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Bus Brake and Chassis System Working Group

Remanufacturing or Rebuilding of Transit Bus Brake and Chassis Components

Abstract: This recommended practice provides guidelines considerations when deciding to remanufacture and/or rebuild brake and chassis components for transit buses.

Keywords: brake, chassis, rebuilding, remanufacturing

Summary: This document is intended to be a starting point for a transit agency considering remanufacturing and/or rebuilding brake and chassis components. Individual operating agencies should modify these guidelines to meet their solicitations of offers and contract protocols.

Foreword

The American Public Transportation Association is a standards development organization in North America. The process of developing standards is managed by the APTA Standards Program's Standards Development Oversight Council (SDOC). These activities are carried out through several standards policy and planning committees that have been established to address specific transportation modes, safety and security requirements, interoperability, and other topics.

APTA used a consensus-based process to develop this document and its continued maintenance, which is detailed in the manual for the APTA Standards Program. This document was drafted in accordance with the approval criteria and editorial policy as described. Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

This document was prepared by the Bus Brake and Chassis System Working Group as directed by the Bus Systems Standards Policy and Planning Committee.

This document 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 recommended practices or guidelines contained herein is voluntary. APTA standards are mandatory to the extent incorporated by an applicable statute or regulation. In some cases, federal and/or state regulations govern portions of a transit agency's operations. In cases where there is a conflict or contradiction between an applicable law or regulation and this document, consult with a legal adviser to determine which document takes precedence.

This document supersedes APTA BTS-BC-RP-009-20, which has been revised. Below is a summary of changes from the previous document version:

- Document formatted to a new APTA standard style.
- Made minor changes to spelling, capitalization and grammar.
- Sections have been renumbered and moved.
- Foreword, including "Scope and purpose," added to document.
- Scope and purpose: Added the following language: "Not all aspects of the procurement or manufacturing process are discussed in this document. The purpose of this recommended practice is to provide a starting point for transit agencies considering remanufacturing or rebuilding brake and chassis components on their buses."

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Introduction

This introduction is not part of APTA BTS-BC-RP-009-19, "Remanufacturing or Rebuilding of Transit Bus Brake and Chassis Components."

APTA recommends the use of this document by:

- individuals or organizations that operate transit systems;
- individuals or organizations that contract with others for the operation of transit systems; and
- individuals or organizations that influence how transit systems are operated (including but not limited to consultants, designers and contractors).

Scope and purpose

Not all aspects of the procurement or manufacturing process are discussed in this document. The purpose of this recommended practice is to provide a starting point for transit agencies considering remanufacturing or rebuilding brake and chassis components on their buses.

Remanufacturing or Rebuilding of Transit Bus Brake and Chassis Components

1. Overview

WARNING: Failure to comply with shop safety provisions can result in personal injury or death.

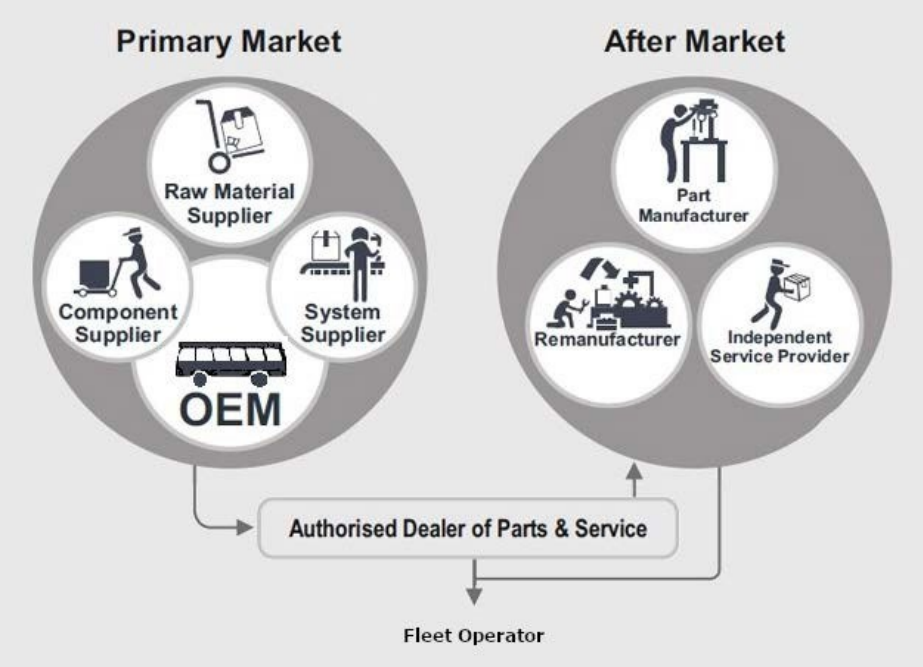
Proper maintenance will ensure the safe and dependable operation of a transit vehicle. Buses should be maintained to comply with OEM maintenance guidelines, as well as federal, state, provincial and local codes and regulations.

This document is intended to be a starting point for a transit agency considering remanufacturing and/or rebuilding brake and chassis components. It aims to provide a high level overview of key considerations when preparing specifications to remanufacture or rebuild brake and chassis components.

2. Supply chain

Remanufacturing at the component level can be performed by either a manufacturer (primary market), or a supplier (aftermarket). See **Figure 1**.

FIGURE 1
Supply Chain of Components



3. Applicability

Remanufactured parts have a reduced environmental impact over new parts. The process also provides the manufacturer with significant cost savings, which are passed on to the fleet owner. However, not all components are rebuildable. Component replacement decision should be considered per part basis and the OEM guidelines if available. The OEM service manual highlights key maintenance practices that can be used to determine inspection and replacement criteria if required.

The following are sample components that are commonly remanufactured:

- compressor
- dryer
- steering gear box

The following are semi-commonly remanufactured parts, which are typically replaced with new units when they fail:

- brake chambers
- radius rods
- brake/leveling valves
- brake calipers

Parts such as ABS sensors, air springs, tie rods and ball joints should not be remanufactured.

4. Recommended considerations

4.1 Basics

Fleet operators generally use technical specifications to communicate their requirements to potential suppliers. Specifications should include clear, concise requirements without restricting competition, reflecting bias to any brand or acting as a barrier to the consideration of any alternatives.

Technical specifications for remanufactured components should include the following considerations:

- **Quality:** In a typical remanufacturing process, core parts are examined, remade and tested to original performance specifications. Make sure the OEM's quality standards are reflected on the remanufactured component. The tolerances and specifications of the component determine this replacement schedule, as specified by the component manufacturer. Visiting the supplier/manufacturer should be available to a customer or any potential customer.
- **Value:** One of the biggest factors in choosing a remanufactured component is cost. Remanufactured components can cost 30% to 60% less than parts purchased new. The warranty provided with remanufactured components should be as close to full new warranty duration as possible.
- **Regulatory compliance:** The supplier must meet all industry and legal specifications of the country it is selling to for its specific product offering. In the event of competing standards in a local area, the more stringent specification shall take precedence. It is the supplier's responsibility to obtain and maintain all relevant certifications. The supplier must be able to present these certifications or policy statements upon request from a customer.

4.2 Core policy

Each supplier should have a documented core policy. Examples of core policy considerations:

- Core return time frame
- Core damage limits
    - Will new product be provided if core is not available?
- Core ownership
    - Will core inventory be maintained by supplier?
- Category/class of core returns
- Return policy

Each fleet operator should define its own core billing policy.

4.3 Transit industry references

Fleet operators should request documentation to support industry reference accounts. Suppliers should maintain a list of current product users. This information is useful for marketing the product and also showcasing experience. Each property will have different requirements. Three years of transit experience at a minimum is recommended for performing the prescribed task.

4.4 Certifications

Remanufactured components can be certified to meet certain standards. Below are a few different types of certifications available in the industry and how they apply to remanufactured products:

- **FMVSS:** Federal Motor Vehicle Safety Standards (FMVSS) are a set of standards regulated by the U.S. federal government. These standards are set to ensure motor vehicle safety in the United States and are written as a minimum requirement. Manufacturers of vehicles must meet eligible requirements in order for those vehicles to be sold and operated in the United States. These standards are not mandatory for aftermarket parts.
- **ISO 9000:** The ISO 9000 family of certifications focuses on quality management and consistently meeting customer needs. ISO 9001 is the only certification in the family that an organization can be certified to. This standard outlines the required criteria to be considered a quality-oriented organization.
- **ISO 14000:** The ISO 14000 family of standards provides practical tools for companies and organizations of all kinds looking to manage their environmental responsibilities.

A copy of the latest certification document should be available upon request. The supplier should have liability insurance and should be able to provide it to the customer upon request.

Vendors' technicians should have a level of expertise necessary to remanufacture the components. It is desirable that the technicians be trained by the OEM of the bus or the component manufacturer and/or be ASE certified.

4.5 Life expectancy and warranty

Remanufactured, rebuilt and/or alternate parts should be held to the same standards as the OEM parts in terms of fit, form, function and durability. The life expectancy should be reasonably comparable to that of the OEM component; however, warranty periods may vary.

4.6 Performance/testing

The supplier/remanufacturer must be responsible for testing and certifying its components as advertised. There are many testing laboratories in North America that are accredited to test to SAE, ASTM and FMVSS standards.

4.7 First-article validation

A first-article inspection is the validating of the quality of a part. It should be done at every level of the supply chain for a new part. Customers can request a sample of their choice to validate for first article before approving a contract with enough time to validate. A site visit may be beneficial to complete a first-article inspection.

4.8 Labeling and traceability

The remanufactured assembly should be serialized and date-coded for traceability whenever possible. The end product must be clearly labeled with the following information at a minimum:

- manufacturer or supplier name
- manufacturer or supplier logo
- manufacturer or supplier part number
- manufacturing date
- part description

Durability of label should match the warranty of the product and beyond. The vendor should be required to supply and affix permanent labels (per the MIL-STD-130 description below) to each component being repaired. The permanent label should be marked with an alphanumeric sequential serial number. Each component part number should require a dedicated serial number prefix followed by a sequential six-digit number that will be used for tracking. Per MIL-STD-130, a permanent label is a label that is as permanent as the normal life expectancy of the item and capable of withstanding the environmental tests and cleaning procedures specified for the item to which it is affixed.

Vendors should be required to be ISO 9001:2015 or newer certified. The ISO certificate should be from an International Accreditation Forum accredited organization that meets CASCO (ISO's Committee on Conformity Assessment) standards. If a vendor uses a subcontractor, its subcontractor should meet the same ISO requirements as the bidder. Letters of certification, proof of IAF accreditation and proof of CASCO conformity are required to be submitted as part of the bid package.

Figure 2 shows an example of appropriate labeling of parts.

FIGURE 2
Labeling Examples

There are many reasons for part number changes, which include but are not limited to re-sourcing to a new supplier, continuous improvements on a part and data entry errors that create duplicate part numbers. When there is a change in a part number, it is essential that the form, fit and function of the part be reviewed. If these criteria are not met, then the supplier must ensure, through an adapter kit, assembly or other design, that the new part is a direct replacement for the old one. At minimum the supplier must provide an explanation for the change in form, fit and function, if there is a change.

4.9 Expected usage and lead time

The transit agency or fleet operator should estimate an annual quantity needed for the reconditioned assembly. The buyer should make sure that the capacity and lead times provided by the remanufacturer are in line with its demand.

4.10 Acceptable failure rate/vendor review

In the case where a part fails within the warranty period, the customer should approach the supplier to investigate the failure in addition to replacing the failed assembly. Through collaborative work, a root cause analysis should be performed and documented by the supplier. The supplier should employ all practical resources, such as third-party testing, to find the reason for the failure. Once the reason for the failure is understood, corrective actions should be taken. The failure analysis report should be shared with the customer.

4.11 Fair comparison

Many times, product offerings and pricing don't match from one company to another. A lower price may be more attractive, but in reality, the product and quality may not be comparable. Ask for itemized quotes that spell out all the parts/components being inspected, reused and replaced. The remanufacturer should also provide a statement of list/processes by component. Make sure 100% of the remanufactured assemblies are functionally tested as part of a quality control process.

Definitions

approved equal: Part approved to be of the same as the OEM part in terms of form, fit and function.

OEM (or original equipment) part: The original equipment component installed on the vehicle upon delivery.

rebuilding: To fix a part after it has failed, or to update its components. The repair is done up to the level of failure, and the final product may or may not meet the standards of an original equipment part.

remanufacturing: A standardized industrial process by which cores are returned to their original shape, condition and performance. This process should meet OEM specifications, including engineering, quality and testing standards.

supplier: A person, organization or other entity that provides something that another person, organization or entity needs. Suppliers provide or supply products or services, while buyers receive them. This document uses the term "vendor" interchangeably with "supplier," in referring to the OEM of the bus, the OEM of the component or a third-party vendor.

Abbreviations and acronyms

ASE Automotive Service Excellence
ASTM ASTM International, formerly the American Society for Testing and Materials
CASCO ISO's Committee on Conformity Assessment
FMVSS Federal Motor Vehicle Safety Standards
IAF International Accreditation Forum
ISO International Organization for Standardization
OEM original equipment manufacturer
SAE SAE International (formerly the Society of Automotive Engineers)

Document history

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