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Air Supply and Air Storage Systems Periodic Inspection and Maintenance

Abstract: This *Rail Standard* covers the basic procedures for the periodic inspection and maintenance of air supply and air storage systems mounted on rail transit vehicles. These procedures specifically addresses air compressors, air reservoirs and related air piping and hoses.

Keywords: air compressor, air piping and hoses, air reservoir, periodic inspection and maintenance

Summary: This document establishes a standard for the inspection and maintenance of air system compressors, reservoirs and associated piping and hoses mounted on a rail transit vehicle. Individual rail transit systems may amend this standard to accommodate their specific equipment, ambient conditions and mode of operations.

Scope and purpose: This standard is intended to be applied, as applicable, by individual rail transit systems, for periodic inspection and maintenance of rail transit vehicles. It is also intended for use by rail transit equipment maintenance organizations. This standard shall be used in conjunction with the rail transit system's instructions and OEM recommendations. The instructions contained in this standard can serve as a guide in developing recommended practices when applied to non-safety critical subsystems and components.

This *Rail Standard* represents a common viewpoint of those parties concerned with its provisions, namely, transit operating/planning agencies, manufacturers, consultants, engineers and general interest groups. The application of any standards, practices or guidelines contained herein is voluntary. In some cases, federal and/or state regulations govern portions of a transit system's operations. In those cases, the government regulations take precedence over this standard. APTA recognizes that for certain applications, the standards or practices, as implemented by individual transit agencies, may be either more or less restrictive than those given in this document.

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Contents

Introduction	iii
Note on alternate practices.....	iii
1. Frequency of conduct	1
2. Requirements and specific tasks.....	1
2.1 Materials	2
2.2 Tools	2
2.3 Safety/personal protective equipment.....	2
2.4 Training requirements	2
2.5 Inspection and maintenance procedures	2
2.6 Correction of deficiencies	4
3. References	4
4. Abbreviations and acronyms	4

Introduction

(This introduction is not a part of APTA RT -VIM-S -003-02, *Standard for Air Supply and Air Storage Systems Periodic Inspection and Maintenance*.)

This Standard for Air Supply and Air Storage Systems Periodic Inspection and Maintenance for rail transit vehicles represents a common viewpoint of those parties concerned with its provisions, namely, transit operating/planning agencies, manufacturers, consultants, engineers and general interest groups. The application of any standards, practices or guidelines contained herein is voluntary. In some cases, federal and/or state regulations govern portions of a rail transit system's operations. In those cases, the government regulations take precedence over this standard. APTA recognizes that for certain applications, the standards or practices, as implemented by individual rail transit systems, may be either more or less restrictive than those given in this document.

This standard describes the basic maintenance and inspection requirements for air system compressors, reservoirs, and associated piping and hoses mounted on rail transit vehicles. APTA recommends the use of this standard by:

- Individuals or organizations that maintain air system compressors, reservoirs, and associated piping and hoses on rail transit vehicles;
- Individuals or organizations that contract with others for the maintenance of air system compressors, reservoirs, and associated piping and hoses on rail transit vehicles; and
- Individuals or organizations that influence how air system compressors, reservoirs, and associated piping and hoses are maintained on rail transit vehicles.

Note on 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 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:

- 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 safety standard (operating histories or hazard analysis findings may be used to substantiate this claim).

Air Supply and Air Storage Systems Periodic Inspection and Maintenance

1. Frequency of conduct

Periodic inspection and maintenance tasks on air supply and air storage systems shall be performed on a regular schedule as determined by the rail transit system. The frequency of any task contained within this periodic inspection and maintenance standard shall comply with all applicable federal, state and local regulations. Further, in the conduct of a rail transit systems' periodic inspection and maintenance programs, frequencies for individual tasks may be established based on a number of additional factors, including but not limited to:

- OEM-recommended intervals;
- industry experience;
- operating environment/conditions;
- historical data;
- performance requirements;
- failure analysis;
- rail transit system's testing and experience; and
- reliability-centered maintenance programs.

2. Requirements and specific tasks

WARNING: Ensure that equipment is secured against uncontrolled movement, in accordance with rail transit system safety instructions, before commencing inspection and maintenance procedures.

WARNING: Compressed air with pressures up to 170 psi can be encountered and can be hazardous when released. Appropriate eye and face protection, meeting minimum ANSI standards, plus other personal protective equipment as approved by the rail transit system shall be worn. Be alert to airborne particles and noise.

WARNING: Refer to the OEM service manual before disassembling any part of the air system and ensure that the air system is safely de-pressurized. Disconnecting pressurized lines will cause solid particles deposited in the line to become uncontrollably propelled and will also cause the air line end to whip randomly as the air escapes.

WARNING: When performing work on the air compressor, follow rail transit system procedures to prevent the air compressor from starting.

WARNING: When handling air filters and desiccant, wear appropriate personal protective equipment and dispose of used materials in accordance with the rail transit system's rules and regulations.

WARNING: Use only those cleaning products and lubricants proven safe and authorized for use by the rail transit system. Consult OEM and MSDS references for suitability for each separate application to prevent personal injury and damage to the equipment.

2.1 Materials

Consumable materials such as air filters, desiccant elements, “O” rings, air compressor oil, and lubricants will be required. Refer to the OEM for specifications with respect to consumable materials and recommended replacement intervals.

2.2 Tools

The following tools are normally required in addition to the standard tools carried by maintenance personnel:

- Properly calibrated and suitably labeled air pressure gauges (ASME grade 2A or better, or as specified by the OEM)
- Leak detection devices

2.3 Safety/personal protective equipment

Appropriate personal protective equipment, meeting minimum ANSI standards and as required by the rail transit system, shall be worn at all times in the performance of these inspection and maintenance tasks.

2.4 Training requirements

Rail transit systems and their contractors shall develop and execute training programs that provide employees with the knowledge and skills necessary to safely perform the tasks outlined in this standard.

2.5 Inspection and maintenance procedures

In all of the following instructions, the OEM’s maintenance manuals must be referred to for torque values, condemning limits, clearance measurements and specific methodology. Devices must be cleaned for proper inspection. These instructions cover only the visual inspection, adjustments, change of consumable materials and functional testing of the air supply and storage systems mounted on rail transit vehicles. Some procedures will not be applicable due to design variations. Methods for the resolution of deficiencies uncovered while performing these instructions may be amended by each rail transit system in conjunction with the OEM. Documentation of the inspection and maintenance process with respect to interval, deficiencies and resolution of those deficiencies shall be done in a comprehensive manner to create a useful database, which will enhance the reliability and accountability of the process.

2.5.1 Air system compressors

1. Inspect the air compressor assembly and mounts for damage or cracks.
2. Inspect vibration mounts for deterioration.
3. Inspect air compressor pump and associated fittings for evidence of leakage or damage.
4. Replace all gaskets, “O” rings, and seals at intervals recommended by the OEM or as operating conditions require.
5. Inspect all mounting hardware, such as bolts, nuts, washers and retaining mechanisms, for proper attachment.
6. Inspect protective screens and guards for damage and proper attachment.
7. Clean and inspect aftercooler and intercooler for corrosion or damage to fins or coils.
8. Check fans for damage such as bent or missing blades and for security of attachment.

9. Inspect drive belts for damage, wear and proper tension.
10. Inspect motor-compressor coupling.
11. Clean and check crankcase breather.
12. Inspect air compressor oil level. Add as required. Replace air compressor oil at intervals recommended by OEM or as operating conditions require.
13. Clean and inspect pressure-relief valves for leakage or damage. Operate valves to check for function. Verify that valves reseal properly.
14. Clean or replace filters and dirt collectors on intake/discharge line to air brake system. Inspect removed filters or dirt collectors for evidence of unusual contamination (oil, water, paint, rust or debris) and correct or report as required.
15. Replace desiccant element or service air dryer at recommended intervals, renewing gaskets and “O” rings as required. Check for the proper operation of the air dryer system, including heaters, thermostats, drain valves and control valves as required by the OEM. Verify proper switching between multiple drying towers if equipped.
16. Inspect air compressor wiring and terminations for security, deterioration or corrosion.
17. Inspect motor portion of air compressor at intervals recommend by the OEM or as operating conditions require using APTA RT-RP-VIM-010-02, “Electric Motor Periodic Inspection and Maintenance.”
18. Operate the air compressor and check for proper direction of rotation where feasible.
19. Audibly check for any unusual noise from muffler or compressor housing (i.e., knocking), which might be indicative of an internal defect.
20. Functionally check air compressor. Verify correct cut-in and cut-out pressure settings. Verify air compressor’s integrity by performing rate/time of rise to normal operating pressure.
21. Verify proper operation of unloaders, drain valves, protective heaters and thermostats.
22. Check for proper operation of synchronizing circuits if equipped.
23. Inspect drain valve heaters if equipped.

2.5.2 Air reservoirs (main, supply and emergency)

1. Inspect the air reservoir housing and mounts for damage, cracks, corrosion or dents along the outer surface.
2. Inspect air reservoir housing and associated fittings for evidence of leakage or damage.
3. Inspect all mounting hardware, such as bolts, nuts, washers and retaining mechanisms, for proper attachment.
4. Clean or replace inlet filter as required.
5. Open the reservoir drain valves or remove the drain plugs and remove all condensate. Return the drain valves to the normally closed position or reinstall and torque all drain plugs. If equipped with automatic drain valves, then verify proper operation.
6. Perform a leakage test in accordance with OEM procedures and at recommended intervals.

2.5.3 Air piping and hoses

1. Inspect all hoses and connections for evidence of leakage or damage.
2. Inspect the air supply piping and fittings (such as unions, elbows and tees) for leakage, damage, cracks or corrosion.

3. Inspect all mounting hardware, such as bolts, nuts, washers and retaining mechanisms, for proper attachment.
4. Clean or replace filters and dirt collectors.
5. Inspect and operate all cut-out valves. Check for ease of use and for any evidence of leakage or damage. Lubricate as required.

2.6 Correction of deficiencies

Any deficiencies uncovered during the inspections required by Sections 2.5.1 through 2.5.3 shall be corrected and documented in accordance with established rail transit system procedures and OEM recommendations.

3. References

American Public Transportation Association, *Recommended Practice*, APTA RT-RP-VIM-010-02 (Second Edition July 26, 2004), “Electric Motor Periodic Inspection and Maintenance.”

4. Abbreviations and acronyms

ANSI	American National Standards Institute
APTA	American Public Transportation Association
ASME	American Society of Mechanical Engineers
MSDS	material safety data sheet
OEM	original equipment manufacturer
psi	pounds per square inch