

22. Standard for Electro-Pneumatic Train Stop Mechanism Inspection and Maintenance

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Abstract: This standard provides procedures for inspecting and maintaining rail transit electro-pneumatic train stop mechanisms.

Keywords: electro-pneumatic train stop, inspection, maintenance, signal, stop trip arm, train stop mechanism

Introduction

(This introduction is not a part of APTA RT-SC-S-022-03, *Standard for Electro-Pneumatic Train Stop Mechanism Inspection and Maintenance*.)

APTA rail transit safety standards represent an industry consensus on safety practices for rail transit systems to help achieve a high level of safety for passengers, employees, and the general public. This document was created by and for those parties concerned with its provisions; namely, rail transit systems (operating agencies), manufacturers, consultants, engineers, and general interest groups. This standard provides procedures for inspecting and maintaining rail transit electro-pneumatic train stop mechanisms.

APTA recommends this standard for:

- Individuals or organizations that inspect, maintain, and/or operate rail transit systems
- Individuals or organizations that contract with others for the inspection, maintenance, and/or operation of rail transit systems
- Individuals or organizations that influence how rail transit systems are inspected, maintained, and/or operated (including but not limited to consultants, designers, and contractors)

This standard intends to meet the following objectives:

- To ensure special life/safety equipment is operational and reliable
- To help rail transit systems incorporate safety considerations during the inspection and maintenance process
- To identify inspection criteria and maintenance standards that provide a high level of passenger and personnel safety

The application of any standards, practices, or guidelines contained herein is voluntary. In some cases, federal and/or state regulations govern portions of how a rail transit system operates. In such cases, the government regulations override any conflicting practices this document requires or recommends.

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Standard for Electro-Pneumatic Train Stop Mechanism Inspection and Maintenance

1. Overview

1.1 Scope

This document establishes standard requirements for inspecting and maintaining rail transit electro-pneumatic train stop mechanisms.

1.2 Purpose

The purpose of this standard is to verify that electro-pneumatic train stop mechanisms are operating safely and as designed through periodic inspection and maintenance, thereby increasing reliability and reducing the risk of hazards and failures.

1.3 Alternate practices

Individual rail transit systems may modify the practices in this standard to accommodate their specific equipment and mode of operation. 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 (RTS) 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. Definitions and acronyms

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

2.1 Definitions

2.1.1 ballast: Granular material placed in the track bed to support and restrain the track in line and surface.

2.1.2 cotter pin: A short strip of soft, folded metal that is inserted through a bolt head or nut to prevent rotation and/or disengagement of that bolt or nut from its connection

2.1.3 hazard: Any real or potential condition that can cause injury, death, or damage or loss of equipment or property.

2.1.4 operations control center (OCC): That facility from which train control, train dispatching, and/or train supervision takes place for the entire RTS or for specific segments of a system if there is more than one control center. *Syn:* **rail control center, rail operations center, rail service control center, train command center.**

2.1.5 original equipment manufacturer (OEM): The enterprise that initially designs and builds a piece of equipment.

2.1.6 personal protective equipment (PPE): All clothing and other work accessories designed to create a barrier against workplace hazards. Examples include safety goggles, blast shields, hard hats, hearing protectors, gloves, respirators, aprons, and work boots.

2.1.7 rail transit system (RTS): The organization or portion of an organization that operates rail transit service and related activities. *Syn:* **operating agency, operating authority, transit agency, transit authority, transit system.**

2.1.8 stop trip arm hook: A device used to hold the stop trip arm in the clear position.

2.1.9 stop trip arm: A device used to enforce compliance of a signal displaying a restrictive aspect. If a train operator fails to comply with the signal displaying a restrictive aspect, the stop trip arm contacts a trip device mounted on the front end of each train, causing the emergency brake application of the train braking system.

2.1.10 train stop circuit controller: Device for opening and closing electrical circuits operated by a rod connected to a component within the stop mechanism.

2.2 Acronyms

OCC	operations control center
OEM	original equipment manufacturer
PPE	personal protective equipment
RTS	rail transit system

3. Inspection and maintenance requirements

3.1 Inspection and maintenance frequency

The inspection and maintenance procedures in this standard shall be performed when electro-pneumatic train stop mechanisms are placed in service, when they are modified, repaired, or disarranged, or as otherwise deemed necessary by RTS.

The RTS shall determine the need for additional inspection and maintenance frequencies for electro-pneumatic train stop mechanisms. A review of the following factors may be useful in making this assessment:

- OEM-recommended intervals
- Industry experience
- Operating environment/conditions
- Historical data
- Reliability-centered maintenance program development
- Failure analysis
- RTS testing and experience
- Regulatory requirements

The frequency of tasks shall comply with applicable federal, state, and local regulations.

3.2 Training

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

3.3 Materials

The following materials are required for inspecting and maintaining electro-pneumatic train stop mechanisms:

- Grease gun
- Rags
- Oil can with oil

- Trash bags and ties
- Scrapers
- Wire brush
- Paint
- Cleaning and dusting brushes
- Lint-free cloths
- RTS-approved degreaser
- RTS-approved contact cleaner
- Additional materials as required by the OEM and/or RTS

3.4 Tools

The following tools are required for inspecting and maintaining electro-pneumatic train stop mechanisms:

- Standard stop trip arm gauge
- Air pressure gauge
- Ruler
- Multi-meter*
- Terminal nut wrench
- RTS-approved portable radio
- Standard tools carried by maintenance personnel
- Additional tools as required by the OEM and/or RTS

* Calibrate in accordance with OEM and/or RTS requirements.

3.5 Personal protective equipment

Personal protective equipment, as required by the RTS, shall be worn at all times during inspection and maintenance.

3.6 Safety

RTS safety rules, procedures, and practices shall be followed at all times during inspection and maintenance.

3.7 Inspection and maintenance procedures

Electro-pneumatic train stop mechanism inspection and maintenance procedures may be modified for each rail transit system's requirements (see Section 1.3) but shall contain the steps listed in Sections 3.7.1-3.7.34 as a minimum.

- 3.7.1 Notify the operations control center (OCC) and/or other authorities of the inspection and maintenance activities to be performed.
- 3.7.2 Inspect the electro-pneumatic train stop mechanism for an accumulation of debris. Remove and bag debris.
- 3.7.3 Inspect wayside drains for blockage or ineffective drainage.
- 3.7.4 Inspect the electro-pneumatic train stop mechanism for damage caused by standing water, water leaks, or retention.
- 3.7.5 Inspect for any condition that may interfere with the operation of the signal equipment.
- 3.7.6 Inspect the electro-pneumatic train stop mechanism and layout for condition of identification plates and markers, damage, rust, corrosion, and missing or loose components and hardware. Ensure cotter pins are in place and spread properly.
- 3.7.7 Inspect the electro-pneumatic train stop mechanism cabling and wiring for condition of wire tags, defective insulation, heat, and loose, corroded, rusted, damaged, or missing connectors and terminals.
- 3.7.8 Inspect polyvinyl chloride (PVC), fiberglass, rubber and other cable conduit material for damage, cracks, breaks, loose conduit connections, missing or loose components, and hardware.
- 3.7.9 Inspect junction boxes and other enclosures for condition of identification plates and markers, rust, corrosion, damage, cracks, breaks, defective latches, locks, hinges, covers, weather seals, and gaskets, loose, deteriorated, or damaged conduit connections, and missing or loose components and hardware. Holes and unused entrances not used for ventilation shall be sealed.
- 3.7.10 Inspect junction boxes and enclosures for the presence and condition of stored circuit drawings, terminal list, and instructions.
- 3.7.11 Ensure ties on which the train stop is mounted are well tamped to withstand vibration and strain caused by passing trains.

- 3.7.12** Inspect stop trip arm for cracks, flaws or other defects
- 3.7.13** Inspect the condition of the train stop trip arm return spring, stop trip arm hook, electro-pneumatic gear assembly, circuit controller, and contacts.
- 3.7.14** Ensure the stop trip arm hook engages the trip arm securely.
- 3.7.15** Inspect the condition of airlines, airline connectors, air strainers, and hose for deterioration.
- 3.7.16** Inspect airlines, airline connectors, valves and mechanism for air leaks.
- 3.7.17** Ensure air strainers are clean.
- 3.7.18** Inspect control magnet where dc energy is used or Z armature where ac energy is used for wear in bearings, vibration of armature, leaks in valve seats, security in mountings and general operating conditions.
- 3.7.19** Inspect piston packings for cracks or deterioration.
- 3.7.20** Clean internal and external surfaces and components of electro-pneumatic train stop mechanism as required by OEM and/or RTS specifications.
- 3.7.21** Lubricate the electro-pneumatic train stop mechanism in accordance with OEM and/or RTS specifications.
- 3.7.22** Check the relative position of the stop trip arm to the adjacent running rail as required using the stop trip arm gauge. Readjust immediately if the stop trip arm is not in gauge.
- 3.7.23** Ensure the stop trip arm operates properly when clearing and returning to the tripping position.
- 3.7.24** Inspect moving parts for excessive wear and/or lost motion.
- 3.7.25** Ensure the rocker shaft does not bind in the bearings.
- 3.7.26** Ensure the rocker shaft and stop trip arm have clearance from the outboard bearing, without excessive lost motion in any direction.
- 3.7.27** Ensure wiring cannot interfere with moving parts or cause a ground condition.
- 3.7.28** Ensure ballast is clear of moving parts.
- 3.7.29** Ensure contacts are properly adjusted.
- 3.7.30** Test retaining circuits and emergency clearing circuits using OEM/RTS procedures.
- 3.7.31** Perform additional tests as required by the OEM and/or RTS.

3.7.32 Inspect the stop trip arm for adequate visibility. Paint the stop trip arm using the color and type of paint approved by the RTS.

3.7.33 Ensure covers and locks are in place and secured.

3.7.34 Notify the OCC and/or other authorities when inspection and maintenance activities are complete.

3.8 Correction of deficiencies

Deficiencies identified during electro-pneumatic train stop mechanism inspection and maintenance shall be corrected and documented in accordance with OEM and/or RTS requirements.

3.9 Documentation

Inspection and maintenance activities shall be documented, reviewed, and filed in accordance with RTS procedures.

Annex A

(informative)

Bibliography

- [B1] New York City Transit, Division of Signals, Standard Procedures Manual 7.71.011, Stop Mechanisms General, 10-07-71.
- [B2] New York City Transit, Division of Signals, Standard Procedures Manual 7.71.012, Stop Mechanisms WABCO Style “S”, 06-02-71.
- [B3] Original equipment manufacturer (OEM) specifications for electro-pneumatic train stop mechanism inspection and maintenance.
- [B4] Rail transit system (RTS) procedures for electro-pneumatic train stop mechanism inspection and maintenance.