

Traffic Locking Tests

Abstract: This document provides procedures for testing rail transit traffic locking.

Keywords: signal, test, testing, traffic, traffic locking

Summary: Traffic locking tests verify that traffic locking will prevent traffic from changing direction on a section of track in between interlockings while that section is occupied or while a signal displays an aspect to proceed into that section. This standard provides prerequisites, procedures and requirements for testing rail transit traffic locking. Individual rail transit systems may modify these requirements to accommodate their specific equipment and mode of operation.

Scope and purpose: This document is intended to satisfy the following objectives:

- to ensure that special life/safety equipment is operational and reliable
- to incorporate safety considerations during the inspection and maintenance process
- to identify those inspection criteria and maintenance practices that provide a high level of passenger and personnel safety

This document represents a common viewpoint of those parties concerned with its provisions, namely transit operating/planning agencies, manufacturers, consultants, engineers, and general interest groups. APTA standards are mandatory to the extent incorporated by an applicable statute or regulation. In some cases, federal and/or state regulations govern portions of a transit system's operations. In cases where this is a conflict or contradiction between an applicable law or regulation and this document, consult with a legal advisor to determine which document takes precedence.

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Participants

The American Public Transportation Association greatly appreciates the contributions of **Bill Palko, Ben Feely, Howard Goldberg** and **Tru Hong**, who provided the primary effort in the drafting of this document.

At the time this standard was completed, the Rail Transit Signal & Communications Working Group included the following members:

Aderemi Omotayo, Los Angeles County Metropolitan Transportation Authority, *Chair*

Joel Jeff McCormack, AECOM, *Vice Chair*

Kurt Slesinger, Greater Cleveland Regional Transit Authority, *Secretary*

Jose Arriojas, *NJ TRANSIT*

Charles V. Barlow, *EverGlow NA*

Ryan Becraft, *Denver Transit Operators*

Frank Beeck, *Rail-IT*

Peter Bertozzi, *Patrick Engineering*

Mark A. Bressi, *Hitachi Rail Systems USA*

Randy Brundridge, *ALSTROM*

Anthony Patrick Candarini, *AECOM*

Sandy Castillo, *MTA*

Nicholas Columbare, *ALSTROM*

David Coury, *Transit Systems Engineering*

Michael Crispo, *Hatch LTK*

Stephen Farrell, *Transit Systems Engineering*

Bennett R. Feely, *Mott MacDonald*

Bruce Fenlason, *Metro Transit–Hiawatha LRT*

Johann Glansdorp, *WMATA*

Howard I. Goldberg, *ALSTROM*

Daniel Hernandez, *Chicago Transit Authority*

Tru Hong, *Gannett Fleming Transit & Rail*

Michael James Lowder, *Chicago Transit Authority*

Scott Matonak, *Hitachi Rail STS*

William McClellan, *ACI*

Jerry McCormack, *Vomar Products*

Eric McGraw, *Chicago Transit Authority*

Douglas James Minto, *Siemens Mobility*

Javier Molina, *Dallas Area Rapid Transit*

Ojo Nwabara, *Hitachi Rail STS*

William J. Palko, *Mott MacDonald*

Stephen Ranck, *ALSTROM*

Daniel Reitz, *Port Authority Trans-Hudson*

Tim Shoppa, *WMATA*

Otobong Usoro, *HNTB Corporation*

Christopher Weil, *Greater Cleveland RTA*

Phil Wellman, *Metro Transit–Hiawatha LRT*

James Winter, *Siemens Mobility*

Project team

Eugene F. Reed, *American Public Transportation Association*

Narayana Sundaram, *American Public Transportation Association*

Introduction

This introduction is not part of APTA RT-SC-S-010-02, Rev. 1, “Traffic Locking Tests.”

APTA recommends the use of this document by:

- individuals or organizations that operate rail transit systems;
- individuals or organizations that contract with others for the operation of rail transit systems; and
- individuals or organizations that influence how rail transit systems are operated (including but not limited to consultants, designers and contractors).

Note on alternate practices

Individual rail transit systems may modify 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 herein in ways that are more or less restrictive than this document prescribes. A rail transit system may develop alternates to 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:

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

Traffic Locking Tests

1. Test requirements

1.1 Test frequency

Traffic locking tests shall be performed based on the following intervals:

- Relay-based systems shall be tested when placed in service; after modification, repair or disarrangement; and at a regular interval not to exceed four years.
- Microprocessor-based systems being maintained under a configuration control plan conforming to APTA-RT-SC-S-035-03 shall be tested when placed in service and after modification, repair or disarrangement.
- Microprocessor-based systems being maintained without a configuration control plan conforming to APTA-RT-SC-S-035-03 shall be tested when placed in service; after modification, repair or disarrangement; and at a regular interval not to exceed four years.

1.2 Materials and data

The following materials are required for traffic locking tests:

- current book of plans for the location under test that includes the following details:
 - signals/routes to be tested
 - switches and their position in each route
 - diagram of route locking sections and limits
 - interlocking layout including track circuit limits and switch/signal locations
 - conflicting signals/routes
 - test data sheets or means to record test results

1.3 Tools

Test tools and apparatus shall be as required by the OEM and/or the rail transit system. Applicable tools shall be calibrated in accordance with rail transit system and/or OEM requirements.

1.4 Personal protective equipment

Personal protective equipment shall be worn as required by the transit system.

1.5 Safety

Rail transit system safety rules, procedures and practices shall be followed at all times during testing. No work of any type shall be performed until train movements have been protected. The normal functioning of any device shall not be interfered with, in testing or otherwise, without first taking measures to provide for the safety of train operation, which depends on the normal functioning of such device.

1.6 Test prerequisites

Prior to performing traffic locking tests, the test person shall ensure the following:

- A test plan is in place to ensure that all traffic locking is tested consistent with the intended train operation and in-service status of all devices, circuits and systems controlling or controlled by traffic locking.
- Track circuit setup and shunting has been completed for all track circuits within the scope of this test.
- All track circuits within the traffic block have been verified to be properly represented in the logic or equation.
- Approach or time locking has been tested and found to operate properly.
- Route locking has been tested and found to operate properly.

2. Test procedure

Traffic locking tests shall be modified for each rail transit system's requirements (see "Note on alternate practices") but shall contain steps 1 through 11 as a minimum. Rail transit system-specific functions related to traffic, including but not limited to emergency release, call-on override, crossing checks, electric switch locks and timed release, shall be accounted for and tested by the rail transit system under the requirements for alternate practices. Test requirements represented herein may be combined with other tests for efficiency or ease of execution.

When performing this test procedure, ensure that non-vital logic does not mask the proper operation of the vital logic (if the configuration of the system prevents this, then the method of testing shall be addressed through a documented alternate practice). Where actual relays are not available to verify logic states, the test person shall use the OEM-recommended microprocessor diagnostic tool to verify the internal states of vital logic equations.

1. Notify the operations control center and/or other authorities of the test activities to be performed.
2. Set the direction of traffic to be tested by establishing a route.
3. Verify that the affected traffic relay is de-energized or the equivalent processor function is restrictive.
4. Align opposing routes at the exiting interlocking and/or call for traffic in the opposite direction with the traffic lever (if present) when the traffic is locked. With each opposing route request and/or traffic lever manipulation (if present), verify that the locked direction of traffic does not change; the requested opposing signal does not clear; and the signal for the route established in step 2, at the entrance interlocking, remains clear.
5. Cancel/remove calls for opposing traffic from step 4. Simulate the movement of a train through the route by sequentially simulating occupancy of each track circuit within the route. Ensure that the next track circuit in the route is occupied before removing the occupancy from the previous track circuit. With each change in occupancy, verify that the direction of traffic cannot be changed and that the associated vital traffic relay remains de-energized or the equivalent processor function remains restrictive.
6. Repeat steps 2 through 5 for all possible routes leading into the traffic block under test.
7. Follow steps 2 and 3 to establish a route, and then occupy the first track circuit in the traffic block between interlockings. Cancel the route and verify that the direction of traffic cannot be changed, and that the associated vital traffic relay remains de-energized or the equivalent processor function remains restrictive.
8. Simulate the movement of a train through the block by sequentially simulating occupancy of each track circuit within the block between interlockings. Ensure that the next track circuit in the route is occupied before removing the occupancy from the previous track circuits. With each change in

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occupancy, verify that the direction of traffic cannot be changed, and that the associated vital traffic relay remains de-energized or the equivalent processor function remains restrictive.

9. Restore the system to its original operating condition (close the opened gold nuts/test links, remove applied temporary jumpers, reset temporary time settings to documented times, etc.).
10. Notify the OCC and/or other authorities when testing is complete.

3. Correction of deficiencies

Deficiencies identified during traffic locking tests shall be corrected and documented in accordance with OEM and/or rail transit system requirements.

4. Documentation

Testing activities shall be documented, reviewed and filed in accordance with rail transit system procedures.

Related APTA standards

APTA STD-ADMIN-GL-002-22, “Definitions for Signal & Communications Terms”

APTA-RT-SC-S-035-03, “Vital Processor-Based System Inspection, Testing and Configuration Control”

APTA-RT-SC-S-004-02, “Approach Locking Tests”

APTA-RT-SC-S-005-02, “Route Locking Tests”

APTA-RT-SC-S-006-02, “Time Locking Tests”

References

In addition to the most recent edition of OEM specifications for testing traffic locking, as well as route aspect charts and/or track plans with traffic locking specifications for the locations under test, this document shall be used in conjunction with the following:

American Railway Engineering and Maintenance-of-Way Association, “Communications and Signals Manual of Standards,” Part 2.4.5, Section H: Traffic Locking.

Federal Railroad Administration (FRA), Office of Safety, “Rules and Regulations Governing Railroad and Train Control Systems,” Section 236.381: Traffic Locking.

Abbreviations and acronyms

OCC Operations Control Center
OEM original equipment manufacturer

Summary of document changes

- Document formatted to the new APTA standard format.
- Revisions made to the boilerplate sections for consistency among documents.
- Applied revisions addressing agreed-to comments from the March 10, 2016; June 8, 2016; and Oct. 4, 2016, committee meetings.
- Changes made to “Personal protective equipment,” “Test prerequisites,” “Test procedure” and “Abbreviations and acronyms” sections.

Document history

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