

# 33. Recommended Practice for Wayside Signal Equipment Inspection

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**Abstract:** This recommended practice provides guidelines for inspecting rail transit signal system wayside signal equipment.

**Keywords:** inspection, signal, wayside signal equipment

## Introduction

(This introduction is not a part of APTA RT-SC-RP-033-03, *Recommended Practice for Wayside Signal Equipment Inspection*.)

APTA rail transit safety standards and recommended practices represent an industry consensus on 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 recommended practice provides guidelines for inspecting rail transit wayside signal equipment.

APTA recommends this practice 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)

The application of any 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 recommends.

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# Recommended Practice for Wayside Signal Equipment Inspection

## 1. Overview

### 1.1 Scope

This document establishes recommended guidelines for inspecting rail transit wayside signal equipment. It addresses electrical and mechanical components of the wayside signal system not within interlockings. This includes but is not limited to: impedance bonds, marker coils, train-to-wayside communication equipment, wayside junction boxes, cables, conduits, cable mounts and brackets, bridging receiver units, terminating receiver units, signs, drains, signal and negative return bonds, crossbond connections, and traction power return cable connections.

This recommended practice includes a visual inspection of wayside signal system equipment. For more detailed inspection and test activities for key specific components of wayside signal systems see the documents listed in Section 2.

### 1.2 Purpose

The purpose of this recommended practice is to verify that wayside signal ac systems and equipment are operating safely and as designed through periodic inspection, thereby increasing reliability and reducing the risk of hazards and failures.

## 2. References

This recommended practice should be used in conjunction with the most recent version of the following publications.

APTA RT-S-SC-021-03, Standard for Electric Train Stop Mechanism Inspection and Maintenance

APTA RT-S-SC-036-03, Standard for Wayside Signal Inspection and Testing

APTA RT-S-SC-041-03, Standard for Interlocking Inspection

APTA RT-S-SC-042-03, Standard for Electro-Pneumatic Train Stop Mechanism Inspection and Maintenance

APTA RT-S-SC-049-03, Standard for Impedance Bond Inspection and Maintenance

### 3. Definitions and acronyms

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

#### 3.1 Definitions

**3.1.1 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.**

**3.1.2 crossbond:** An electrical connection between adjacent tracks used to balance negative propulsion return current between tracks.

**3.1.3 gauge plate:** Metal plates that are typically insulated, extending from rail to rail, used to maintain gauge of track.

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

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

**3.1.6 impedance bond:** *See:* audio frequency impedance bond, power frequency impedance bond.

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

**3.1.8 negative bonding:** Conductors of low resistance providing a path for the return propulsion current at non-insulated joints.

**3.1.9 operations control center (OCC):** A location or locations designed, equipped, and staffed for the purposes of monitoring and controlling RTS activities from a central location or locations. *Syn:* **rail control center, rail operations center, rail service control center.**

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

**3.1.11 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.

**3.1.12 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.

**3.1.13 rail cable clamp:** A mechanical device used to secure large current carrying cables to the running rail.

**3.1.14 rail fastener:** A device designed to resist lateral and longitudinal rail movement and restrain rail rotation, while providing vertical support.

**3.1.15 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.**

**3.1.16 signal bonding:** Rail connection providing a low resistance path for track circuit current.

**3.1.17 wayside signal equipment:** Components of the signal system located on the right-of-way.

**3.1.18 wiggle wire:** An antenna used for wayside-to train communication.

## 3.2 Acronyms

<b>OCC</b>	operations control center
<b>OEM</b>	original equipment manufacturer
<b>PPE</b>	personal protective equipment
<b>PVC</b>	poly-vinyl chloride
<b>RTS</b>	rail transit system

## 4. Inspection provisions

### 4.1 Inspection frequency

The inspection procedures in this recommended practice should be performed when wayside signal equipment is placed in service, when it is modified, repaired, or disarranged, or as otherwise deemed necessary by the RTS.

The RTS should determine the need for additional inspection frequencies for wayside signal equipment. 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 should comply with applicable federal, state, and local regulations.

## **4.2 Training**

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

## **4.3 Materials**

The following materials are recommended for inspecting wayside signal equipment:

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

## **4.4 Tools**

The following tools are recommended for inspecting wayside signal equipment:

- Meggering device\*
- Multi-meter\*
- RTS-approved portable radio
- Standard tools carried by maintenance personnel
- Additional tools as recommended by the OEM and/or RTS

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

## **4.5 Personal protective equipment**

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

## **4.6 Safety**

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



## 4.7 Inspection procedures

The inspection procedures in this recommended practice may be modified for each rail transit system's requirements but should contain the steps listed in Sections 4.7.1-4.7.19 as a minimum.

- 4.7.1 Notify the operations control center (OCC) and/or other authorities of the inspection activities to be performed.
- 4.7.2 Inspect the wayside signal equipment for an accumulation of debris. Remove and bag debris.
- 4.7.3 Inspect wayside drains for blockage or ineffective drainage.
- 4.7.4 Inspect the wayside signal equipment for damage caused by standing water, water leaks, or retention.
- 4.7.5 Inspect the wayside signal equipment for any condition that may interfere with the operation of the equipment.
- 4.7.6 Inspect the wayside signal equipment cables/wiring, bonding, and hardware for defective insulation, rust, corrosion, missing components, damage and loose or broken connections. Holes and unused entrances not used for ventilation shall be sealed.
- 4.7.7 Inspect tuning units and impedance bond layouts for loose, missing, rusted, corroded and/or damaged mounting bolts and hardware.
- 4.7.8 Inspect traction power return and crossbond cable termination hardware, rail cable clamps, pin bonds, welds and negative return bonds for loose or broken connections, rust, corrosion, heat, missing components, damage, and for defective insulation and cracks.
- 4.7.9 Inspect rail joint signal and negative bonding rail cable clamps, pin bonds or welds for rust, corrosion, heat, missing components, damage, and loose or broken connections.
- 4.7.10 Inspect wayside signal equipment insulated joints, gauge plates and switch rods for bridging, broken or deteriorated insulation, metal shavings, loose or missing hardware.
- 4.7.11 Inspect track circuit cables and hardware for defective insulation, rust, corrosion, missing components, damage and loose or broken connections.
- 4.7.12 Inspect train-to-wayside communication equipment (antennas, wiggle wires) and hardware for defective insulation, rust, corrosion, missing components, damage, and loose or broken connections.
- 4.7.13 Inspect marker coils for loose or missing mounting hardware, cracked or otherwise damaged housing.

- 4.7.14** Inspect the wayside enclosure equipment, for damage, cracks, breaks, defective latches, locks, hinges, covers, and loose, deteriorated, or damaged conduit connections and hardware. Holes and unused entrances not used for ventilation should be sealed.
- 4.7.15** Inspect associated wayside signs and hardware for proper location, visibility, rust, corrosion, missing components, damage, and loose or broken fasteners.
- 4.7.16** Inspect junction boxes and enclosures for the presence and condition of stored circuit drawings, terminal list, wire tags, and instructions.
- 4.7.17** Inspect polyvinyl chloride (PVC), fiberglass, rubber and other cable conduit material for damage, cracks, breaks, loose conduit connections, missing or loose components, and hardware.
- 4.7.18** Ensure covers, doors, and locks are in place and secured.
- 4.7.19** Notify the OCC and/or other authorities when inspection is complete.

#### **4.8 Correction of deficiencies**

Deficiencies identified during the inspection of wayside signal equipment should be corrected and documented in accordance with RTS and/or OEM recommendations.

#### **4.9 Documentation**

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

## **Annex A**

(informative)

### **Bibliography**

- [B1] Original equipment manufacturer (OEM) specifications for wayside signal equipment inspection.
- [B2] Rail transit system (RTS) procedures for wayside signal equipment inspection.