

# 11. Standard for Cable Plant Inspection and Testing

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**Abstract:** This standard provides procedures for inspecting and testing rail transit cable plants.

**Keywords:** cable plant, inspection, test, testing, signal

## Introduction

(This introduction is not a part of APTA RT-SC-S-011-03, *Standard for Cable Plant Inspection and Testing*.)

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 testing rail transit cable plants.

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 Cable Plant Inspection and Testing

## 1. Overview

### 1.1 Scope

This document establishes standard requirements for inspecting and testing rail transit cable plants.

### 1.2 Purpose

The purpose of this standard is to verify that cable plants are operating safely and as designed through periodic inspection and testing, 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 hazard:** Any real or potential condition that can cause injury, death, or damage or loss of equipment or property.

**2.1.2 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.**

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

**2.1.4 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.

**2.1.5 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.**

### 2.2 Acronyms

<b>OCC</b>	operations control center
<b>OEM</b>	original equipment manufacturer
<b>PPE</b>	personal protective equipment
<b>RTS</b>	rail transit system

## 3. Inspection and test requirements

### 3.1 Inspection and test frequency

The inspection and testing procedures in this standard shall be performed when cable plants 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 and test frequencies for cable plants. 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**

No consumable materials are required for inspecting and testing cable plants unless otherwise specified by the OEM and/or RTS.

### **3.4 Tools**

The following tools are required for inspecting and testing cable plants:

- Multi-meter\*
- Mega ohm meter\*
- RTS-approved portable radio
- RTS-approved discharging equipment
- 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 testing.

## 3.6 Safety

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

## 3.7 Inspection and testing procedures

Cable plant inspection and testing procedures may be modified for each rail transit system's requirements (see Section 1.3) but shall contain the steps listed in 3.7.1-3.7.3 as a minimum.

Perform the cable discharging procedure after disconnecting and prior to reconnecting all cables in accordance with OEM and/or RTS recommendations.

### 3.7.1 Inspection

- 3.7.1.1 Notify the operation control center (OCC) and/or other authorities of the inspection activities to be performed.
- 3.7.1.2 Inspect wayside cables, wiring, junction boxes, and other enclosures for rust, corrosion, damage, cracks, breaks, and defective insulation, latches, hinges, locks, covers, seals, gaskets, loose conduit connections, and missing or loose components and hardware.
- 3.7.1.3 Inspect wayside cables, wiring, junction boxes, and other enclosures for damage caused by standing water, water leaks or retention, and any condition that may interfere with testing and/or revenue operations. Holes and entrances not used for ventilation should be sealed.
- 3.7.1.4 Inspect junction boxes and enclosures for the presence and condition of stored circuit drawings, terminal list, wire tags, and instructions.
- 3.7.1.5 Notify the OCC and/or other authorities when inspection is complete.

### 3.7.2 Continuity test

- 3.7.2.1 Notify the OCC and/or other authorities of the test activities to be performed.
- 3.7.2.2 Remove power from the equipment and circuits identified for testing.
- 3.7.2.3 Perform cable discharging procedure after disconnecting cables in accordance with RTS procedures.
- 3.7.2.4 Isolate conductors identified for testing.
- 3.7.2.5 Perform continuity test on each conductor identified for testing in accordance with RTS procedures.
- 3.7.2.6 Verify that continuity test measurements are in accordance with RTS procedures.

- 3.7.2.7 Perform cable discharging procedure prior to reconnecting cables in accordance with RTS procedures.
- 3.7.2.8 Reconnect conductors to their termination points.
- 3.7.2.9 Restore power and equipment to normal operation.
- 3.7.2.10 Perform equipment functional testing to verify operation in accordance with RTS procedures.
- 3.7.2.11 Ensure covers, doors, slider straps and locks are in place and secured.
- 3.7.2.12 Notify the OCC and/or other authorities when testing is complete.

### **3.7.3 Insulation resistance test**

- 3.7.3.1 Notify the OCC and/or other authorities of the test activities to be performed.
- 3.7.3.2 Remove power from the equipment and circuits identified for testing.
- 3.7.3.3 Perform cable discharging procedure after disconnecting cables in accordance with RTS procedures.
- 3.7.3.4 Isolate conductors identified for testing.
- 3.7.3.5 Perform insulation resistance test on each conductor to ground and between all conductors in a multi-conductor cable in accordance with RTS-approved procedures.
- 3.7.3.6 Verify that insulation resistance test measurements are in accordance with RTS procedures.
- 3.7.3.7 Perform cable discharging procedure prior to reconnecting cables in accordance with RTS procedures.
- 3.7.3.8 Reconnect conductors to their termination points.
- 3.7.3.9 Restore power and equipment to normal operation.
- 3.7.3.10 Perform equipment functional testing to verify operation in accordance with RTS procedures.
- 3.7.3.11 Ensure covers, doors, slider straps and locks are in place and secure.
- 3.7.3.12 Notify the OCC and/or other authorities when testing is complete.

### **3.8 Correction of deficiencies**

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

### **3.9 Documentation**

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

## **Annex A**

(Informative)

### **Bibliography**

- [B1] Original equipment manufacturer (OEM) specifications for cable plant inspection and testing.
- [B2] Rail transit system (RTS) procedures for cable plant inspection and testing.