 |
| 3.2 Abbreviations and acronyms | 1.5 |
| 4. Frequency of conduct..... | 1.5 |
| 5. Battery system maintenance..... | 1.5 |
| 5.1 Dry cell system..... | 1.6 |
| 5.2 Wet cell system..... | 1.6 |
| 5.3 Tools/materials | 1.7 |
| 5.4 Safety/personal protective equipment..... | 1.8 |
| 5.5 Training requirements | 1.8 |
| 5.6 Disposal/storage | 1.8 |
| 5.7 Replacement programs..... | 1.8 |
| Annex A (informative) Bibliography | 1.9 |

APTA PR-IM-S-001-98, Rev. 1

Standard for Passenger Rail Equipment Battery System Periodic Inspection and Maintenance

1. Overview

This standard establishes procedures for passenger rail equipment battery maintenance.

1.1 Scope

This standard for battery maintenance applies to all passenger cars.

Passenger car battery systems provide continuous electrical power to specific components or subsystems of the passenger car during brief input power interruptions encountered in normal service. These batteries also serve as a stabilizing element in the DC power system and provide continuous power to critical safety systems during extended input power interruptions or during emergencies.

Those systems and subsystems (if applicable) are essential in the safe operation of passenger cars. They may include (but are not limited to) automatic train control (ATC), emergency light systems, radio and communication devices, brake control systems, wheel protection systems, smoke and/or fire detectors, door operators, and any other low voltage system that would improve passenger safety or aid the passengers safe egress in an emergency situation.

This standard is intended for use by railroads to provide procedures for the inspection and maintenance of batteries installed on passenger rail equipment.

2. References

This standard shall be used in conjunction with the following publications. When the following standards are superseded by an approved revision, the revision shall apply.

Applicable federal, state, and local regulations including but not limited to:

APTA-PR-IM-S-013-99, Rev 1 Standard for Passenger Car Periodic Inspection and Maintenance

APTA-PR-E-RP-007-98, Recommended Practice for Storage Batteries and Battery Components

Original equipment manufacturer (OEM) instructions.

Standard maintenance procedure (SMP). (See 3.1.6)

49 CFR 1910.242 Hand and portable power tools and equipment, general

3. Definitions, abbreviations, and acronyms

3.1 Definitions

For the purpose of this standard, the following terms and definitions apply:

3.1.1 dry cell battery: A voltage-generating cell having an electrolyte in the form of moist paste.

3.1.2 electrolyte: Typically, sulfuric acid (H₂SO₄) or a solution of potassium hydroxide (KOH) and distilled water.

3.1.3 original equipment manufacturer (OEM): the organization that built or manufactured a specific piece of passenger rail equipment describing maintenance procedures and frequencies for that piece of equipment.

3.1.4 periodic maintenance: The performance of selected inspection and maintenance actions on systems or sub-systems. Regulatory agencies or the operating authority may set the frequency of these actions. The frequency may be expressed as a function of time (i.e. days, weeks, or months) or of utilization (i.e., mileage, cycles, etc.).

3.1.5 specific gravity: For solid or liquid, the ratio of the density of the solid or liquid to the density of an equal volume of distilled water at 39°F (4°C). For gas, the density of the gas to that of air or hydrogen under prescribed conditions of temperature and pressure.

3.1.6 standard maintenance procedure (SMP): The internal railroad document giving specific instruction on how to perform maintenance on a specific system or compound.

3.1.7 wet cell battery: A primary cell having a liquid electrolyte.

3.2 Abbreviations and acronyms

| | |
|------|---|
| APTA | American Public Transportation Association |
| OEM | original equipment manufacturer |
| SMP | standard maintenance procedure (unique to individual railroads) |

4. Frequency of conduct

The frequency of conduct of this task shall be as specified in and in compliance with the requirements of sections 4 and 5 of *APTA-PR-IM-S-013-99, Rev 1 Standard for Passenger Car Periodic Inspection and Maintenance*.¹

5. Battery system maintenance

Battery inspection, repair, and maintenance procedures vary slightly with type and construction of the battery.

This standard details the maintenance procedures for both dry cell and wet cell battery systems.

¹ For references in Italics, see Section 2.

5.1 Dry cell system

The maintenance procedure for dry cell systems shall include the following steps:

- a) Disconnect input power and unnecessary load.
- b) Check condition of battery holder for loose connection, broken or worn parts, and proper spring tension.
- c) Check condition of battery case for cracking and mechanical or thermal damage. Insure that plugs or covers, if present, are in position and secured per the railroad standard maintenance procedure (SMP).
- d) Check battery casings for damage and signs of leakage or residue in accordance with SMP.
- e) Check battery voltage versus rating for proper value, and check for shorted cells in accordance with SMP.
- f) Insure batteries are fully charged in accordance with the original equipment manufacturer (OEM) instructions/SMP. Perform capacity test as required by SMP.
- g) Check battery charger output charging rates (and temperature compensator if applicable) in accordance with SMP.
- h) Replace components that do not meet specification as needed.
- i) Record data as required.

5.2 Wet cell system

The maintenance procedure for wet cell systems shall include the following steps:

- a) Disconnect input power and unnecessary load(s).
- b) Check battery box (resilient), mounting hardware and shoring/blocking in accordance with SMP.
- c) Wash batteries in accordance with SMP.
- d) Inspect battery casings for damage and signs of leakage or residue in accordance with SMP.
- e) Inspect individual battery cells for proper electrolyte levels (and replenish as needed) in accordance with SMP. Check for shorted cells in accordance with SMP.
- f) Insure batteries are fully charged in accordance with OEM instructions/SMP.
- g) Measure electrolyte-specific gravity and charging temperature.
- h) Inspect inter-cell jumpers and all connections in accordance with SMP.

- i) Inspect mounting hardware and make sure shoring/blocking is sound.
- j) Check cell voltages for proper value in accordance with SMP.
- k) Measure specific gravity for each cell and correct per the electrolyte temperature, as measured with an appropriate thermometer in accordance with SMP.
- l) Check battery charger output charging rates (and temperature compensator if applicable) in accordance with SMP.
- m) Replace components as needed that do not meet specifications.
- n) Reconnect input power and load.
- o) Record data as required.

5.3 Tools/materials

The following tools shall be available to personnel for performing battery system periodic inspection and maintenance:

- a) Distilled/de-ionized water
- b) Insulated pole nut wrench (per OEM instructions)*
- c) Digital volt meter**
- d) Bulb hydrometer
- e) Thermometer
- f) Insulated torque wrench*, **
- g) Pressure washer
- h) Automatic battery filler (per OEM instructions)
- i) Flashlight

* All tools shall be insulated (and spark resistant) for shock protection.

** These tools shall be calibrated in accordance with railroad or tool manufacturer's recommended procedures

5.4 Safety/personal protective equipment

The following safety/protective equipment shall be available to personnel performing battery system periodic inspection and maintenance:

- a) Approved safety glasses/splash goggles
- b) Face shield
- c) Rubber gloves
- d) Rubber apron
- e) Long-sleeved clothing
- f) Lock out/tag out tags

5.5 Training requirements

Operating properties and their contractors shall develop and execute training programs that equip employees with the knowledge and skills necessary to safely and effectively perform the tasks outlined in this standard.

5.6 Disposal/storage

Follow OEM instructions/SMP and insure compliance with applicable federal, state, and local regulations governing hazardous waste.

5.7 Replacement programs

Upon completion of "useful life cycle" period, change out shall be accomplished in accordance with OEM instruction/SMP.

Annex A

(informative)

Bibliography

[B1] AAR RP-036, Storage Batteries, Part 1-Recommended Method for Capacity Rating of Storage Batteries in Railroad Car Service Recommended Practice, 1962.

[B2] DIN 40771, BS 6260, Cells with Pocket Plates and Cells with Steel or Plastic Container.

[B3] IEC 60623-Ed. 4.0, (2001-09) SC 21A, Secondary Cells And Batteries Containing Alkaline Or Other Non-Acid Electrolytes—Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes - Vented Nickel-Cadmium Prismatic Rechargeable Single Cells.

[B4] IEC 60077-1-Ed. 1.0, (1999-10) TC 9, Electrical Railway Equipment—Railway Applications - Electric Equipment for Rolling Stock - Part 1: General Service Conditions and General Rules.

[B5] IEEE STD. 450-1987, Concerning Test Procedures and Battery Replacement Criteria.

[B6] ISO-9001, International Standard Organization, Quality Level.

[B7] NFF 64018, NFF 16101, Railway Rolling Stock Accumulators (Batteries) Nickel—Cadmium Secondary Single Cells.

[B8] SAFT NIFE, Procedure for Testing Batteries.

[B9] UIC 854R, Technical Specification for "Starting Batteries" (Alkaline or Lead Acid).

[B10] 49 CFR Section 229.43, Exhaust and battery gases

[B11] 49 CFR Section 238.225, Electrical System