FLORIDA DEPARTMENT OF TRANSPORTATION

PREVENTATIVE MAINTENANCE GUIDE

Florida Department of Transportation
Public Transit Office

Revised February 2026

FLORIDA DEPARTMENT OF TRANSPORTATION

PREVENTATIVE MAINTENANCE GUIDE

OVERVIEW

Preventative maintenance (PM) is the cornerstone of a transit agency maintenance program. A PM program looks to identify and subsequently repair or replace worn or defective vehicle components before a failure occurs. This is accomplished through a systematic program of scheduled maintenance activities, such as inspections, lubrications and services at predetermined intervals that meet the vehicle manufacturer's OEM recommendations. These inspections should ensure that vehicles remain in safe operating condition. Successful PM programs look to have most of their maintenance work performed during these scheduled maintenance activities to have a proactive, cost-efficient maintenance program minimizing downtime and the impact on passenger transportation. The overall effectiveness of a PM program is dependent on the success and functionality of each element of the program.

The Florida Department of Transportation (FDOT) requires agencies using state and/or federal grant funding to provide transportation services (hereby referred to as "Agencies") have preventative maintenance programs that ensure all vehicles operated by the transit agency are systematically inspected, maintained and lubricated using methods and standards that meet or exceed the vehicle manufacturer recommendations. Agencies must operate safe vehicles to transport clients and/or the public. This is accomplished by ensuring vehicles are properly always maintained. This improves vehicle performance and helps vehicles to meet their life expectancy.

The purpose of the *Preventative Maintenance Guide* is to provide Agencies with a resource to aid with developing comprehensive PM programs emphasizing passenger safety and extending the useful life of the vehicle. This process is a combination of basic guidelines, industry standards and technical support in public transit vehicle maintenance.

Vehicle types are defined as follows:

Public Transit Vehicle Definitions
Public Transit Vehicle- rolling stock that is owned, leased, or controlled by a public transit system. For the purposes of this part, vehicles used by a public transit system for support or internal system administrative functions are not included in this definition and vehicles used exclusively on fixed guideways, rails, or tracks are not included. Public transit vehicles include: (1) Buses are motor vehicles designed or constructed for the public transport of persons. Bus types are designated in two categories: (a) Type I means Medium to Heavy-duty purpose-built transit bus with a gross vehicle weight rating (GVWR) greater than 26,000 Lbs.

(b) Type II means minibuses, cutaways and modified vans equipped to transport persons in public transportation.

(2) Other public transit vehicles subject to this part include rolling stock used by a public transit system, including sedans, vans, low speed vehicles, innovative vehicles and autonomous vehicles that do not run on fixed guideways, rails or tracks.

STATE OF GOOD REPAIR (TITLE 49 CFR 625.17)

This federal regulation connects federal requirements to daily maintenance practices, aligns all Florida agencies on expectations and strengthens compliance, training and operational consistency. Preventative maintenance is more than a daily routine. Preventative maintenance is federal compliance.

State of Good Repair § 625.17
The condition in which a capital asset is able to operate at a full level of performance. A capital asset is in a state of good repair when that asset:
1. Is able to perform its designed function;
2. Does not pose a known unacceptable safety risk, and
3. Its lifecycle investments must have been met or recovered, including all scheduled maintenance, rehabilitation, and replacements.

Reference: 49 CFR 625.17

MAINTENANCE PLANS

Agencies are required to develop written maintenance policies and procedures that outline their routine maintenance practices. These living documents should describe how vehicle maintenance activities are performed and should provide in-depth descriptions of the agency's unique practices and staff roles and responsibilities related to completing these tasks.

The elements of a maintenance plan will vary based on the transit agency's capabilities and funding source.

Agencies that receive FTA Section 5307 and/or 5311 grant funding will develop comprehensive maintenance plans based on FAC 14-90 and/or the federal PTASP rule. Agencies that receive only Section 5310 grant funding must develop a Transportation Operating Procedure (TOP), based on the State Management Plan, which includes maintenance policies and procedures.

All maintenance plans should include, at a minimum, the following elements:

- **Vehicle fleet roster:** Includes an inventory of all vehicles operated by the transit agency. Agencies not used for passenger transportation should indicate they are administrative vehicles. It is recommended the fleet roster indicate the vehicles' unit ID, make, model, year of manufacture, VIN, wheelchair lift/ramp accessibility, number of wheelchair positions (if applicable), current mileage and average annual mileage.
- **Preventative maintenance:** Provides a detailed description of preventative maintenance inspection policies and practices. This information should include all the target intervals used to conduct preventative maintenance inspections, routine and long-term maintenance for the vehicle fleet, the method used by agency staff to track and schedule these maintenance activities and how defects found during the PM inspections are prioritized and scheduled for repair.
  If the agency outsources maintenance activities, it is recommended the maintenance plan or TOP include information such as the entity conducting the PM inspections and methods used by agency staff to provide oversight of these outsourced maintenance activities. Any campaigns and/or scheduled replacement schedules should also be included in this section.
- **Pre-Trip and Post-Trip Inspections:** Describes policies as they relate to daily pre-operational and post-operational inspections, such as methods for ensuring safety related deficiencies are identified, communicated to maintenance staff and repaired in a timely manner.
- **Vehicle History Files:** Provides a description of how maintenance documents are stored and maintained by the agency.

In addition to the elements listed above, Agencies that receive 5307 and/or 5311 funding should also include the following elements:

- **Information** Management **Procedures and Practices:** Describes policies for providing oversight of ongoing maintenance activities. This includes procedures for tracking and monitoring maintenance information, including how often this information is tracked and monitored, how the information is used by the agency to provide oversight and who is responsible for this task. If the agency uses a computerized maintenance software program or online maintenance database, describe the program's capabilities and how it is used to monitor the maintenance program.
- **Warranty Procedures:** Describes how warranty information and eligibility are tracked and monitored by agency staff and methods for ensuring that all applicable repairs are pursued and documented.
- **Road Calls:** Describes how in-service failures are tracked and monitored by agency staff to adjust the PM inspection program as needed.

Those 5307 and/or 5311 Agencies having in-house maintenance shops should also include the following elements in their maintenance plans:

- **Personnel Roles & Responsibilities**: Identifies agency staff roles and responsibilities as related to in-house maintenance program activities, such as organizational charts and staff position descriptions for senior leadership management and in-house shop technicians and personnel.
- **Materials Handling**: Provides information about materials handling policies to include where safety data sheets are stored and procedures for their retention.

- **Parts Department:** Provides information about parts department policies and procedures to include staffing, parts usage and recording practices, types of parts stored and inventory balancing.

All maintenance plans or TOPs must include, at a minimum, the elements required by FDOT. Plans must include detailed information about the agency's own unique maintenance program practices and therefore may require additional elements not listed above. The individual details of each maintenance plan or TOP should differ based on these descriptions of an agency's unique practices and position descriptions as each relates to vehicle maintenance programs.

PRE-TRIP & POST-TRIP INSPECTIONS

To ensure vehicles are safe for passenger transportation, Agencies must perform pre-operational and post-operational inspections of all vehicles used to transport passengers. These inspections should seek to identify and repair defects for components that directly affect the safe operation of the vehicle. Table 1 provides a list of components recommended by FDOT to be examined during pre-trip/post-trip inspections along with guidelines for inspecting each component.

The pre-trip inspection is a comprehensive inspection that is performed prior to the vehicle departing for service. During service, the driver should use his/her senses to make themselves aware of problems during the operation of the bus, including listening for odd noises, noticing any unusual smells, identifying fluid leaks and observing the dash gauges and indicator lights for abnormal issues. Issues detected should be reported during the post-trip inspection. The post-trip inspection also requires a walk around the exterior and interior of the vehicle to check for damage that may have occurred during the daily operation. Personal items or suspicious packages that may have been left behind by passengers should be noted.

If multiple drivers use the same vehicle each day, it is recommended that each driver perform a brief walk around the interior and exterior of the vehicle to inspect for damage. However, it is not required that a comprehensive pre-trip/post-trip inspection be performed each time drivers change. Only one pre-trip inspection performed prior to the vehicle's first service run and one post-trip inspection performed at the conclusion of the vehicle's last service run is required by FDOT.

PRE-TRIP/POST-TRIP INSPECTION CHECKLIST FORM

Pre-trip/post-trip inspections should be documented on a checklist form. FDOT recommends that the checklist include the following information:

- Identification of the vehicle being inspected
- The date and mileage of the inspection
- The vehicle components that are inspected
- The condition of the vehicle components during the inspection
- The name and signature of the individual conducting the inspection

Completed pre-trip/post-trip inspection forms should be reviewed by a transit agency employee or designee before the vehicle is used for its next scheduled service. Deficiencies that are determined to directly and/or immediately affect passenger safety should be reported to and reviewed by an agency staff member immediately so that the issue can be addressed. For assistance with determining whether identified deficiencies will affect the vehicle's safe operation, see Safety Related Defects on page 29.

Agencies should keep completed pre-trip/post-trip inspection forms, in which no deficiencies were found, for a minimum of 14 days. Pre-trip/post -trip inspection forms with noted deficiencies are filed along with documentation of the repair for the life of the vehicle.

PRE-TRIP/POST-TRIP INSPECTION COMPONENTS

Table 1: Pre-trip/Post-trip Inspection Guidelines

Component	Pre-trip Procedure	Post-trip Procedure
Service Brakes	• From the driver's seat and with the vehicle running, pump the brakes three to four times and then hold constant downward pressure on the pedal. The brake pedal should be firm and should not depress. • Hold the brake pedal while shifting the vehicle into drive. The vehicle should not move. • Check that the warning buzzer or brake light is off.	• Indicate whether problems were experienced with the service brakes such as hard braking, pulling or noise from the brakes during the operation of the vehicle.
Parking Brake	• With the vehicle running, parking brake applied and transmission in drive, gently press the accelerator to slightly above idle to test that the parking brake is holding.	• Indicate whether problems were experienced with the parking brake during the operation of the vehicle since the pre-trip inspection was performed.
Tires, Wheels and Lug Nuts	• Visually inspect all tire treads and sidewalls for excessive wear, uneven wear, cuts or damage. • Visually inspect to ensure adequate tread depth for every major groove of the tire. (Minimum requirement for tread depth is 4/32 inch for the front tires and 2/32 inch for the rear tires.) • Check tire inflation by thumping or knocking the tire to check for low pressure and flats. • Visually inspect rims for bends, damage or welds. • Check valve stems for damage or missing caps. • Check that all lug nuts are present and that none are loose. • Check that the wheels and hubs are free of oil or grease. Oil or grease could indicate a leaking hub or axle seal.	• Visually inspect all tire treads and sidewalls for excessive wear, uneven wear, cuts or damage • Visually inspect rims for bends, damage or welds. • Check that all lug nuts are present and that none are loose. • Check that the wheels and hubs are free of oil or grease. Oil or grease could indicate a leaking hub or axle seal.
Steering	• With the engine running, check power steering assist function. With key on/engine off, turn the steering wheel back and forth until the front wheels barely move. Steering play should not exceed 2 inches.	• Indicate whether problems were experienced with the steering such as shaking, pulling, vibration or loose steering during the operation of the vehicle.
Horn	• Check that the horn works properly. The horn is considered defective if the sound is weak, inaudible, if the button is difficult to depress or the button sticks.	• Indicate whether problems were experienced with the horn during the operation of the vehicle since the pre-trip inspection was performed.

Lighting Devices	• The operator should perform a complete walk around of the vehicle or request assistance to ensure proper operation of all exterior lighting, including: 1. Headlights 2. 4-way flashers 3. Left and right turn signals 4. High beams 5. Brake lights 6. Back-up lights 7. Emergency Exit lights 8. Marker lights/Clearance lights • Interior and stepwell lighting should also be checked to ensure proper operation. • All lights should be checked for damage, light covers and lens clarity.	• The operator should perform a complete walk around of the vehicle and check the operation of all lights.
Windshield Wipers	• Check exterior condition of wiper blades for damage and that wiper blades and arms are secure. • From the interior of the vehicle, check for proper operation of windshield washer and blades. • Windshield should be clean with no obstructions or damage to glass in driver's view.	• Indicate whether problems were experienced with the windshield wipers during the operation of the vehicle since the pre-trip inspection was performed.
Mirrors	• Check for proper operation, securement and condition of rearview mirror, side mirrors and passenger view mirror. Mirrors should be clean, secure and adjustable.	• Indicate whether problems were experienced with the mirrors, such as looseness or inoperability, during the operation of the vehicle since the pre-trip inspection was performed.
Climate Control	• Operate and check heater and air conditioning controls and function through all selector ranges and check varying fan speed for proper function.	• Indicate whether problems were experienced with the climate control during the operation of the vehicle since the pre-trip inspection was performed.
Emergency Exit Windows, and Doors	• Check the following emergency exits for damage and proper opening and closing function: 1. Emergency exit windows 2. Roof hatches 3. Emergency exit door • Check for proper operation for all interlocks, warning lights and alarms on emergency exits • Check to ensure all emergency exits are properly identified	• Indicate whether problems were experienced with the emergency exit windows and doors during the operation of the vehicle since the pre-trip inspection was performed.
Passenger Doors	• Check passenger doors for proper opening and closing function • With the vehicle running, check for audible alarm when rear passenger door is left open	• Indicate if doors operated properly during the operation of the vehicle since the pre-trip inspection was performed.

	• Check door entry area and steps for debris or loose flooring • Check for proper operation of any interlock.	

Interior Gauges and Warning	• Start engine and check all gauges and warning indicator lights. • Check that the back-up alarm is audible and properly functioning. • If equipped with an air brake system, the bus should not be operated if the air pressure gauge is less than 90 psi.	• Indicate whether any warning lights illuminated or gauges were out of tolerance during the operation of the vehicle since the pre-trip inspection was performed.
Exhaust System	• Visually inspect the exterior exhaust system. • With vehicle running, listen for exhaust leaks and check for exhaust fumes in the vehicle interior.	• Indicate whether problems were experienced with the exhaust system during the operation of the vehicle since the pre-trip inspection was performed.
Wheelchair Lift and/or Ramp	• Conduct one complete cycle of the wheelchair lift or ramp as outlined below to ensure proper operation: • Check all warning lights and audible signals designed to operate with kneeling of a bus or operation of the wheelchair lift or ramp • Cycle lift from stow position to floor level and inspect condition of the lift or ramp while deployed. Check the outboard roll stop barrier for proper latching. • Cycle lift to ground level and check for any leaking, damaged, missing parts and for smooth operation. Raise lift from ground level. With the platform slightly off ground, make sure the outboard roll stop barrier raises and it is latched securely. This must be performed by visually inspecting and latching mechanism to ensure it is in the correct locked position and by physically attempting to pull/push barrier down with an adequate amount of force to make certain the barrier is securely latched.	• Indicate whether problems were experienced with the wheelchair lift and/or ramp during the operation of the vehicle since the pre-trip inspection was performed.
Belts and Securement Devices	• Check for proper number and operation, condition of wheelchair lap/shoulder belts, tie downs and other wheelchair securement/floor attachment devices.	• Indicate whether problems were experienced with the belts and securement devices during the operation of the vehicle since the pre-trip inspection was performed.
Interlock Systems	• With the engine running, check that transmission will not shift out of park under the each of the following conditions: 1. Parking brake applied 2. Entry door open 3. Wheelchair lift/ramp door open 4. Emergency door open • Emergency door locked.	• Indicate whether problems were experienced with the interlock during the operation of the vehicle since the pre-trip inspection was performed.
Windows and Seats & Handrails	• Check the condition of all windows for damage and cracks. • Check seats for securement and condition. • Check foldaway seats for proper operation. • Check passenger securement devices for condition and operation.	Perform an interior walkaround of the vehicle to check the following conditions: • Check condition of all windows for damage and cracks.

	• Check for tightness of handrails and stanchions	• Check seats for securement and condition. • Check foldaway seats for proper operation. • Check passenger securement devices for condition and operation. • Check for tightness of handrails and stanchions • Check for items left behind by passengers
Safety, Security, & Emergency Equipment	• Check for the following safety devices: 1. Fire extinguisher proper charge, rating and current inspection tag. Fire extinguisher should be secure 2. Safety triangles 3. First aid kits 4. Bio-hazard kits 5. Seat belt cutter • Reflective safety vest	• Indicate whether safety, security and emergency equipment were used or became loose or damaged during the operation of the vehicle since the pre-trip inspection was performed
Fire Suppression	• Check the fire suppression dash monitor for proper function. • Check fire suppression gauges to ensure the system is properly charged. The arrow should be pointing in the green area of the gauge. • Current inspection tag.	• Indicate whether the fire suppression system discharged during the operation of the vehicle since the pre-trip inspection was performed.
If Applicable	**Procedure**	
Fast Idle	• Fast idle shall only operate with transmission in park and return to idle when service brake is pressed.	• Indicate whether problems were experienced with the fast idle during the operation of the vehicle since the pre-trip inspection was performed.
PA System	• Test microphone switch, volume control and speakers for proper function.	• Indicate whether problems were experienced with the PA system during the operation of the vehicle since the pre-trip inspection was performed.
2-Way Radio	• Perform 2-way radio check.	• Indicate whether problems were experienced with the 2-way radio during the operation of the vehicle since the pre-trip inspection was performed.
Farebox System	• Make sure farebox system is working properly and programmed for normal function.	• Indicate whether problems were experienced with the farebox system during the operation of the vehicle since the pre-trip inspection was performed.
Passenger Stop Request	• Check the passenger stop request on the left and right sides of the bus and the wheelchair accessible areas for proper function.	• Indicate whether problems were experienced with the passenger stop request during the operation of the vehicle since the pre-trip inspection was performed.
Destination Signs	• Check that signs are readable from the outside and working properly.	• Indicate whether problems were experienced with the destination signs during the operation of the vehicle since the pre-trip inspection was performed.

PREVENTATIVE MAINTENANCE INSPECTIONS

The goal of preventative maintenance is to emphasize passenger safety and to ensure the vehicle and its related components reach their useful life. This is conducted through the development of a vehicle maintenance program that emphasizes proactive, scheduled maintenance activities.

PM SCHEDULES

A successful PM program should be based on routine, systematic PM inspections. Successful PM programs seek to identify and repair defects before a failure occurs that could affect passenger service and safety. When developing PM programs, Agencies can choose their own schedules, procedures and methods for conducting maintenance activities. This information should be included in the agency's maintenance plan and should include, but not be limited to, the following information:

PM Inspections

FDOT requires Agencies to conduct routine scheduled PM inspections of vehicle components and systems that affect the safe operation of the vehicle. As an industry standard, all the vehicle's safety components, auxiliary components and vehicle accessories should be placed on an inspection or service schedule. PM inspections should be performed at the predetermined interval specified by the agency in their maintenance plan or TOP. FDOT recommends that PM inspections include, at a minimum, the vehicle components specified in *Table 3* and *Table 4* of this manual based on the type of vehicle being inspected.

All replacement parts and air and fluid filters must be of OEM specifications or approved equivalents. Part numbers for filters and oil specifications, fluids and greases can be found in the vehicle's owner manual. If the manual is missing, a copy can be viewed at the vehicle manufacturer's website.

Routine and Long-Term Maintenance

FDOT also requires Agencies to perform routine and long-term maintenance on their vehicles to ensure they meet their vehicle life expectancy. Routine and long-term maintenance should be guided by the Original Equipment Manufacturer (OEM) recommendations for servicing vehicles. Some of the routine and long-term maintenance items include, but are not limited to, the following:

- Oil fluid and filter changes
- Brake services
- Engine services
- Transmission services
- Rear differential services
- Engine tune ups, etc.

Target Intervals

All target intervals chosen by the agency for conducting vehicle maintenance should be selected based on the following factors:

- Public safety
- Vehicle manufacturer recommendations
- Yearly operating miles per vehicle
- Duty cycle and operating profile of bus routes (urban, suburban, commuter, fixed route)
- Warranty implications
- Vehicle maintenance history and/or fleet maintenance history (fleet defects, failures, campaigns, etc.)

All target intervals used by the agency to conduct OEM services and PM inspections must be clearly defined in the agency's maintenance plan or TOP.

The target interval chosen by the agency should show a positive overall impact on vehicle performance and maintenance cost per mile. This should be reflected in the agency's ongoing maintenance activities and analysis of performance indicators during their FDOT Triennial Reviews. Agencies should remain prepared to demonstrate or explain the factors used to establish their target intervals.

Performing Maintenance Activities on Time

Agencies should develop an effective tracking system to ensure PM inspections and routine and long-term maintenance activities are performed on time according to the target intervals established in the agency's maintenance plan or TOP.

> Per FTA guidance and the *FDOT State Management Plan*, PM activities, such as inspections and services, will be considered late if they exceed 10% of the target interval provided by the agency in their maintenance plan or TOP. For example, inspections conducted using 6,000-mile intervals must be performed within 6,600 miles of the prior inspection to be considered on time. For inspections conducted using six-month intervals, they must be performed within 198 days of the prior inspection to be considered on time. According to the Federal Transit Administration's *Comprehensive Review Guide for Triennial and State Management Reviews* and FDOT's *State Management Plan*, at least 80% of an agency's PM cycle activities that are examined must be occurring on time to be compliant with FTA and FDOT guidance regarding on-time inspections.

Sample PM Program

One approach FDOT recommends for setting up PM programs is to use a progressive PM inspection cycle to maximize efficiency and reduce vehicle downtime.

An example of a progressive PM inspection cycle is the ABAC cycle. This cycle is comprised of three progressive levels: "A" level inspections, "B" level inspections and "C" level inspections. Inspections are performed in the following sequence: A, B, A, C, using the predetermined target

mileage interval chosen by the agency. For example, if an agency chooses to perform PM inspections using a 6,000-mile interval, the inspections will follow this sequence:

Table 2: Example of ABAC PM Cycle

Inspection Type	Mileage of Inspection
A	6,000 miles
B	12,000 miles
A	18,000 miles
C	24,000 miles
A	30,000 miles
B	36,000 miles
A	42,000 miles
C	48,000 miles

It is recommended that Agencies incorporate their OEM services during their routine PM inspections to limit the amount of vehicle maintenance downtime. The sample ABAC cycle could be used to incorporate additional levels, such as D or E levels, which would include OEM services needed at greater mileage intervals. PM cycles should be customized or altered to fit the agency's needs. **All PM cycles must be clearly defined in the transit agency's maintenance plan or TOP.** If the transit agency uses multiple PM cycles, each PM cycle must be comprehensively defined.

Oil Analysis Programs

If Agencies choose to extend target intervals for conducting oil changes that go beyond OEM recommendations, the agency should develop a systematic and methodical approach to implementing and documenting an oil analysis program. The interval used by the agency to conduct oil changes should be increased or decreased in increments to be consistent with the results of ongoing oil analysis samples. For example, if the agency detects a sudden rise in wear metals or contamination, the oil change target interval should be shortened.

TRACKING MAINTENANCE PROGRAM ACTIVITIES

Tracking Upcoming PM Inspections, Routine and Long-Term Maintenance

Agencies should develop and implement an effective method for tracking and monitoring all upcoming inspections and service intervals to ensure that each is performed on time according to the target interval provided in the maintenance plan or TOP. The tracking method, along with the staff roles and responsibilities related to monitoring PM cycles, should be outlined in the maintenance plan or TOP.

Oversight of Completed Maintenance Activities

FDOT requires all agencies to track and monitor ongoing maintenance activities. This can be accomplished through a variety of methods based on the agency's size and capabilities using software programs, spreadsheets or manual logs. Maintenance program oversight may include, but is not limited to:

- Reviewing completed inspection forms to address defects and schedule repairs
- Ensuring inspection forms are thoroughly completed

- Monitoring defects to identify repairs eligible for warranty repair/replacement
- Monitoring unscheduled maintenance repairs to determine thoroughness of their PM inspections
- Identifying repeat repairs to determine root causes of failures

Agencies can predict potential failures, in some cases, by finding trends in fleet maintenance program activities and adjusting the PM program to avoid the potential failures by placing components on a scheduled replacement campaign.

Adjustments to the PM program may also be based on FDOT's assessment of the transit agency's maintenance program activities and method for developing their PM program and overall ability to meet or exceed vehicle manufacturer recommendations. These adjustments may result from the agency's routine oversight of fleet maintenance activities. An agency's PM program should be fluid to consistently reduce road calls, component failures and other unscheduled maintenance trends.

PREVENTATIVE MAINTENANCE INSPECTION CHECKLIST FORM

Agencies should document their PM inspections on a checklist form that includes the following information:

- Identification of the vehicle being inspected
- The date and mileage at the time of the inspection
- The name of the company conducting the inspection
- Vehicle components being inspected
- The condition of the vehicle components examined during the inspection
- The name and signature of the individual conducting the inspection

Agencies must retain completed PM inspection forms along with documentation of any related repairs for the life of the vehicle.

PM INSPECTION VEHICLE COMPONENTS

Agencies should ensure that PM inspections examine vehicle components specific to the type of vehicle being operated. *Table 3* provides the recommended vehicle components for Type I vehicles and *Table 4* provides the recommended vehicle components for Type II and Other Public Transit vehicles. These tables also include inspection guidelines that FDOT considers significant in the detection of deficiencies that could potentially affect passenger safety. Agencies may use these guidelines as a baseline for developing more detailed PM inspection procedures that further describe the methods used by maintenance technicians when conducting these inspections.

The following inspection guidelines in *Table 3* and *Table 4* can be applied with slight modifications based on the make and model of the vehicle being inspected and the type of inspection being performed. The physical execution of the inspection will be based on the sequence of the component items listed on the agency's PM inspection form.

TYPE I VEHICLE COMPONENTS

Type I Vehicles
"Medium to Heavy-duty purpose-built transit bus with a gross vehicle weight rating (GVWR) greater than 26,000 lbs."

Table 3: Components for Type I Vehicles

SECTION 1 – EXTERIOR INSPECTION
Locate vehicle in the yard and check for fluid leaks and body damage prior to starting or moving the vehicle. Perform 360 degree walk around and visual inspection of the unit. Check for fluid leaks such as fuel, coolant and oil. If a leak is noticed, further inspect accordingly to prevent damage upon start up.
Check the condition and operation of ramp/kneel warning. While the unit is running, inspect the operation of the kneeling warning system. Check for audible alarm and flashing warning light. Ensure the ramp folds without hesitation and does not slam into place.
Check the condition and operation of all exterior lights. Check the condition of the exterior lights and lenses. Check parking, low and hi beam headlights, turn signal operation and front, rear and hazard flashers. Turn on all outside clearance lights and check operation. Check license plate lights, back-up lights, brake lights and decal lights.
Check the condition and operation of destination signs. Visually inspect destination signs for damage to glass. Make sure the destination is clearly visible and the message matches commanded message from controller.
Check the condition and operation of all door operations and mechanisms such as sensitive edges. The door opens at the correct speed. Inspect door glass and sealing gasket conditions. Ensure that doors are mounted securely and sealed when closed and sensitive edges are working correctly on both sides per manufacturer specified test. That door opening and closing times are within specifications. Inspect the condition of door glass for cracks or breaks. Interlocks should activate when doors are open and deactivate when doors are closed.
Check the condition and operation of all component doors, body panels and windows. Visually inspect the body of the unit for damage. Verify doors open and close properly.
Check the condition and operation of all exterior mirrors. Inspect mirrors and mounting brackets to ensure mirrors are secured to the unit and clearly visible to the driver. Verify all motor functions operate smoothly and consistently.
Check the condition and operation of windshield wiper arms, blades and condition of glass. Check wiper arms to ensure the arms are secure to the wiper motor, consistent and even pressure is holding the wiper arm against the windshield glass. Inspect the condition of the wiper blade. Inspect the windshield for any cracks, chips or damage that may affect the operator's line of sight. Fill windshield washer reservoir as needed. Inspect wipers to ensure they are working correctly in all settings. Verify the washer nozzles are aimed correctly at windshield and flowing freely.
Check the condition and operation of the bike rack. Inspect the bike rack for loose mounting hardware, cracking in the frame and broken welds. Inspect and verify that the latch and release mechanism are working properly and hold the rack in place while loaded in the upright position.

Check to ensure the license plate is securely attached.

Inspect the license plate to ensure it is secured to the unit and clearly visible.

Check the condition of the front and rear bumpers.

Visually inspect the bumper cover for cracks and chalking. Ensure the bumper and bumper covers are attached to the unit firmly and no hardware is missing.

Check the condition of the exhaust pipe and ensure it is secure.

Inspect tailpipe to ensure it is secure and not cracked, bent or broken.

SECTION 2 – INTERIOR INSPECTION

Check the condition, mounting and operation of the following safety related equipment: the fire extinguisher, warning triangles, engine compartment fire suppression system control panel.

System components are in the correct location, accessible and are up to date. The area should be free of trash and debris and have a corresponding inspection tag. Follow the fire suppression system manufacturer's guidelines for inspecting the system.

Verify that the proof of insurance and registration are in the vehicle.

Visually check the driver's area for proper registration and insurance card.

Check the condition and operation of all the passenger stop request switches, bells and display signs.

Verify each stop request signals the audio alert and indicator light in the driver's area

Check the condition and operation of all emergency escape windows and roof hatches. Physically work each of the emergency escape windows to ensure all open easily and latch securely when closed.

Verify all sealing edges are clean and free of debris. Lubricate and verify all latches function correctly. Inspect for signs of leakage and verify unit latch works correctly.

Check the condition and mounting of all passenger seating, stanchions and grab rails.

Inspect all seats, stanchions and grab rails to ensure they are secure and safe. Check rear seats over engine compartment mounting hardware. Check fasteners at all handrails and stanchion brackets.

Check the condition and mounting of all interior trim, fixtures and barrier/modesty panels.

Inspect all interior trim and panels. Inspect for cracked, bent or broken panels.

Check the condition and mounting of all passenger notices, warning signs or decals.

Ensure that all passenger notices and warning signs are clearly visible and secured in the correct location.

Check the condition and mounting of all interior mirrors.

Ensure that all interior mirrors are secured and lenses are not cracked or broken.

Check the condition of the vinyl flooring for tears, soft spots or trip hazards.

Inspect for any lifted seams, weak floor panels and loose or torn grip safety tape.

Check the condition of all interior compartment access doors and latches.

Ensure all storage compartments lock in a secured position, all hinges are tight and all hardware is in place.

Check the condition, mounting and operation of all interior and exterior stepwell and curb lamps.

Ensure that the exterior curb lamps are secured. Ensure that all lights illuminate with doors open and while wheelchair ramp is deployed.

Check wheelchair seats, belts and anchors.

Inspect wheelchair seating areas. Check wheelchair seat belt lap extensions and wheelchair shoulder harnesses. Inspect wheelchair securement devices for damaged webbing and proper operation of locking mechanism. Inspect floor tie down anchors. Ensure the vehicle is equipped with the proper amount of securement devices for the number of wheelchair positions.

Check ramp/kneeler operation.

When kneeling the bus, verify audible alarm and indicator lights are functioning properly. Deploy ramp and verify counterbalance function when ramp reaches 90 degrees. With the ramp fully deployed, lift inspection hatch and check that the motor and chain are free of debris and lubricate as needed. Ensure the ramp raises to a closed position under its own power without slamming. Raise bus suspension back to travel position while observing for both audible and visual kneeling alarms.

Check the condition of the driver's seat and the operation of the seat control functions. Check the condition and operation of the driver's seat belt.

Verify that the seat base is secured and the front to rear slides lock in place and hold firmly. If equipped with air features, inspect for leakage as well as inspecting the lumbar functions. Inspect seat belt for frays or tears. Ensure that the seat belt retractor is working properly and holds firmly. Verify buckle locks in place and releases as it should.

Check the operation of horn for loudness and tone.

Check the function of the horn button to ensure it works consistently without excessive force. Listen to make sure the horn is loud and the correct tone.

Check the condition and operation of electric and/or manual steering column for tilt and telescoping function, assist and excessive play.

Check all functions of the steering column and ensure all are working freely and with ease. If any grease points are visible, lubricate and clean the area upon completion. Pull on steering wheel firmly and inspect for any play in the hub and column assemblies.

Check the operation and condition of the turn signal, hazard and high beam control switches.

Inspect the function of the switches. Check light test switch function. Verify all signal, hazard, high beam functions and indicators are working correctly.

Check the condition and operation of the driver's map light.

Inspect the map light switch and light. Verify that it functions correctly. Ensure the map light moves freely if adjustable.

Check the condition and operation of the driver's booster fan in all speeds.

Operate booster fan to verify it works on all 3 speeds.

Check the condition, operation and mounting of all dash gauges, displays, control switches and all other electronic components found in the driver's seat area.

Inspect all gauges for operation as well as accuracy.

Check the condition of the brake and accelerator pedals for condition of the rubber covers and pivot pins for excessive play.

Check brake foot valve plunger for sticking. Lubricate as needed. Ensure the area is free of debris and all pedals function correctly.

Check the operation of the interior aisle and overhead lamps in all modes.

Make sure the interior lamps function in all modes (All, Right Side, Forward, Reverse and Off). Inspect the condition of the lenses as well.

Check the operation of the defroster fan motor at all speeds and the flow from defrost to floor.

Inspect heater filter if equipped.

Perform a Federal DOT air brake system test

Follow FDOT air brake test procedure:

- Check air compressor governor cut-in and cut-out pressures.
- Test air leakage rate.
- Test low pressure warning signal.
- Check that spring brakes come on automatically.
- Check rate of air pressure build up.
- Test parking brake
- Test service brake

SECTION 3 – ENGINE BAY INSPECTION

Check the condition and operation of the following engine compartment run box controls.

Check the operation of the rear run and rear start switches, remote throttle, run box gauges and engine compartment lamps.

Check the condition and mounting of the alternator and alternator wiring.

Verify alternator is securely mounted and, if air cooled, verify cooling tube is secure and coupler is in good condition.

Check the condition and operation of all belts, drive pulleys, idler pulleys and spring-loaded tensioners.

Check the belt gauge according to OEM specifications. Check tensioners and idler pulleys. Inspect all belts for frays, chunking and missing ribs.

Check the condition, mounting and operation of the following engine accessories, components and subsystems.

- Air compressor: Check build up rate and air dryer purge. Drain tanks and inspect for water and/or oil intrusion. Service dryer desiccant filter as needed.
- Water pump: Inspect the water pump for leakage around weep hole and inspect the bearing while unloaded for noises and bearing wear.
- Turbocharger: Inspect turbo impeller for pitting and missing fins. Check for oil leaking at return and supply line. Inspect all intake and exhaust piping brackets, clamps and mounting for signs of leaks.
- Fuel system components: Check for signs of leakage and residue that may indicate a leak.
- EPA emission and exhaust system components: Check all after-treatment components for visible signs of exhaust leaks as well as DEF fluid leakage.

Check the condition, mounting and operation of hydraulic radiator cooling system and steering system components.

Inspect cooling fan blades for cracks or loose blades. Check hub and verify hydraulic components and driveshaft are in good working order. If equipped with electric fans, verify all are working. Check fan cut in and cut out with OEM parameters. Check fluid level as needed.

Check the condition and mounting of engine and transmission dipsticks, dipstick tubes and oil filler assemblies and caps.

Inspect for leakage or improper installation. Verify dipsticks seat and lock in place correctly.

Check the condition and mounting of all the engine/transmission cooling system and vehicle heating system components and perform cooling system pressure and condition tests.

Inspect reservoir cap and sight glasses for leakage.

Inspect the entire engine compartment area for signs of fluid and exhaust leaks.

Check the condition and mounting of all engine air intake components.

Ensure that all components are secured in place and not contacting any pulleys or belts. Service engine air filter as needed.

SECTION 4- LOWER/UNDERSIDE INSPECTION

NOTE: VEHICLE MUST BE RAISED OFF THE GROUND TO ALLOW PROPER TESTING/INSPECTION OF STEERING & SUSPENSION AND VEHICLE UNDERCARRIAGE.

Check the condition of the king pin bushings and bearings and front and rear wheel bearings.

Inspect kingpins before greasing. Check for play in both bearings and bushings to OEM specifications.

Inspect and clean the batteries, battery cables/connections, battery compartment components, battery tray and slides.

Inspect battery condition for cracking, signs of bloating and gassing. Clean all corrosion. Check battery hold downs and all connections are free of corrosion. Inspect battery tray and slides for any defect that may need repair.

Test the batteries and record the test results.

Check all battery cells are full, no surface charge is present and test to stated CCA rating on battery with approved tool.

Check the condition of the wheels and mounting hardware, axle flange and hub-covers.

Check all lugs for proper torque with a torque wrench. Check for loose lugs and signs of rust around flange which may indicate a loose lug. Inspect all hubs for signs of leakage and proper fluid level.

Inspect, test and record the tire sidewall condition, tread condition, tire pressures and tire tread depths.

Inspect all tires for safe operating conditions according to FDOT specs. Record depths and inflation pressures. Inspect sidewalls for abrasions, bulges and tears. Inspect valve-stem for leaks and ensure valve stem cap is present. A flow though cap is preferred.

Perform fluid and filter services.

As per service intervals determined by agency and OEM specifications.

Check the condition and mounting of the steering gear box and the hydraulic hoses for damage and leakage.

Ensure the steering gearbox is secured to the frame. Look for signs of movement. Check for fluid leakage.

Check the condition and mounting of all steering components to include, but not limited to, tie rod ends, steering links, steering shafts and linkages.

Inspect all suspension components and bushing condition. Lubricate as needed.

Check all ABS valves for condition, secure mounting and leaks.

Inspect for leaks. Ensure all components are mounted securely and lines are clear of kinks, restrictions or chafing.

Check ABS electrical connections and harnesses for damage and proper routing.

Inspect all harnesses and connectors for secured mounting and that the protective loom is not deteriorating or wearing through.

Check the condition, mounting and serviceability of all foundation brake components to include, but not limited to, s-cam shafts and bushings, slack adjusters, brake spiders, brake shoes, brake drums, brake calipers and rotors.

Ensure all components are in good working order according to OEM specs.

Record brake lining, brake pad and /or rotor thicknesses.

Check rotors/drums for wear, scoring and warping. Check brake lines/ hoses for signs of wear, chafing or leaks. Check for any dirt, grease or rust accumulation on the brake system. Record in millimeters remaining liner at each wheel end.

Check the condition and mounting of all air bellows/bags and height control valves.

Inspect air bag bellows in the relaxed position for excessive cracking and dry rot. Inspect bags at ride height for leakage and level bag inflation from one side to the other.

Check the condition and mounting of all suspension shock absorbers.

Inspect all suspension components including shocks, torque rods and mounts.

Check the condition and mounting of all air system valves.

Verify all valves are mounted securely. Inspect for water and oil residue.

Check the condition and mounting of all air supply components.

Inspect air tanks, hoses, piping, fittings, check valves and the air dryer. Inspect all tanks and mounting hardware for damage, loose or broken mounting clamps. Inspect air dryer and purge valve for secure mounting and signs of contamination. Service air dryer as per OEM recommendations.

Check the condition and mounting of all suspension components to include, but not limited to, axles, axle mounts, torque arms and radius rods, sway bars, sway bar links and bushings.

Ensure all components are mounted securely and not worn out. Inspect for play and loose or worn bushings.

Check the condition of bus frame, structure, cross members and brackets for damage, cracks or missing fasteners.

Visually inspect the frame for cracks, rust and excessive pitting. Inspect for damage.

Check the fuel tank for secure mounting, damage or leaks. Check fuel filler and cap assembly for secure mounting and leaks.

Ensure tank mounting straps are secured and free of damage. Look for active leaks or signs of fuel leakage on all lines in and out of tank.

Check the condition and mounting of the driveshaft and the driveshaft u-joints and slip joint for play. Verify presence of driveshaft guard.

Inspect for signs of u-joint cups being loose or any play up, down or side to side. Inspect slip yoke for excessive play. Properly grease all points on driveline. Ensure driveline guard is intact and secure.

Check the condition and mounting of all engine and transmission mounts and brackets.

Inspect for missing or loose hardware.

Check the condition and mounting of the transmission heat exchanger assembly.

Check starter for condition, secure mounting and the condition of electrical connections. Check all engine to frame ground connections.

Ensure all mounting bolts are secure. Verify all connections are tight and free of corrosion.

Check the differential housing for cracks, damage or leaks.

Inspect housing at suspension mounts for loose components, cracks and lubricate leaking.

Check for leaks at wheel ends and pinion seal. Clean and check the differential breather assembly.

Check differential fluid level and top off as needed.

Ensure fluid level is correct. Inspect fill plug magnet for excessive metal debris.

Check and record brake slack adjuster applied strokes at all wheel ends.

Check applied brake stroke specification as per brake chamber size. Ensure the stroke is equal on both sides and moves freely and is not binding.

Check brake chamber push rod for even length side to side and observe for smooth application and release of brakes.

Check and record remaining brake lining/pad measurement.

Record and note remaining brake lining on inspection form.

Inspect brake rotor condition.

Visually inspect the rotor for excessive heat checking and grooving. Measure the remaining thickness of rotor. Compare to manufacturer specifications and record results. Replace if necessary.

Grease undercarriage components.

Ensure all zero/grease fittings are taking grease. Replace if necessary.

Perform required fluid and filter changes associated with PM type being performed.

Perform according to OEM or agency requirements.

Test drive the vehicle to observe the condition of the following components.

- Engine performance: Has power and achieves road speeds in a timely manner.
- Shift points: Verify transmission shifts in and out of all gears smoothly without hard shifts.
- Steering: Make sure steering is tight with no excessive play, pulling or vibrations.
- Suspension: Make sure the bus can handle any road conditions without excessive noise or poor ride quality.
- Brakes: Verify bus stops at an acceptable stopping distance through various stopping conditions, panic stops and wet conditions.
- Speedometer: Verify speedometer is accurate and reads correctly throughout all gears.

TYPE II AND OTHER PUBLIC TRANSIT VEHICLE COMPONENTS

Type II Vehicles
"Paratransit type buses of any length such as minibuses, cutaway and modified vans equipped to transport persons in Public Transportation."
Other Public Transit Vehicles
"Motorized rolling stock that provide public transportation and include sedans, vans, low speed vehicles, and autonomous vehicles that do not run on fixed guideways."

The following preventative maintenance inspection guidelines can be applied to Type II and Other Public Transit Vehicles with some modification for applicable vehicle components.

Table 4: Components for Type II and Other Public Transit Vehicles

A-Level Inspection Components
Interior Components
Passenger Door/ Check Operation of All Interlocks and/or Starter Interrupt Ensure the interlock system is working properly when parking brake is applied. If equipped, check passenger door sensitive edge operation.
Standee Line & Warning On vehicles designed to allow standees, check the condition of the standee line and sign. Check for sign prohibiting anyone from occupying a space forward of the line.
Flooring/ Steps/ All Interior Panels Inspect floor covering for tears, rips or gouges. Inspect headliner for damage, sag or dirt. Inspect the condition of side panels. Check steps for yellow edge or nosing to pronounce presence of steps.
Wheelchair Belts/ Floor Anchors Check wheelchair seat belt lap extensions and wheelchair shoulder harnesses for proper function. Inspect wheelchair securement devices for damaged webbing and proper operation of locking mechanism. Inspect floor tie down anchors. Ensure the vehicle is equipped with the proper amount of securement devices for the number of wheelchair positions.
Passenger Seat Condition/ Foldaway Seat Operation Inspect seat covering for the driver and passenger seats for rips, tears, gouges, exposed springs and security of floor mounting. Arm rest(s) should be inspected for proper attachment to seat(s). Check folding seats for proper operation of adjustment controls. Check the driver's seat for proper fore and aft movement and tracks should be lubricated as necessary.
Passenger Seat Belts Seat belts should be inspected for proper retraction mechanisms and damaged webbing.
Stanchions & Handrails Inspect condition of the grab rails and stanchions for the standee passengers.

Roof Hatches/ Operation Check roof hatches to ensure proper function and that they shut and open properly.

Emergency Door and Window Operation

Check emergency door operation to ensure proper function. Check window exits to ensure all exits function properly.
Ensure that all emergency exit signage is clear and legible.

Fire Extinguisher/ First Aid Kit/ Emergency Triangles/ Spill Kit

Inspect the above-mentioned safety equipment to ensure it is in proper working order, securely mounted and easily accessible.

The fire extinguisher must be fully charged with a dry chemical or carbon dioxide having at least a 1A:BC rating and bearing the label Underwriters Laboratory Inc.
Check maintenance tag for expiration date and condition of all components for damage or conditions that may prevent operation.
Nozzle outlets must be unobstructed

Fire Suppression System

If equipped with fire suppression system, check "System OK" LED is illuminated.
Check that the system is properly charged and that all instruction labels are intact, clean and legible. Ensure inspection tag for expiration date.
Check the condition of all components for damage or conditions that may prevent operation. Nozzle outlets must be unobstructed, properly aimed and must have protective covers.
The tank system area should be free of trash or debris. Trash or refuse containers cannot be in area of fire suppression system.
Check fire suppression systems that extend into the battery compartment.
Follow the fire suppression system manufacturer's guidelines for servicing the system.

Interior Lights

Inspect all interior lights.
Check all emergency exit lights at emergency windows and rear exit door.

Vehicle Registration/ Plates

Check condition and currency of license plate and registration and appropriate manuals and documentation.

Drivers Compartment

Brake & Accelerator Pedals

Check pedals for sticking, binding or failure to return to normal position.
Check pedals for excessive pad wear.

Driver's Seat & Belt

Check the driver's seat for proper fore and aft movement. Tracks should be lubricated as necessary. Check the driver's seat belt for proper retraction mechanisms and damaged webbing.

Horn Operation

Check horn. The horn must be capable of emitting a sound audible under normal conditions from not less than 200 feet.

Service Brake Operation

Perform a brake test to ensure brakes are operating properly.

Check All Gauges/ Switches

Activate ignition switch and check all warning indicator lights (oil, battery, engine, etc.) for proper operation. If the vehicle is equipped with gauges, check proper readings after the engine has been started.
Check all switches, levers and knobs for proper function.

Check Fast Idle

Check fast idle system for proper operation.

Check Air System Pressures

Perform leak down test

Shift Lever Operation

Move the shift lever into each gear and ensure the detents are operating correctly.

Parking Brake Operation

Test parking brake on an incline or by pulling against the brake with the engine.

Back-Up Alarm

While depressing the brakes, shift the vehicle into reverse and check the audible back-up alarm.

Driver's & Panel Lamps

Inspect the interior lights.
Check all emergency exit lights at emergency windows and rear exit door. Check all dash and gauge lights for proper operation.

Interior Mirrors/ Sun Visor

Check inside rear-view mirror(s) for proper mounting, adjustment and condition of the glass. Check the right and left exterior mirrors for adequate field of vision. Check sun visor.

Windshield Wipers & Washers

Inspect the windshield for cracks, scratches and any visible damage.
Operate windshield wipers and washer through all ranges on wet glass to ensure proper operation. Check washer fluid level.

Climate Control System/ Fans

Operate and check heater and air conditioning controls through all selector ranges and check varying fan speed for proper function. Check rear unit output as applicable.

Fare Collection System

If equipped, ensure fare collection equipment is securely mounted and operating properly.

Cleanliness

Check the general cleanliness of the vehicle interior.

Exterior Inspection

Check for Damage/ Corrosion/ Bumpers & Mounts/ Decals

Inspect the exterior of vehicle for signs of body damage, missing trim, decals, paint condition and any signs of developing rust.
Check front and rear bumpers.
Inspect for loose, damaged or missing hardware.

Condition of All Glass

Inspect all windows for cracks, blemishes or other damage.

Wiper Blades & Arms

Inspect the condition of windshield wiper blades and arms. Replace if needed.

Exterior Mirrors
Inspect mirror brackets for secure mounting or rusting. Check mirrors for broken/fading glass.

Check Light Lenses & Reflectors
Check the condition of the exterior light lenses and reflectors.

Condenser Fan Operation
Visually inspect fan blades for cracks, bends and proper clearance from shroud or screen.
Turn on the air conditioning system and check fan operation, listen for any unusual noises and check for debris.

All Access Doors/ Engine Cover & Latch Operation
Inspect exterior access doors and lubricate hinges or spring latches as necessary. Check and lubricate hood latch and check hood retainer bar.
If applicable, check battery compartment door latches for proper operation and that compartment door will securely latch.

Tire Damage & Wear
Inspect all tires (including spare) for damage or excessive wear, signs of uneven wear due to imbalance or improper front- end alignment. Check sidewalls for scrubbing or damage.
Determine tread depth using tread depth gauge. Tread group pattern depth shall not be any less than 4/32 (1/8) inch, measured at any point on a major tread groove for tires on the steering axle and no less than 2/32 (1/16) inch measured at any point on a major tread groove for all other tires.
Check air pressure in all tires including spare using tire air gauge. Check hubcaps for secure mounting.

Check Wheels/ Lug Nuts/ Valve Stems
Check wheel lugs for proper torque.
Check all wheels, including spare, for any damage, welds, improper bead seating of tire or missing balance weights.
Inspect valve core. All tires must have FDOT approved valve stem caps. Inflate-through valve caps are preferred.

Fuel Cap and Door
Check fuel cap for proper fit and any signs of damage to fuel servicing piping/ hoses.

Leveling
Check vehicle for proper leveling and ensure it is not severely leaning from side-to-side, from front-to- rear or rear-to-front.

Engine Compartment

Clean Batteries and Terminal Ends/ Check Electrolyte Level Check battery mounting tray condition for corrosion and wear. Check battery case for cracking or damage.
Check the post and fasteners for corrosion. Clean and cover with protectant. If applicable, check and service water levels.
If equipped with a maintenance free battery, check "green" indicator.

Check Battery Hold Downs/ Cables/ Ground Straps
Check battery hold downs. Check cables for fraying or signs of deterioration. Check battery slide out tray for proper function.

Record Voltage Output
Check and record charging system voltage output at batteries. Load test and record voltage batteries individually.

Check Belts/ Tensioners & Hoses/ Air Compressor Mounting

Inspect all belts for signs of wear, fraying, cracks, glazing, and proper tension. Inspect heater hoses and connections.

Check air compressor mounting for alignment, missing / loose bolts and bracket fractures and/or breaks.

Check All Fluids

Check transmission fluid level. Check the color for any signs of overheating.

Check the fluid levels for engine oil, engine coolant, power steering fluid, brake fluid and windshield washer fluid.

Inspect for Leaks

Inspect all lines, hoses and reservoirs for signs of leakage.

Check engine, transmission, differential and all engine accessories for signs of leaks around gaskets, seals, drain plugs, etc.

Check Radiator Core/ Mounts

Inspect radiator core and mounts for proper operation. Check the radiator cap for signs of leaks or pressure loss.

Remove and inspect the radiator cap. At this time, the radiator cores and the interior of the radiator housing may be visually inspected for corrosion or clogging.

Inspect remote coolant reservoir. Should be clear enough to visually check coolant level. Pressure test coolant system and cap with proper testing equipment.

Check Wiring for Routing/ Chafing & Loose Connections

Inspect wiring and all connections for signs of chafing, corrosion, loss of insulation and crimping. Ensure wiring does not contact moving parts or heated surfaces.

Check Engine Mounts

Check for any signs of loose hardware or deterioration/oil-soaked contamination. Inspect transmission mounts.

Replace Engine Oil & Filter

Change oil according to manufacturer's specifications.

Check Air Filter

Remove air filter and inspect air intake hoses and clamps. Visually inspect all vacuum hoses and connections.

Replace air filter according to manufacturer's guidelines.

Check Fuel Filter

Check and/or replace fuel filter. Inspect fuel lines for leaks or damage.

Check/ Clean A/C Filters & Cores/ Lines for Routing/ Chafing

Remove filters and clean or replace. Inspect lines for any signs of leaks or chafing.

Clean condenser and evaporator fins of any debris.

A/C Compressor Mounting/ Clutch

Inspect compressor for any loose or missing hardware. Check pulley alignment and correct if needed.

Ensure all wiring is securely routed.

Chassis/Drive Line

Steering Gear/ Linkage & Arms

Check the steering column for any absence or looseness of U-bolts or positioning parts. Check for worn, faulty or any welded universal joints.
Check the steering wheel for broken spokes, cracks and for securement.
Check the steering box for any mounting bolts loose or missing. Check for any cracks in gear box or mounting brackets.
Check for any looseness of the pitman arm on the steering gear output shaft. Check for leaks.

Steering Shaft & Free Play

Check for any motion, other than rotational, between any linkage member and its attachment point. Check for loose clamps or clamp bolt on tie rod or drag link.
Check for linkage components that are not secured with proper pins or devices. Check for any looseness in any threaded joint.

Lube Chassis

Lubricate all steering and suspension Components.

Check Differential Oil Level/ Clean Breather/ Check Axle Seals

Check for proper fluid level. Ensure breather is clean. Check seals for any signs of leakage. Ensure all hardware is secure.

Check Exhaust System for Mounting/ Leaks/ Restriction

Check the exhaust system for mounting, routing, leaks and restrictions.

Wheelchair Lift Inspection

Lift Manufacturer Tag/ Month & Year Manufactured/ State of FL Certificate

Check that each wheelchair lift or ramp is legibly and permanently marked by the manufacturer or installer with the following information:

- The manufacturer's name and address
- The month and year of manufacture

A certificate that the wheelchair lift or ramp securement devices and their installation conform to State of Florida requirements applicable to accessible buses.

Check Lift Wiring for Routing/ Chafing & Loose Connections

Inspect all lift wiring for proper routing. Inspect pendant cord for any damage.

Check Lift for Damage/ Inspect Lift Anchor Bolts

Inspect lift towers for proper alignment. Ensure lift mounting hardware is secure.

Cycle Lift – Check all Safety Systems Including Barriers

Lower lift to ground level and check for damaged, missing parts and for smooth operation.
With platform slightly off ground, make certain the outboard roll stop barrier raises and is latched securely.
Continue to raise lift to floor level and check for any unusual noises or abnormal operation. Lift should not fold in with weight (50 pounds) on it.
Due to varying lift configurations, refer to the Owner's Manual for a list of warning lights, audible alarms and safety mechanisms to ensure all safety devices are working properly.

Record Lift Cycle Count

Document the lift cycle count on your preventative maintenance inspection form.

Check for Hydraulic Leaks/ Level

Inspect cylinders, hoses, pump and reservoir for any signs of leaks.
Check for proper fluid level. If hydraulic fluid is to be added, only use lift manufacture's or approved equivalent type of fluid.

Clean, Lubricate & Adjust Lift as Needed

Check lift padding and labels.
Check lift manual operation and instruction label.
Lubricate appropriate lube points. All lubricants used must meet the manufacturer's specifications. Lubricants must be odorless and not leave a residue.
Refer to original owner's manual for lift adjustments if necessary.

Tire Tread Depth/Inflation

L/ Front

Record the tread depth and air pressure for the left front tire.

R/ Front

Record the tread depth and air pressure for the right front tire.

R/R Inside

Record the tread depth and air pressure for the right rear inside tire, if applicable.

R/R Outside

Record the tread depth and air pressure for the right rear outside tire.

L/R Inside

Record the tread depth and air pressure for the left rear inside tire, if applicable.

L/R Outside

Record the tread depth and air pressure for the left rear outside tire.

Note for all tires: Use manufacture's tire pressure recommendation found on inside driver's door GVWR label.

B-Level Inspection Components –
in addition to all A-Level inspection components

Chassis/Drive Line

Shocks/ Springs/MORryde

Inspect shock absorber cylinders for signs of leakage.
Check bushings for signs of wear and the mounting brackets for secure mounting. Inspect coil and/or leaf springs for signs of damage or wear.
Check MORryde shear springs and related components, if equipped. Check the air springs for leaks, cracks and dry rotting.

Torque Rods

Inspect for any damaged or missing bushings. Ensure all hardware is intact and secure.

Check Drive Shaft & U-Joints

Check the driveshaft. Check slip joint for play.
On vehicles with two-piece drive shafts, check center support bearing for excessive compression of the rubber insulator. Inspect the center support bearing by rotating the inner race while holding the outer race. Replace if there is evidence of roughness or wear.
Lubricate driveline u-joints and slip yoke.

Check Brakes
This task must be performed on a vehicle lift. Remove wheels and inspect all brake pads/linings for wear. When reinstalling wheels, all lug nuts must be properly torqued to manufacture's specifications with hand torque wrench. Impact gun only to be used in combination with correctly rated torque-stick wrench.

Air Tank Mounting/ Lines and Valves
Check air tank(s), lines and valves for secure mounting. Look for any loose or missing hardware. Check for leaks.

Underbody/ Mounts & Frames
Inspect underbody mounts and frame for proper securement. Look for any loose or missing hardware, bushing deterioration, cracks, etc.

Fuel Tank Mounting & Fuel Leaks
Check fuel tank for secure attachment to vehicle by inspecting for loose, broken or missing mounting bolts or brackets (some fuel tanks use springs or rubber bushings to allow movement).
Check fuel system for any visible leak at any point.

Brake Inspection

Brake Foundation/ Lines/ Rotors/ Drums
Check rotors/drums for wear, scoring and warping. Check calipers/cylinders and brake lines for signs of wear, chafing or leaks.
Check for any dirt or grease accumulation on the brake system.

L/ Front Measurement
Record the remaining lining on the left front brake.

R/ Front Measurement
Record the remaining lining on the right front brake.

L/ Rear Measurement
Record the remaining lining on the left rear brake.

R/ Rear Measurement
Record the remaining lining on the right rear brake.

Test Drive

Check Engine Performance
Start the engine and check for any unusual noises.
Check exhaust stream for any unusual color, odor or sound.
Check for any active or inactive fault codes and if the engine has any outstanding Technical Service Bulletins from the manufacturer.
During operational test drive, check for smoothness of acceleration.

Check Shift Points
During operational test drive, check operation and position of shift lever and indicator. Check operation in each gear.
Check shift points through all gear ranges in drive position.

Steering
During operational test drive, check the centering of the steering wheel and the smoothness of turns. Also check for looseness in steering wheel.

Suspension
During operational test drive, check for proper tracking of the vehicle, balance of tires and front-end alignment.

Brakes
Check for smooth pedal operation during braking. Check for any pulling, vibrating or shaking while braking. Check for any unusual noises such as grinding or squealing coming from wheels.

Speedometer
During operational test drive, check operation of speedometer.

C-Level Inspection Components –
in addition to all A-Level and B-Level inspection components

Engine Compartment

Test Anti-Freeze Protection
Test antifreeze for proper protection level using the correct testing equipment. Use caution. Many modern engine coolants cannot be mixed. Be sure when adding coolant to only use manufacture's recommended coolant.

A/C Pressure Check
Conduct thorough operational check and inspection of air conditioning system to ensure proper operation and ensure there are no leaks.
Note: All air conditioning work involving opening the system for repair and recharging must be performed by an EPA 608 certified technician.

Chassis/Drive Line

Check Front Wheel Bearings/Hubs
This task must be performed on a vehicle lift.
Inspect wheel bearings. Clean and lubricate or replace if necessary. Vehicles with hub bearings, check bearings for play, roughness and noises. Check sealed wheel hubs for end play, roughness and noises.

Long Term Maintenance
in addition to all A-Level, B-Level and C-level inspection components

OEM Recommended Services and Intervals

Drain & Refill Differential
Drain and refill differential fluid according to the OEM recommended intervals at a minimum.

Transmission Fluid/ Filter
Remove transmission pan and drain fluid according to the vehicle's OEM recommended interval. If the transmission torque converter is equipped with a drain plug, drain fluid from it as well. Inspect debris in the bottom of pan for signs of internal transmission damage. Check the color of fluid for signs of overheating. Remove and replace filter screen.

Engine Tune-Up
The engine must receive a tune-up service according to OEM recommended intervals.

Coolant System Fluid Flush & Fill
The coolant must be replaced and system flushed according to OEM recommended intervals.

Brake Fluid Flush & Fill
Brake fluid must be replaced and system flushed according to OEM recommended intervals.

Power Steering Fluid Flush & Fill
Power steering fluid must be replaced and system flushed according to OEM recommended intervals.

CLASSIFYING DEFECTS

FDOT considers some vehicle components essential to the vehicle's safe operation. There are two categories of these safety components: critical safety components and safety-sensitive components. **Critical safety components are considered by FDOT to be crucial to the vehicle's safe operation. When critical safety components are identified as defective during a vehicle inspection, the vehicle must be at once removed from service until repaired.**

The following are examples of systems that are classified as critical safety components by FDOT and are considered to directly and at once impact passenger safety.

- Steering System
- Service and Parking Brakes
- Suspension
- Tires, Wheels and Wheel End Components
- Interlock Systems
- Wheelchair Lift components that affect the safety of the passenger (example: outer roll stop barrier)

The following are examples of systems that are classified as safety-sensitive components by FDOT and require further assessment to determine whether they could cause a direct and immediate impact to passenger safety:

- Fuel and Exhaust Systems
- All Lights, Mirrors, Wipers and Warning Devices
- Interior Controls, Gauges and Safety Equipment
- Air System
- Emergency Exits (doors, windows, etc.)
- Fire Suppression Systems

These lists include examples of safety-related components and are not intended to be all-inclusive. Agencies must exercise judgment and caution when deciding whether a defect may affect passenger safety and be classified as critical or safety sensitive. The assessment must be made using a methodical risk analysis approach. The policies, procedures and staff duties related to these assessments should be described in the agency's maintenance plan or TOP. Determinations should be documented on the inspection form where the safety-sensitive defect was identified. The form should document whether the defect was determined to need immediate repair or whether the vehicle can safely provide temporary service while the repair is deferred to a later date. While making these determinations, Agencies should also consider issues such as American Disability Act (ADA) requirements. For example, 49 CRF 37.163(e) states,

> "If there is no spare vehicle available to take the place of a vehicle with an inoperable lift, such that taking the vehicle out of service will reduce the transportation service the entity is able to provide, the public entity may keep the vehicle in service with an inoperable lift for no more than five days (if the entity serves an area of 50,000 or less

population) or three days (if the entity serves an area of over 50,000 population) from the day on which the lift is discovered to be inoperative."

The inspection form should indicate any limitation or restrictions placed on the use of the vehicle because of the safety defect identified.

The inspection with the noted deficiency, along with any related repair documentation, should be kept for the life of the vehicle and filed by the transit agency in the corresponding vehicle history file.

DEFECT IDENTIFICATION/REPAIR

In cases where a vehicle component is found to be defective or experiences a failure, the repair or replacement of that component should be documented on a work order that includes the following information:

- Identification of the vehicle that was repaired
- The date and mileage of the repair
- Information regarding the origin of the defect being repaired
- A brief description of the vehicle component repair or replacement
- Identification of the company conducting the repair
- The name and/or signature of the technician conducting the repair

To ensure passenger safety, vehicle component repairs, rebuilds or replacements performed should meet the original manufacturer and/or industry standards for that specific type of vehicle.

It is recommended that the inspection form noting the defect and related repair work order or invoice be documented and filed by the transit agency in one of two ways:

- The inspection form containing the defect(s) and separate corresponding repair documentation must be filed together in the vehicle history file, OR
- The inspection form containing the defect(s) will include information about any repair(s) made because of the inspection. Documentation of repair(s) directly on the inspection form must still include the minimum repair documentation information listed above.

For agencies that have manual vehicle history files, it is recommended the inspection form and related repair documentation be kept for the life of the vehicle and filed together in the vehicle history files.

For agencies that have electronic vehicle history files, it is recommended the agency keep the inspection form and the related repair information in their software programs and have direct and immediate access to this information upon request by FDOT.

IN-HOUSE MAINTENANCE PROGRAMS

Agencies with in-house maintenance facilities should meet or exceed the following guidelines:

Maintenance Technician Qualifications

Agencies should ensure maintenance technicians performing PM inspections:

(a) Understand the requirements in Chapter 14-90, FAC and identify defective components.

(b) Are knowledgeable of and have mastered the methods, procedures, tools and equipment used when performing an inspection for the types of vehicles operated by the bus transit system

(c) Have at least one year of training and/or experience as a mechanic or inspector in a vehicle maintenance program and have sufficient general knowledge of the types of vehicles owned and operated by the bus transit system to recognize deficiencies or mechanical defects.

It is preferred that only maintenance technicians who meet FDOT's minimum qualifications conduct PM inspections. In cases where maintenance technicians conducting these inspections do not meet the minimum qualifications, it is recommended that Agencies provide further assessment and validation related to the technician's ability to conduct comprehensive inspections that meet or exceed FDOT standards.

Maintenance Technician Training

All maintenance technicians performing PM inspections should take part in ongoing technical training for vehicle components specific to the types of vehicles operated by the agency. Agencies should track and document all maintenance training certifications held by each technician employed and these filed along with personnel records.

Battery electric, LP Gas, CNG type powered or any emerging technologies vehicle require stand-alone component specific technician training. Vehicle manufacturers should be consulted for maintenance, repairs and inspection to ensure technician and operator safety.

OUTSOURCED MAINTENANCE PROGRAMS

FDOT recommends that Agencies outsourcing PM inspections develop service agreements with the outsource provider to ensure that inspections meet or exceed the transit agency policies outlined in their maintenance plan or TOP. Service agreements should ensure that the outsource provider conducts PM inspections, services and other maintenance activities according to the intervals and policies outlined in the transit agency's maintenance plan or TOP. The transit agency should monitor and conduct oversight of the outsource provider's work to ensure these standards are met, as well as the policies and procedures outlined in the service agreement.

FDOT recommends the following vehicle components to be inspected while the vehicle is suspended on a lift:

- Torque rods
- Ball joints
- Steering Gear/Linkage & Arms
- Lube
- Drive shaft & U-joints
- Differential Oil Level/Clean Breather/Axle seals
- Drain and refill differential fluid
- Replace transmission fluid and filter
- Front Wheel Bearings
- Air Tank Mounting/Lines & Valves
- Exhaust System for Mounting/Leaks/Restrictions
- Underbody/Mounts & Frames
- Fuel Tank Mounting & Fuel Leaks
- Brake Foundation/Lines/Rotors/Drums
- L/Front Brake Measurements
- R/Front Brake Measurements
- L/Rear Brake Measurements
- R/Rear Brake Measurements
- Engine Oil & Filter
- Shocks/Springs/MORryde

MAINTENANCE PROGRAM COMPLIANCE

Agencies must undergo a complete review of maintenance program policies, procedures and activities by FDOT every three years during their Triennial Review. The maintenance reviews examine the transit agency's ability to meet applicable FDOT standards using data gathered during the Triennial Review process. The criteria for meeting these standards are further outlined in the *FDOT State Management Plan.* An agency's overall compliance will be determined based on the agency's ability to meet the applicable requirements and the agency's adherence with the policies outlined in their maintenance plan or TOP.

For more information about Triennial Reviews and compliance, please visit: www.floridacota.org

TECHNICAL ASSISTANCE AND RESOURCES

FDOT has established numerous technical assistance resources to help Agencies with the development of comprehensive maintenance programs.

FDOT has contracted with Lively Technical College, Tallahassee, to provide vehicle maintenance related training to Florida agencies through the Lively Paratransit Instructional Program (LPIP) and the Florida Transit Technician Program (FTTP). These programs offer technician maintenance training and a variety of training and technical resources to agencies. Also available is maintenance management expertise to agencies choosing to outsource their maintenance activity to a local vendor. Opportunities to network with other transit professionals throughout the state is provided through the Florida Association of Paratransit Technicians and the Florida Transit Maintenance Consortium. Some of these resources available are:

- Training courses for maintenance technicians and maintenance managers
- Maintenance plan templates for in-house and outsourced maintenance programs
- *Transportation Operating Procedure* templates for 5310-only agencies
- Facility and Equipment Maintenance Plan templates
- Outsource Service Agreement templates
- Sample Preventative Maintenance Inspection forms for Type I, Type II and Other Public Transit vehicles
- Sample Pre-trip/Post-trip Inspection forms

For more information, please visit these sites:

Lively Paratransit Instructional Program	www.LivelyPIP.com
Florida Transit Technician Program	www.FloridaTTP.com
Florida Transit Maintenance Consortium	www.FloridaTMC.com
Florida Association of Paratransit Technicians	www.flparatech.com

FDOT has contracted with the Center for Urban Transportation Research (CUTR) to develop the Compliance Oversight and Technical Assistance (COTA) program to aid FDOT Districts with performing Triennial Reviews to assess Agencies' maintenance, safety and operations programs. The COTA program also hosts technical assistance resources to help Agencies with ensuring they have transportation systems that operate safely and efficiently.

For questions related to vehicle maintenance compliance, please visit: www.floridacota.org