41. Standard for Interlocking Inspection

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Abstract: This standard provides procedures for inspecting rail transit interlockings.

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Introduction

(This introduction is not a part of APTA RT-SC-S-041-03, Standard for Interlocking Inspection.)

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 rail transit interlockings.

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 Interlocking Inspection

1. Overview

This document has been created as a standard due to the crucial role interlockings play in the safe movement of trains.

1.1 Scope

This document establishes standard requirements for inspecting rail transit interlockings. The inspection procedure in this standard encompasses wayside electrical and mechanical components of the interlocking signal system including but not limited to: impedance bonds, marker coils, track circuits, signals, switch machines, bonds and clamps, interlocking junction boxes, cables, conduits, cable mounts and brackets, inductive loops, drains, traction power return cable connections, stock rails, rail braces, switch points, frogs, gauge plates, insulated joints and snow melting equipment.

1.2 Purpose

The purpose of this standard is to verify that interlockings are operating safely and as designed through periodic inspection, 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 audio frequency impedance bond: A device of low resistance and low impedance to all frequencies to which it is not tuned, used with jointless audio frequency track circuits to couple inductively and confine the signaling energy to its own track circuit and equalize the return propulsion current between rails without impeding its flow. Syn: signal impedance bond.

2.1.2 gauge plate: A metal plate, extending from rail to rail, used to maintain gauge of track.

2.1.3 gauge rod: A metal rod, extending from rail to rail, used to maintain gauge of track.

2.1.4 guardrail: In rail construction, a rail or other device that is laid parallel to the running rails of a track to prevent derailment or to hold the wheels in alignment and prevent their flanges from striking the points of turnouts, crossing frogs, or the points of switches.

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

2.1.6 impedance bond: See: audio frequency impedance bond, power frequency impedance bond.

2.1.7 insulated joint: A joint in which electrical insulation is provided between adjoining rails.

2.1.8 interlocking: An arrangement of signals and signal appliances so interconnected that their movements must succeed each other in proper sequence and for which interlocking rules are in effect. It may be operated manually or automatically.

2.1.9 interlocking signal: An appliance that conveys information governing train movement through an interlocking.

2.1.10 marker coil: A wayside, passive, electronic device installed at a precise location to convey grade, distance and program station stop information to passing trains.

2.1.11 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.
2.1.12 **original equipment manufacturer (OEM):** The enterprise that initially designs and builds a piece of equipment.

2.1.13 **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.

2.1.14 **power frequency impedance bond:** An iron core coil of low resistance and relatively high reactance, used on electrified railroad to provide a continuous path for the return propulsion current around insulating joints and to confine the alternating current signaling energy to its own track circuit.

2.1.15 **rail fastener:** A device used to secure the rail to the plate.

2.1.16 **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.

2.1.17 **stock rail:** The rail against which the point of a switch, derail, or moveable point frog rests.

2.1.18 **switch:** A pair of switch points with their fastenings and operating rods providing the means for establishing a route from one track to another.

2.1.19 **switch machine:** A device that performs the mechanical function of controlling the movement of switch points or a derail from one position to the other.

2.1.20 **switch point:** A movable tapered track rail, the point of which is designed to fit against the stock rail.

### 2.2 Acronyms

- **OCC** operations control center
- **OEM** original equipment manufacturer
- **PPE** personal protective equipment
- **PVC** polyvinyl chloride
- **RTS** rail transit system

### 3. Inspection requirements

#### 3.1 Inspection frequency

The inspection procedures in this standard shall be performed when interlockings are placed in service, when they are modified, repaired, or disarranged, or as otherwise deemed necessary by the RTS.
The RTS shall determine the need for additional inspection frequencies for interlockings. 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 interlockings:

- RTS-approved lubricants
- RTS-approved cleaning solutions
- Additional materials as required by the OEM and/or RTS

### 3.4 Tools

The following tools are required for inspecting interlockings:

- RTS-approved interlocking inspection checklist
- 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.

### 3.6 Safety

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

### 3.7 Inspection procedure

Interlocking inspection procedures may be modified for each rail transit system’s requirements (see Section 1.3) but shall contain the steps listed in Sections 3.7.1-3.7.23 as a minimum.

#### 3.7.1
Notify the operations control center (OCC) and/or other authorities of the inspection activities to be performed.

#### 3.7.2
Inspect interlocking signals and route selection boxes for rust, corrosion, damage, cracks, and for defective latches, lenses, hoods, hinges, latches, padlocks, and for missing or loose components and hardware. Replace burned out bulbs as required.

#### 3.7.3
Inspect interlocking signals and route selection box bases, mast, ladders and mounting hardware for damage, rust, corrosion and missing hardware.

#### 3.7.4
Inspect interlocking insulated joints, gauge plates, and switch machine rods for broken or deteriorated insulation, metal shavings, or loose or missing hardware.

#### 3.7.5
Inspect interlocking junction boxes and other enclosures for rust, corrosion, damage, cracks, breaks and for defective latches, hinges, padlocks, covers, weather seals, gaskets, loose conduit connections and missing or loose components and hardware. Holes and unused entrances not used for ventilation should be sealed.

#### 3.7.6
Inspect interlocking junction boxes and other enclosures for the presence and condition of stored circuit drawings, terminal list, wire tags and instructions.

#### 3.7.7
Inspect inductive and wire loop layout components and mounting hardware for damage, rust, corrosion, defective cable insulation and missing or loose components and hardware.

#### 3.7.8
Inspect 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 impedance bond layouts for defective cable insulation, rust, corrosion, damage, and loose or missing hardware.
3.7.10 Inspect traction power return cables, rail clamps, pin bonds and welds for defective cable insulation, rust, corrosion, damage and loose or missing hardware.

3.7.11 Inspect track circuit cables and hardware for defective insulation, rust, corrosion, missing components, damage and loose or broken connections.

3.7.12 Inspect marker coils for loose or missing mounting hardware and cracked or otherwise damaged housing.

3.7.13 Inspect marker coils for an accumulation of debris underneath the marker coil units. Remove and bag debris.

3.7.14 Inspect snow melter system equipment for defective insulation, rust, corrosion, missing components, damage, and loose or broken connections.

3.7.15 Inspect switch machine, components and layout for defective insulation, rust, corrosion, damage and loose or missing hardware. Remove any ballast or debris from the switch layout.

3.7.16 Inspect the switch points for proper closure/tuck. Inspect the heels and switch points for binding, chipping, wear, bends and loose or missing hardware.

3.7.17 Inspect stock and guardrails for unusual wear, loose or missing rail braces, hardware, tie straps, and damaged or worn mounting pads plates or ties.

3.7.18 Inspect frogs for wear, chipping, and loose or missing hardware.

3.7.19 Inspect and observe switch layout for unusual vibrations, excessive pumping or lateral movement or other abnormal movements as a train passes.

3.7.20 Ensure cranks, blocks, clamps, hammers and other items required by the RTS are present and in good condition.

3.7.21 Inspect interlocking area for proper drainage and/or water leaks.

3.7.22 Inspect the interlocking for any condition that may interfere with the operation of signal equipment.

3.7.23 Notify the OCC and/or other authorities when inspection is complete.

3.8 Correction of deficiencies

Deficiencies identified during interlocking inspection shall be corrected and documented in accordance with OEM and/or RTS requirements.

3.9 Documentation

Inspection shall be documented, reviewed, and filed in accordance with RTS procedures.
Annex A

(informative)

Bibliography

[B1] Original equipment manufacturer (OEM) specifications for interlocking inspection.

[B2] Rail transit system (RTS) procedures for interlocking inspection.