

1. Standard for Third Rail Current Collection Equipment Periodic Inspection and Maintenance

Approved July 10, 2001
APTA Rail Transit Standards Vehicle Inspection and Maintenance Committee

Approved January 24, 2002
APTA Rail Transit Standards Task Force

Authorized February 2, 2002
APTA Rail Transit Standards Executive Committee

Abstract: This standard covers basic procedures for periodic inspection and maintenance of third rail current collection equipment on rail transit vehicles, with emphasis on maintenance of high voltage current collection devices.

Keywords: periodic inspection and maintenance, third rail current collection equipment

Introduction

(This introduction is not part of APTA RT-S-VIM-001-02, *Standard for Third Rail Current Collection Equipment Periodic Inspection and Maintenance*.)

This Standard for Third Rail Current Collection Equipment Periodic Inspection and Maintenance for rail transit vehicles represents a common viewpoint of those parties concerned with its provisions, namely, transit operating/planning agencies, manufacturers, consultants, engineers and general interest groups. The application of any standards, practices or guidelines contained herein is voluntary. In some cases, federal and/or state regulations govern portions of a rail transit system's operations. In those cases, the government regulations take precedence over this standard. APTA recognizes that for certain applications, the standards or practices, as implemented by individual rail transit systems, may be either more or less restrictive than those given in this document.

This standard describes the basic inspection and maintenance requirements for third rail current collection equipment on rail transit vehicles. APTA recommends the use of this standard by:

- Individuals or organizations that maintain third rail current collection equipment on rail transit vehicles;
- Individuals or organizations that contract with others for the maintenance of third rail current collection equipment on rail transit vehicles; and
- Individuals or organizations that influence how third rail current collection equipment is maintained on rail transit vehicles.

Participants

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

Kirk Slicer

Joseph D. Brattelli

At the time that this standard was completed, the VIM Committee included the following members:

Jayendra Shah, Chair
Ben Antonio, Vice Chair

Dave Barber
Richard Berk
David Blizzard
Stephen Bonina
Joseph Brattelli
Gordon Campbell
David Case
Dhiren Chakraborty
Lisa Cobb
John Condrasky
Chris Eichin
Kevin Johnson
Paul Kovacs

Dave Kubicek
Brian Ley
Joseph Marie
Bill McCoy
Thomas Peacock
David Phelps
James Plomin
John Sadorra
Robert Spadafora
Clive Thornes
Brian Whately
Hannie Woodson

APTA Rail Transit Standards Vehicle Inspection and Maintenance Committee project consultant:

Gordon S. Campbell, *LDK Engineering*

APTA Rail Transit Standards project team:

Gabrielle Bayme, *Standards Development Program Specialist and Project Editor*
Saahir Brewington, *Administrative Assistant and Project Editor*
Antoinette Hankins, *Program Assistant*
Thomas Peacock, *Director-Operations & Technical Services*
David Phelps, *Senior Project Manager - Rail Programs*

Contents

1. Overview	1.1
1.1 Scope	1.1
1.2 Purpose	1.1
1.3 Alternate practices.....	1.1
2. References	1.2
3. Definitions, abbreviations, and acronyms	1.2
3.1 Definitions	1.2
3.2 Abbreviations and acronyms	1.2
4. Frequency of conduct	1.2
5. Requirements and specific tasks	1.3
5.1 Materials.....	1.4
5.2 Tools.....	1.4
5.3 Safety/personal protective equipment	1.4
5.4 Training requirements	1.4
5.5 Inspection and maintenance	1.5
5.6 Correction of deficiencies	1.6
Annex A (informative)	1.7

Standard for Third Rail Current Collection Equipment Periodic Inspection and Maintenance

1. Overview

This document establishes a standard for the inspection and maintenance of third rail current collection equipment. Individual rail transit systems should tailor these standards to accommodate their specific equipment and mode of operation.

1.1 Scope

This standard includes all essential periodic inspection and maintenance requirements for third rail current collection equipment used on rail transit vehicles.

1.2 Purpose

This standard is intended for use by rail transit equipment maintenance organizations. It establishes procedures for periodic inspection and maintenance of third rail current collection equipment used on rail transit vehicles.

1.3 Alternate practices

APTA recognizes that some rail transit systems may have unique operating environments that make strict compliance with every provision of this standard impossible. As a result, certain rail transit systems may need to implement the standards and practices herein in ways that are more or less restrictive than this document prescribes. A rail transit system may develop alternates to the APTA standards so long as the alternates are based on a safe operating history and are described and documented in the system's safety program plan (or another document that is referenced in the system safety program plan).

Documentation of alternate practices shall:

- a) Identify the specific APTA rail transit safety standard requirements that cannot be met
- b) State why each of these requirements cannot be met
- c) Describe the alternate methods used
- d) Describe and substantiate how the alternate methods do not compromise safety and provide a level of safety equivalent to the practices in the APTA safety standard (operating histories or hazard analysis findings may be used to substantiate this claim).

2. References

Original Equipment Manufacturer’s Specifications for third rail current collection equipment inspection and maintenance.

Rail transit system procedures for third rail current collection equipment inspection and maintenance.

3. Definitions, abbreviations, and acronyms

3.1 Definitions

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

3.1.1 third rail: An electrical conductor (also called contact rail) located alongside the track designed to carry energy for the propulsion and auxiliary systems of trains.

3.1.2 third rail current collection equipment: A mechanical assembly, commonly mounted to a rail transit vehicle truck frame (usually four assemblies per car, electrically linked together). Its design provides a continuous pressure applied sliding shoe connection to the third rail for the purpose of transferring power from the third rail to the rail transit vehicle.

3.2 Abbreviations and acronyms

ANSI American National Standards Institute

MSDS Material Safety Data Sheet

OEM Original Equipment Manufacturer

4. Frequency of conduct

Maintenance tasks on the third rail current collection equipment shall be performed on a regular schedule to ensure proper operation of the equipment. The sections of this standard listed in Table 1 provide a guide of detailed procedures for each identified maintenance task.

Table 1

INSPECTIONS AND MAINTENANCE	RECOMMENDED INSPECTION INTERVALS (Not to Exceed)	SECTION
Visual	* 30 Days	5.5.1
Mechanical	* 180 Days	5.5.2
Electrical	* 12 Months	5.5.3
Cleaning/Coating	* 24 Months	5.5.4
Lubrication	As required by OEM	5.5.5

* Each inspection step includes all previous levels.

* Rail transit systems may opt to use equivalent mileage instead of recommended days when determining inspection intervals.

The frequency of tasks in Table 1 shall comply with all applicable federal, state and local regulations. Further, in the conduct of a rail transit system's periodic inspection and maintenance programs, frequencies for individual tasks may be established based on a number of additional factors, including but not limited to:

- OEM – recommended intervals
- Industry Experience
- Operating Environment/Conditions
- Historical Data
- Performance Requirements
- Failure Analysis
- Rail Transit System's Testing and Experience
- Reliability Centered Maintenance Programs

5. Requirements and specific tasks

WARNING: The following inspection and maintenance procedures must be performed in a voltage free area, (disconnected from all sources of supply) and where no third rail is present. Follow proper lock-out/tag-out procedures as required by the rail transit system.

WARNING: Ensure the proper electrical discharge of auxiliary and propulsion capacitors. Follow proper procedures as required by the OEM and rail transit system.

WARNING: Ensure the vehicle is properly secured against uncontrolled movement in accordance with the rail transit system rules before commencing inspection and maintenance procedures.

WARNING: When disconnecting components from the Third Rail Current Collection System, ensure that all components are adequately supported to prevent uncontrolled movement.

WARNING: Use only those cleaning products and lubricants proven safe and authorized for use by the rail transit system. Consult OEM and MSDS references for suitability for each application to prevent personal injury and damage to the equipment.

5.1 Materials

The following materials are normally required to perform third rail current collection equipment inspection and maintenance:

- Approved non-conducting cleaning solvents.
- Approved lubricants as required by the OEM.
- Referenced OEM maintenance manuals for additional materials.

5.2 Tools

The following tools are normally required to perform third rail current collection equipment inspection and maintenance:

- Standard tools carried by the maintenance personnel.
- 500 or 1000 Vdc Megohm-meter (Commonly referred to as a Megger).*
- Multi-meter.*
- Force Gauge (Spring scale or Digital).*
- Torque Wrench.*
- Third Rail Shoe Height Gauge.
- Contact Shoe Pad Wear Gauge (if applicable).
- Fulcrum Gauge (if applicable).

* These tools require periodic calibration as specified by the rail transit system's practices.

5.3 Safety/personal protective equipment

Appropriate personal protective equipment, meeting minimum ANSI Standards and as required by the rail transit system, shall be worn at all times in the performance of these inspection and maintenance tasks.

5.4 Training requirements

Rail transit systems and/or their maintenance contractors shall develop and execute training programs that provide employees with the knowledge and the skills necessary to safely and effectively perform the tasks outlined in this standard.

5.5 Inspection and maintenance

5.5.1 Visual

- a) Electrical – Frayed, burnt, broken, cut, or otherwise defective shunt straps or electrical cables shall be replaced. Make sure that cables are not lying over objects that will cause them to chafe. Ensure that insulated cables are not in contact with hydraulic/pneumatic lines.

NOTE: If required by the rail transit system or manufacturer's recommendation, use colloidal copper coating material between connections.

- b) Mechanical – Missing or damaged cotter pins, bolts, nuts, lock washers, support brackets, electrical terminals shall be replaced. Inspect for the alignment of torque stripes on the associated hardware if applicable. Loose hardware shall be torqued to OEM specifications. Re-apply torque stripes, if applicable.

NOTE: Elastic lock nuts and chemical locking compounds are not to be used to secure current carrying components.

- c) Wear Indicator – Current collector shoes shall be replaced if the pad wear limit telltale hole is exposed or the shoe is worn down to the condemning limit. Use shoe pad wear gauge, if applicable.

NOTE: Current collector shoes can wear and deteriorate at an accelerated rate during severe weather when third rail icing occurs. It is therefore recommended to inspect all vehicles immediately following such weather.

- d) Shoe Contact – Inspect the current collector shoe pad for correct contact to the third rail. Excessive burning of pad contact area generally indicates improper shoe height, alignment, or improper spring tension. If required, adjust or replace components in accordance with rail transit system procedures. Report all abnormal conditions.
- e) Current Collector Height – Inspect the current collector shoe height from top of running rail using the rail transit system's approved height gauge. Adjust as required. Follow manufacturers' recommendations for all other required adjustments.
- f) Fuse Condition – Inspect all ribbon or braided type fuses for burnt, separated or otherwise damaged elements and replace as required. Inspect the open element indicator on cartridge type fuses. If activated, replace fuse.

NOTE: The reasons for a blown fuse should be found and corrected.

- g) Inspect all insulating materials for burnt or broken condition

5.5.2 Mechanical

- a) Inspection – Inspect the current collector shoe spring and shoe back assembly for damage, broken springs or supports. All defective components shall be replaced.
- b) Assembly Function – Test for correct current collector shoe spring tension. Adjust as required.

5.5.3 Electrical

- a) Perform an insulation test using a megger set at 500 or 1000 Vdc. Ensure that the knife switch or main breaker is in the open position. Connect the megger negative lead to carbody ground and the positive lead to the line side of the main knife switch or circuit breaker. An insulation level sufficient to ensure freedom from tracking, arcing, fire and other electrical hazards shall be achieved and maintained. Equipment, except as noted below, shall meet a minimum level of five (5) megohms.

Tip: If minimum megohm readings are not achieved, follow steps in 5.5.4 and re-test.

NOTE: Third rail shoe beams, as described in Section 5.5.4.(c) below, in service prior to the effective date of this standard may not exhibit the same insulation resistance as newer equipment, and are more sensitive to variations in humidity and temperature. Rail transit systems should utilize a combination of OEM recommendations and its own experience to determine a minimum acceptable level. In the absence of other data, a minimum of five (5) megohms is recommended.

- b) Fuse Condition – Perform circuit continuity test on all cartridge type fuses and replace all fuses that exhibit an “open” condition. Inspect all ribbon type fuses for security and signs of damage or overheating. Replace all damaged or blown fuses.

NOTE: The reasons for a blown fuse should be found and corrected.

5.5.4 Cleaning/coating

- a) Fuse Assembly – Clean surface thoroughly with an approved non-conductive grease dissolving solvent and inspect for evidence of structural deterioration, electrical tracking or flashover.
- b) Collector Mounting Brackets – Clean surface thoroughly and inspect for evidence of structural deterioration, electrical tracking or flashover.
- c) Shoe Beams – Wooden beams and beams made of other types of porous material may require periodic surface cleaning and re-coating with an approved dielectric material. Follow manufacturer’s recommendations and rail transit system practices when determining if this step is necessary.

5.5.5 Lubrication

Generally, none is required for this type of assembly. However, refer to the OEM recommendations for all required lubrication applications.

5.6 Correction of deficiencies

Any deficiencies uncovered during the inspections required in Section 5.5.1 through 5.5.5 shall be corrected and documented in accordance with rail transit system procedures and OEM recommendations.

Annex A (Informative)

Bibliography

[B1] APTA RP-E-004-98, Recommended Practice for Gap and Creepage Distance.

[B2] APTA RP-E-009-98, Recommended Practice for Wire Used On Passenger Equipment.