APTA STANDARDS DEVELOPMENT PROGRAM
RECOMMENDED PRACTICE
American Public Transportation Association
1666 K Street, NW, Washington, DC, 20006-1215

APTA RT-VIM-RP-019-03 Rev 1
First Published: September 28, 2003
First Revision: July 26, 2004
Second Revision: December 2012

Rail Transit Vehicle Inspection and Maintenance Working Group

Truck Systems Periodic Inspection and Maintenance

Abstract: This *Recommended Practice* provides the framework for developing minimum inspection, maintenance, testing and alignment procedures to maintain rail transit trucks in a safe and reliable operating condition.

Keywords: bearings, cracks, gearboxes, leveling, lubricants, trucks, wear, wheels

Summary: This document is intended to provide a template for developing system-specific transit vehicle truck inspection and maintenance procedures that incorporate best practices. These practices address design details found in a wide sampling of transit vehicle truck designs. Rail transit systems should select recommendations that are applicable to the configuration of their specific equipment.

Scope and purpose: This *Recommended Practice* applies to rail transit vehicles. It is intended to be applied, as applicable, by rail transit systems, for periodic inspection and maintenance. These procedures specifically address wheels, axles, drives, primary suspensions, truck frames, secondary suspensions, truck to carbody connections and ride controls. This document should be used in conjunction with rail transit system (RTS) instructions and OEM recommendations.

Participants

The American Public Transportation Association greatly appreciates the contributions of Paul Kovacs and Richard Berk, who provided the primary effort in revising this *Recommended Practice*.

At the time this Recommended Practice was completed, the working group included the following members:

Jayendra Shah, *Chair*
Ken Morford, *Vice Chair*
Vicki Porter, *Secretary*

Juan Aristizabal
Steve Bethel
Dave Barber
Damian Barnhart
Paul Denison
Sherif Bastawros
Tom Berg
Richard Berk
Jerry Blackman
Stephen Bonina
Richard Campbell
Stelian Canjea
Lisa Cobb
John Condrasky
Terry Consavage
Richard Curtis
Phil Eberl
Bill Egan
Chris Eichin
Marc Gagne
Mike Ghobrial
Dan Gornstein
John Green
Scott Grogan
Terry Hildebrandt
Ben Holland
Antonio Huggins
Paul Jamieson
Gary Jarboe
Anthony Jones
John Kesich
Henry Kolesar
Paul Kovacs
David Kowalski
Jospeh Krempasky
Brian Ley
John MacEwen
Lloyd Mack
Phil Olekszyk
Steve Rumsey
John Sadorra
Richard Seaton
George Shaffer
John Shea Jr.
Melissa Shurland
James Skaggs
Narayana Sundaram
Michele Swayzer
Tom Tarantino
Clive Thornes
Brian Turner
Wilson Wallace
Michael Wetherell
Brian Whately
Mark White
Eve Williams
Cliff Woodbury
Hannie Woodson
Bob Young

Project consultant
Gordon S. Campbell,
InterfleetTechnology, Inc.

Project team
Charles Joseph,
American Public Transportation Association

Contents

Introduction

(This introduction is not a part of APTA RT-VIM-RP-019-03 Second Revision 2013, *Recommended Practice for Truck Systems Periodic Inspection and Maintenance*.)

This *Recommended Practice* for Truck 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 Recommended Practice. APTA recognizes that for certain applications, the standards or practices, as implemented by individual rail transit systems (RTS), may be either more or less restrictive than those given in this document.

This document describes the basic maintenance and inspection requirements for rail transit vehicle truck systems. APTA recommends the use of this *Recommended Practice* by:

- Individuals or organizations that maintain truck systems on rail transit vehicles;
- Individuals or organizations that contract with others for the maintenance of truck systems; and
- Individuals or organizations that influence how these systems are maintained on rail transit vehicles.

Truck Systems Periodic Inspection and Maintenance

1. Frequency of conduct

Periodic inspection and maintenance tasks on truck systems should be performed on a regular schedule as determined by the RTS. The frequency of any task contained within this *Recommended Practice* shall comply with all applicable federal, state and local regulations. Further, in the conduct of the RTS's periodic inspection and maintenance programs, the frequencies for individual tasks should 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
- RTS's testing and experience
- Reliability Centered Maintenance Programs.

Table 1 provides baseline intervals that can be used for developing the truck system preventive maintenance component of an RTS's vehicle inspection and maintenance program. As experience is gained with a new truck system, inspection and maintenance intervals should be reviewed for effectiveness and, where warranted, the intervals changed to achieve safety and cost-effective reliability.

TABLE 1

Baseline Truck Maintenance Intervals

Inspections And Maintenance	Miles	Time	Interval
Visual inspection	3,000 to 5,000	Monthly	NA
Wheel gauging, measuring, adjusting, checking and replenishing lubricants	12,000 to 15,000	Three to four months	NA
Predictive testing (*See Section 2.5.2.1*)	NA	As determined by RTS	After Overhaul

NOTE: In the absence of experience, recommendations or history, initial inspection intervals should be no longer than 30 days or 3,000 to 5,000 miles.

2. Requirements and specific tasks

WARNING: Before commencing inspection and maintenance work, set up the protection required so that that equipment will not be energized or moved unexpectedly.

WARNING: After completing truck inspection and repairs, verify that truck brake cutout devices are returned to the normal operating position and brakes apply. If brake cut out devices are left in the cutout position, tag cutout devices, and then follow appropriate RTS operating procedures for moving vehicles with brakes cutout.

2.1 Materials

The following materials are normally required for truck inspection and maintenance:

- approved lubricants;
- colloidal copper compounds;
- referenced OEM's maintenance manuals for additional materials; and
- service bulletins or RTS instructions.

2.2 Tools

In addition to the standard tools carried by maintenance personnel, the following specialized equipment may be required:

- acoustical listening device and
- specialized gauges.*

NOTE: Tools marked with an asterisk (*) require periodic calibration as specified by the RTS's practices.

2.3 Safety/personal protective equipment

Appropriate personal protective equipment meeting minimum American National Standards Institute (ANSI) standards, and as required by the RTS, should be worn at all times in the performance of this maintenance task.

RTS established safety practices, rules and procedures shall be followed at all times in the performance of these inspections and tests.

2.4 Training requirements

The RTS and/or its 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*. To correctly judge the safety and serviceability of rail transit vehicle trucks, maintainers and their supervisors must thoroughly understand the equipment they are charged with maintaining. Those assigned as inspectors should be skilled and experienced employees.

In addition to the fundamental technical skills required of these employees, maintenance workers who inspect and maintain rail transit vehicle trucks should have received detailed, formal and on-the job training for inspecting and maintaining each truck configuration they may encounter in the course of their work.

2.5 Inspection and maintenance procedures

Skilled maintenance workers experienced with truck assemblies should perform these inspections. For consistency, maintenance workers should work from standard check sheets that guide the work. Each step of the inspection should be acknowledged as complete when the task is completed. Each inspection element should be checked off as it is completed in order to provide accountability for the completeness of procedures performed. The practice also provides maintenance workers and their supervisors with a record of inspection progress for continuity if the work is passed to other maintenance workers or shifts. Deficiencies discovered

during the inspection should be recorded on the inspection check sheets. The inspection documents should be signed by the inspector completing the inspection.

Any repairs or adjustments that are completed during the inspection should be recorded on the inspection form and signed off as completed by the maintenance worker performing the work. If deficiencies are not acknowledged as having been corrected on the inspection forms, the disposition of the each incomplete item should be noted on the inspection forms (i.e., re-inspected and found serviceable or converted to a work order number, etc.). A maintenance supervisor or an RTS designee must review each completed inspection and immediately apply his or her signature that the work is finished deferred or scheduled for completion.

NOTE: It is important to develop a system that tracks deferred repairs until those repairs are completed.

2.5.1 Wheels and axles

2.5.1.1 Wheels

Measure flange and tread wear using gauges appropriate for the wheel profile being inspected. If measuring gauges are used (rather than go/no-go gauges) record flange height and thickness, rim thickness or the wheel diameter calculated from a rim reference groove. Record measured dimensions on inspection records to maintain wheel wear history. For DC motor current balance and effective spin/slide detection, maintain propulsion and brake system manufacturer recommendations for wheel diameter matching. Maintain precise wheel diameter matching in accordance with the propulsion, braking and onboard signalling systems' OEM recommendations.

Severity of wheel defects discovered and their disposition should be determined by RTS guidelines or the AAR Wheels and Axle Manual. Inspect wheel plates and hubs for cracks, gouges and arc burns. Wheels with hub, plate or rim defects that may cause stress concentrations must be removed from service. Inspect wheel treads for slide flats, spalling, shelling and thermal cracking. Check rims and plates for discoloration due to overheating.

For ring damped wheels, inspect the ring for damage.

For resilient wheels, inspect external shunts connecting the tire to the hubs or cheek plates. Use inspection methods on internal shunt resilient wheels that confirm that the ground path impedance across each tire and hub is uniform. Check that tires have not shifted on the hub of two-piece wheels.

For optimal wheel life, plan reprofiling at a flange thickness that minimizes the amount of wheel tread removed to restore a full flange. Replace wheels with condemning defects that cannot be removed by wheel truing. Use manufacturer's or AAR guidelines to define a minimum diameter wheel and minimum rim thickness.

NOTE: To minimize the potential for flange climb derailments out bound from wheel truing, reduce wheel/rail friction by finishing with a low feed rate, minimum depth, skim cut that produces a smooth surface finish to be established by the RTS. Evaluate applying a friction modifier to the flange throat of wheels as the last step before moving wheel sets off the wheel truing machine to further reduce the potential for flange climb derailments.

NOTE: Establish limits with a margin of safety that ensures that wheels will not wear past condemning limits before the next inspection.

NOTE: Pi tapes (wheel tape), which are required for accurate wheel diameter matching during wheel truing operations, can be used for approximating the diameter of service worn wheels. Wheel sets must

be lifted off the running rail. The pi tape is wrapped around the entire wheel and held so that the standoffs locate the tape on the tread gauging point.

2.5.1.2 Axles

Disposition of axle defects should be determined by RTS guidelines or the AAR Wheels and Axle Manual.

Visually inspect axles for grooves, nicks or arc burning. Remove indications by polishing, but replace axles with nicks, gouges, arc burns or circumferential scoring that may become a stress concentration point. Replace axles that have been overheated.

Where equipped, check serviceability of temperature indicators installed in axles to detect overheated journal bearings.

2.5.1.3 Journal bearings

Visually inspect grease-lubricated journal bearings for evidence of purging. Record observations on inspection forms, noting the location of purging bearings. Use bearing manufacturer guidelines for monitoring lubricant purging that may include lubricant replenishment or bearing replacement. Check oil level in the reservoir of oil-lubricated journal bearings. If journal bearing problems are suspected, spin test and listen for unusual noises. Compare noise/vibration against baseline noise and vibration signatures.

2.5.1.4 Ground brush boxes

Remove and inspect each ground brush, and inspect the springs and the brush guide. Verify that each brush slides freely and is retained tightly against its slip ring. Inspect carbody to ground brush housing cables. Replace cables that have torn stranding. Replace ground brushes that are shorter than a wear limit witness mark or the wear limit established by the RTS. Replace ground brushes with evidence of burning, discoloration or shunt damage. Determine the cause of damaged ground brushes and springs, and repair the cause before replacing the damaged components.

2.5.1.5 Flange lubricators

Where equipped, inspect truck-mounted solid lubricant blocks and holders. Replace lubricant blocks worn to manufacturer or RTS limits. Ensure that blocks slide freely in holders and that they are retained tightly against the throat of the flange and/or in the restraining rail contact zone on the back of the flange. Check torque striping alignment to find loose mounting hardware. Tighten and torque-stripe as required.

Where equipped, inspect oil or grease lubricant delivery systems. Fill lubricant reservoirs. Test-actuate the controls. Verify that the specified lubricant flow rate is delivered through each nozzle to the throat of the flange.

2.5.1.6 Sanding equipment

Where equipped, verify that truck-mounted sand nozzles deliver sand to the head of the rail. Replace damaged or plugged sand delivery nozzles. Refill sand boxes as required in accordance with RTS instructions. When sanding system delivery controls are repaired or replaced or concurrent with truck replacement, verify that each sand release command delivers the specified volume of sand to the head of the rail.

2.5.2 Drives

2.5.2.1 Gear boxes

Check and maintain the oil level in each gearbox. Use OEM guidelines for determining and maintaining proper gearbox oil levels. Use oil designated by the OEM or the RTS as appropriate for the gear drive being

serviced. Use inspection forms to record the amount of make-up oil added on the inspection form. Tighten covers, replace accessible gaskets or replace gearboxes found with unusual and excessive oil leakage.

NOTE: Use oil consumption records to identify gearboxes that leak oil excessively.

To remove oil contamination buildup, drain oil and refill gearboxes at scheduled intervals or based on sampled oil or environmental conditions. When removing oil, the magnetic plug should be checked for metal particles. The plug should be wiped clean before reinstallation. Refill the gear unit, and install and safety-wire filler plug.

The following predictive inspection techniques may be incorporated into the periodic inspection cycle:

- Gear box backlash: Find accelerated gear tooth wear by rotating the gearbox input shaft forward and back through its range of motion. Translate the motion to a measurement and record in inspection records for identification of trends over time.
- Contaminant detection: Use spectrographic analyses of wear metal concentrations and other contaminants in the oil for early indication of unusual gear and bearing wear by detecting the presence of metallic material in the gearbox oil.
- Noise monitoring: Use acoustical listening and/or recording equipment during spin testing to detect distressed bearings and abnormal gear tooth wear. Place sensing equipment in standard locations if recording for future comparisons.
- Temperature monitoring: Use temperature measuring equipment to measure bearing temperatures and record. Perform test under standardized conditions.

NOTE: RTS shall develop baseline comparison standards, established for its equipment and local operating environment. Baseline conditions shall represent a known serviceable drive system standard.

NOTE: When predictive inspections indicate an anomaly, conduct more intensive gearbox inspections, or plan wheel/axle/gear replacement.

2.5.2.2 Resilient and flexible couplings

Inspect traction motor flexible couplings for evidence of grease or oil slinging. Check flexible coupling components for excessive lost motion. Where appropriate, gauge the coupling halves for proper alignment. Where equipped, inspect output quill to axle resilient couplings for compressed, sheared and torn rubber elements and cracked or missing spider components. Inspect for age-related surface cracks or bulging in elastomer coupling elements that are an indication of loss of resilience. Add lubricant and secure fittings, adhering to OEM or RTS guidelines. Remove and replace defective couplings.

NOTE: Listen for noisy flexible couplings during spin testing.

2.5.2.3 Drive component suspension

Inspect traction motor and gear unit suspension elements. Inspect horizontal stabilizers and gear drive to traction motor resilient mounting bushings. Inspect drive component safety blocks, cables and hangers. Verify that all safety restraint components are in the correct position and that all attachment fasteners are tight, in place and safety-wired where required. Inspect, and replace as required, elastomeric pads and bushings that are deformed, are torn, exhibit initiation of bond failure or are cracked with obvious compression set. Inspect suspension element retaining fasteners for evidence of looseness. Check that castellated nuts have cotter pins properly installed and that fasteners with a provision for safety wire are properly wired and retained. Mark and monitor torque stripes on all safety-critical fasteners. Inspect for, and correct the reason for, loose drive

component suspension elements. Retained torque fasteners should be installed/replaced according to RTS practices.

2.5.2.4 Speed sensors

Inspect speed sensor housings for impact damage that has distorted or cracked the body. Verify that speed sensor mounting hardware is tight. Where equipped, check integrity of safety wiring and/or alignment of torque stripes as an indication of loosening mounting hardware. Adjust, tighten or replace speed sensors, mounting hardware and brackets as required. Check that speed sensor connections are tight and that the cables are properly secured and are not chafing. Inspect open generator gears (usually found on non-powered axles) for damage and accumulations of metal-laden dirt that may impede accurate pulse counts. Clean the sensors if required.

2.5.3 Primary suspension

2.5.3.1 Steel springs, equalizer beams and journal bearing adapters

Inspect coil spring sets for damaged and broken coils or excessive rust pitting. Replace springs in matched sets only. Replace damaged spring seats and worn journal bearing adapters when springs are replaced. Where equipped, inspect equalizer beams for cracks, arc burns, wear or deformation. Inspect for pedestal liner wear that allows excessive journal adapter lateral and longitudinal movement. Replace damaged components.

> NOTE: Evaluate overall truck condition and wheel size before spot replacing defective journal box springs, equalizer beams, spring seats or bearing adapters. Complete truck replacement and back shop overhaul may be time- and cost-effective.

2.5.3.2 Shock rings and bonded rubber chevrons

Inspect linear or conical bonded rubber primary suspension elements for deformation or evidence of cracks and tearing at the bonded interface. In shock ring applications, inspect for bulging, pinched and deformed elastomer between the axle cap and the journal bearing housing. Replace chevrons in matched sets only.

> NOTE: Evaluate overall truck condition and wheel size before spot replacing defective primary suspension elements. Consider that diagonally opposite flange wheel wear and unstable ride quality may be a symptom of deteriorated elastomers in the primary suspension. Investigate poor ride quality reports.

2.5.4 Truck frames and bolsters/slewing rings

2.5.4.1 Cast truck frames/fabricated truck frames

Inspect truck frames for propagating cracks and points of contact that result in mechanical wear. Carefully inspect welds and the heat-affected zones adjacent to welds for stress-induced cracks. Carefully inspect slender transition sections and the load-bearing transoms of cast steel trucks for fatigue-induced cracks. Inspect the attachments for brake equipment, stabilizer or radius rods and the transom attachment points used for articulated side frame arrangements. Inspect and lubricate transom spherical bearings where equipped.

> CAUTION: Follow all OEM recommendations with respect to welding, drilling and application of heat to truck frames. Heat-treated frames have a higher propensity to crack or fail as a result of inappropriate repairs.

> NOTE: Where cracks are suspected, confirm using non-destructive test methods such as dye penetrant. Use magnetic particle or ultrasonic testing to verify integrity of critical welds when trucks are disassembled for overhaul.

2.5.4.2 Truck/carbody bolsters, spring planks

Inspect bolsters and spring plank/swing hangers for propagating cracks and points of contact that result in mechanical wear. Carefully inspect the stabilizer or radius rod attachment points and shock absorber attachment brackets for cracks. Where on-car weld repairs are permitted, use conservative weld repair pre-heat and post weld local stress relief to neutralize stress concentrations around the weld.

Inspect center pin receptacle liner and longitudinal, lateral and bolster vertical stop wear surfaces for clearances exceeding tolerance limits. Inspect side bearing contact surfaces, and replace accessible contact pads or plan truck replacement for renewal of wear liners, contact pads or bushings to restore manufacturer or RTS clearance limits. Inspect ground cables and shunts, and replace frayed shunt straps with torn conductors. Check ground cable and shunt attachment hardware for tightness. The points of attachment must be clean and flat. Use colloidal copper compounds to improve and maintain integrity of ground cable and shunt strap attachments.

Inspect rubber bushings in accordance with RTS instructions and replace as required.

2.5.4.3 Slewing rings

Inspect slewing rings using OEM or RTS guidelines. Lubricate bearing elements based on manufacturer recommendations and the local operating environment. Rotate slewing rings periodically to maximize the life of the races.

2.5.5 Secondary suspensions

2.5.5.1 Steel springs

Inspect springs for breaks and cracks and rust pitting. Inspect spring pockets for accumulations of dirt and debris that retains moisture. Inspect condition of resilient pads located in spring pockets. Replace springs that are broken or corroded in excess of specifications. Replace damaged resilient pads. Secondary springs must be matched so that each spring carries an equal load. Check car-leveling heights and adjust as required in accordance with RTS instructions. Plan to add shims after wheel truing, and remove shims when wheels are renewed.

2.5.5.2 Air springs

Inspect bellows for air leaks at the bead rings. Look for bulges in the outer ply. Look for abrasion of the plies between convolutions. Replace leaking or physically damaged air bellows.

Inspect air bellows shrouds for physical damage that may impede operation of the air spring.

Check leveling valves and adjust air spring pressure to specified values after changing a damaged bellows. After checking and adjusting leveling valves, check that valves admit, lap and release air properly. Determine the cause of sluggish leveling valve operation and repair before returning the car to service. Check car-levelling heights. Check and secure the adjustment screws after the adjustments.

> NOTE: Periodically check carbody height and level. Secondary suspension shimming adjustments may be required to restore ready-to-run nominal floor height above the running rail. Plan to adjust shimming to compensate for the compression set of elastomers and composites used as side bearings. Plan to add shims after wheel truing, and remove shims when wheels are renewed.

> NOTE: A vehicle leveling work station should be established with known, minimal track surface and cross level deviation. All vehicle leveling checks should be performed at the vehicle leveling work station in order to factor out track structure variables.

2.5.5.3 Torsion Rods

Inspect torsion rod bushings for cracks and other signs of wear. Inspect mounting hardware for securement. Lubricate and/or replace as required in accordance with RTS instructions.

2.5.6 Truck-to-carbody connections

2.5.6.1 Radius rods

Inspect radius rod resilient pads at the truck/bolster anchor and at the carbody anchor. Inspect radius rod securing hardware. Replace radius rod resilient pads that are separating from the bonded metal backing plate, have taken a permanent compression set or are cracked. Replace radius rod resilient pads in truck sets. Use recommended and approved methods to measure radius rods' length. Use approved methods to ensure that radius rods are adjusted to maintain carbody and truck bolster alignment.

2.5.6.2 Pipes, hoses and cables, cleats, and clamps

Visually inspect all air hoses and pneumatic/hydraulic pipes for damage and loose clamps. Repair or tighten as required. Check flexible connections and hoses for damage of chafing. Redress hoses and cables that are being damaged by contact with truck and carbody equipment or by abrading each other. Inspect that cleats are effective in securing and routing hoses and replace or repair as required. Visually inspect all cables for damage such as chafing, road damage and for loose cleats and clamps. Repair, tighten or replace as required.

2.5.6.3 Cables and chains

Inspect hand/parking brake cables, chains, rods and links for evidence of fouling and security of attachment. Repair or replace as required. Adjust chains and cables so that parking brakes can be applied and released without interference. Lubricate as required.

2.5.7 Ride-quality controls

2.5.7.1 Shock absorbers/snubbers/rotary dampers

Inspect lateral, vertical and yaw-dampening shock absorbers for fluid leaks and secure attachment. Using OEM or RTS guidelines, replace leaking shock absorbers and check that shock absorber mounting hardware is tight. Determine and remedy the cause of broken shock absorber mounting hardware, and then replace damaged components. Check and replenish oil in rotary shock absorbers in accordance with OEM and RTS guidelines.

2.5.7.2 Tie rods and tie rod ends

Where equipped, inspect tie rods and tie rod ends for proper attachment and freedom of motion. Adjust tie rod length to allow the full range of motion required by the attached shock absorber. Replace worn, loose tie rod ends. Lubricate tie rod ends using OEM and RTS guidelines.

2.5.8 Miscellaneous truck-mounted equipment

2.5.8.1 Trip cocks

Inspect the emergency pipe trip cock for proper attachment and operation. Gauge and adjust as required.

2.5.8.2 Antennas and receiver coils

Where equipped, inspect truck-mounted cab signal antennas and ATC receiver coils for proper attachment. Inspect cable insulation for splits and cuts, and verify that connectors are tight.

2.5.8.3 General hardware

Inspect all truck mounted hardware for wear, damage, and missing components in accordance with RTS instructions and repair or replace.

2.6 Correction of deficiencies

Any deficiencies uncovered during the inspections required by Sections 2.5.1 through 2.5.8 should be corrected and documented in accordance with established RTS procedures and OEM recommendations.

3. References

Association of American Railroads, "AAR Manual of Standards and Recommended Practices," Section G, Wheels and Axle Manual, 2011.

4. Definitions

acoustical listening device: A rudimentary low-frequency vibration monitor that transforms the minute impacts from mismatched or distressed rolling and sliding elements into audible pressure waves that can be heard through an air tube stethoscope or seen by observing the plot of electrical signals generated by a transducer monitoring the same energy.

baseline noise and vibration signature: The displacement response frequency from vibrations generated by mechanical rolling and sliding contact. Vibration characteristics can be recorded by plotting the displacement amplitude and frequency or when in an audible range, by characteristic sounds. The baseline signature is a record of the characteristics recorded from a new, rebuilt or pre-determined, known serviceable truck and is used as the basis for comparison.

snubber: A friction or hydraulic device used to damp oscillations, also known as a shock absorber or damper (e.g., truck-to-bolster yaw oscillations).

spin test: A diagnostic procedure typically used to detect anomalies that are not apparent when inspecting stationary motors, gear drives and wheel sets. Wheel sets are jacked off the running rail and rotated under no load conditions (or "spun") either through resistance control of traction power line voltage or by utilizing a testing device supplying low voltage or low frequency. A low-voltage power supply is connected to DC traction motors, usually at the motor lead plug and receptacle quick disconnect. For induction motors, a variable-voltage, variable-frequency or fixed low-frequency power supply is required.

spot replace: Repair or replacement of the specific unserviceable parts found defective in an assembly.

torque stripe: Registration marks painted across a fastener and an adjacent stationary reference surface immediately after the specified tightening torque has been applied. Marks subsequently found out of registration indicate relative motion, probable loosening and reduced clamping forces.

wheel profile gauges: Instruments for determining the deviation of the observed, actual wheel profile from the new or ideal wheel profile.

5. Abbreviations and acronyms

AC alternating current
AAR Association of American Railroads
ANSI American National Standards Institute
DC direct current
OEM original equipment manufacturer
RTS rail transit system

6. Summary of changes

a) Document has been formatted to the new APTA standard
b) Sections have been renumbered and moved around
c) Scope and summary moved to the front page
d) Updated Working Group membership
e) Minor changes to spelling, capitalization and grammar
f) New sections added *Summary of changes* and *Document history*
g) Table 1 – revised spin test requirement
h) Section 2.1 – an extra bullet added for *service bulletins*
i) Section 2.5.1.1 5th paragraph – additional text to refer to final skim cuts and application of friction modifier. Also added a note after 5th paragraph
j) Section 2.5.1.3 1st paragraph – added text to refer to journal bearing problems
k) Section 2.5.1.6 - added text regarding sand boxes and verification of sand volume after truck has been overhauled
l) Section 2.5.2.1 – added a new bullet referring to temperature monitoring and a note on developing comparison standards.
m) Section 2.5.4.1 – added a note about magnetic particle testing
n) Section 2.5.4.2 – added after 2nd paragraph a note regarding inspection of rubber bushings
o) Section 2.5.5.1 – added a requirement to adjust steel springs
p) Section 2.5.5.2 – added a note to state that the car leveling system should meet or exceed RTS or OEM specifications
q) Section 2.5.5.3 – added text regarding replacing torsion rods as required in accordance with RTS instructions
r) Section 2.5.8.2 – added receiver coils in the section heading
s) Section 2.5.8.3 – added new section called General hardware
t) Section 5 Definitions – added a new definition for *baseline noise and vibration signature*

7. Document history

Document Version	Working Group Vote	Public Comment/ Technical Oversight	CEO Approval	Policy & Planning Approval	Publish Date
First published	Jan 14, 2003	-	-	May 23, 2003	Sept 28, 2003
First revision	-	-	-	-	July 26, 2004
Second revision	Aug 2012	4Q 2012	4Q 2012	4Q 2012	January 2013

