





May 2, 2019

TO: Madam Chair Anderson and PRTC Commissioners

FROM: Perrin A. Palistrant 
Director of Operations and Operations Planning

THROUGH: Robert A. Schneider, PhD 
Executive Director

SUBJECT: February 2019 Fleet Maintenance Audit

Overview

The most recent fleet maintenance audit (attached) was conducted in February 2019. Random sample audits are conducted three times per year by PRTC's independent contractor, Transit Resource Center (TRC) -- the report summary is presented below. Average defects remained consistent for active vehicles and increased slightly for contingency vehicles. First Transit management worked diligently to reduce the number of defects and improved processes to assist maintenance staff. PRTC management continues to work with First Transit management staff to ensure TRC's suggested improvements are being followed, and will maintain stepped up service monitoring of various aspects of maintenance activities.

Report Summary

Bus audits are conducted of First Transit three times annually (approximately one every four months) on behalf of the Potomac and Rappahannock Transportation Commission (PRTC) by Transit Resource Center (TRC). First Transit is under contract to PRTC to maintain PRTC's bus fleet. This is the seventeenth audit conducted of First Transit since their contract with PRTC began on July 1, 2013. An audit scheduled for December 2018 was cancelled due to the deployment of 37 new MCI buses. The schedule for 2019 has been adjusted accordingly.

Audits consist of a physical bus inspection of 51 buses, which represents about one-third of the total fleet. The audits also include a fluids analysis, records review, and road testing of one-quarter of the sample. A review is also made of maintenance worker qualifications as agreed to by PRTC and First Transit. Reporting is based on a random sampling of the active fleet (47 buses) with separate analysis made of the contingency fleet (4 buses).

For this audit there was an average of 2.6 defects per bus for all buses inspected (active and contingency buses combined), identical to the last audit. The 47 active buses inspected averaged 2.5 defects per bus, compared to 2.6 per bus during the last audit, while the four contingency buses averaged 3.75 defects per bus, compared to 3.3 per bus during the last audit. New for this audit was the inspection of 10 newly-delivered model year 2019 MCI buses, which averaged 0.8 defects per bus. Without the new buses in the mix the remainder of all buses had an average of 3.0 defects per bus.

The summary table which follows compares active and contingency buses in several defect categories for the past four audits. On-time adherence to preventive maintenance inspections (PMIs) scheduled at 6,000-mile intervals continues to be perfect at 100% for thirty-four consecutive audits.

TABLE 1 <i>Comparison of Active & Contingency Buses</i>				
	Dec. '17	Apr. '18	Aug. '18	Feb. '19
Average # of Defects per Bus: All Buses	4.75	3.0	2.6	2.6
Average # of Defects per Bus: Active Fleet	4.2	2.8	2.6	2.5
Mechanical Defects (net of cosmetic defects): Active Fleet	2.6	1.8	1.4	1.4
Average # of Defects per Bus: Contingency Fleet	11.0	4.8	3.3	3.75
Average # of "A" Defects per Bus: All Buses	0.41	0.23	0.20	0.23
Average # of "A" Defects per Bus: Active Fleet	0.40	0.23	0.21	0.23
Average # of "A" Defects per Bus: Contingency Fleet	0.50	0.25	0.0	0.25
PMI Adherence	100%	100%	100%	100%

The number of "A" defects, which totaled 11 last audit, increased to 12 this audit. "A" defects are those agreed upon by PRTC and First Transit as being more serious, those that would keep a bus from resuming revenue service until repaired. "A" category defects were reported to First Transit

shortly after being identified. A copy of the “A” defect list used for all audits is attached as Appendix B.

The four contingency buses inspected averaged 3.75 defects per bus, compared to 3.3 last audit and 4.7 the audit before last. This compares to an average of 2.6 defects for the active fleet. Conclusions drawn from such a small fleet sampling (only four buses) are difficult to make.

TRC will continue to conduct a separate analysis of contingency buses, determine if operators are reporting defects as part of their pre and post trip inspections, and whether First Transit is correcting those defects. In conducting the analysis of four contingency buses, TRC found that eight of the 15 contingency fleet defects should have been noted by the operator. Of the eight defects, none were noted by operators on the pre or post trip inspection reports.

Other aspects of the audit revealed:

- The workshop continues to be clean.
- PMI records, filed electronically, continue to be extremely well organized and easy to locate.
- Bus exteriors and interiors are exceptionally clean.
- Exterior-related body defects for the active fleet decreased to 51 for this audit compared to 53 last audit and 46 the audit before last. Exterior-related body defects continue to rank as the highest defect category after Engine Compartment defects, a total of 24 for the active fleet this audit.
- The number of interior condition defects for the active fleet continues to remain low at four compared to only one last audit and three the audit before last.
- When cosmetic (interior condition and exterior body) defects are removed from the active fleet totals, the number of mechanical defects equals 1.4 per bus compared to the same last audit.
- Bus areas where no defects were found on any of the active buses inspected include Climate Control, Destination Signs, Exhaust, Lights, and Structure/Chassis/Fuel Tank.
- Three categories saw a significant decrease in the number of average defects per bus: Climate Control, Lights, and Structure/Chassis/Fuel Tank.
- Three categories saw a significant increase: Driver’s Controls, Passenger Controls, and Safety.
- The road tests of the 13 buses selected at random revealed no defects this audit compared to no defects last audit.
- Refrigerant-related air conditioning (AC) repairs examined were all performed by EPA certified personnel as required by PRTC.
- First Transit management continues to show a willingness to minimize defects by immediately repairing “A” defects shortly after being identified.
- The review of PMI records revealed that First Transit continues to have a process to follow up on defects identified during PM inspections.

- Testing of fluid samples showed six alerts compared to five last audit: one engine oil, two transmission, and three coolant. Of the six alerts, five require some action to be taken before the next PM interval. Results appear to be providing an early warning of possible problems as opposed to neglected maintenance.
- Regarding fluid alerts reported last audit where First Transit was recommended by the lab to take corrective action, an examination found that follow-up action was taken in all cases.
- First Transit is compliant in three of the four workforce categories (two employees do not meet minimum work experience requirements). Required annual refresher training is at full compliance except one new hire was not on the job long enough to fulfill this requirement.
- First Transit management continues to be cooperative with regard to providing the buses and workspace needed for carrying out inspections in a timely fashion.
- A review of all contingency bus records revealed that all were driven at least 30 miles per month. All contingency buses have current registrations, all are being given required maintenance attention, and the four contingency buses selected for inspection for this audit did start prior to being inspected.

Attachment: As stated



TRANSIT RESOURCE CENTER

Presents:

Fleet Maintenance Audit Report

February 2019

Presented to:



Potomac & Rappahannock Transportation Commission

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April 10, 2019

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**Potomac and Rappahannock Transportation Commission
(PRTC)**

**VEHICLE MAINTENANCE AUDIT
Conducted February 18-22, 2019**

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POTOMAC AND RAPPAHANNOCK TRANSPORTATION COMMISSION
VEHICLE MAINTENANCE AUDIT
Conducted February 18-22, 2019

SUMMARY

Bus audits are conducted of First Transit three times annually (one every four months) on behalf of the Potomac and Rappahannock Transportation Commission (PRTC) by Transit Resource Center (TRC). First Transit is under contract to PRTC to maintain PRTC's bus fleet. This is the seventeenth audit conducted of First Transit since their new contract with PRTC began on July 1, 2013. An audit scheduled for December 2018 was cancelled due to the deployment of new MCI buses. The schedule for 2019 was adjusted accordingly.

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The summary table which follows compares active and contingency buses in several defect categories for the past four audits. On-time adherence to preventive maintenance inspections (PMIs) scheduled at 6,000-mile intervals continues to be perfect at 100% for thirty-four consecutive audits.

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TRC will continue to conduct a separate analysis of contingency buses, determine if operators are reporting defects as part of their pre and post trip inspections, and whether First Transit is correcting those defects. In conducting the analysis of four contingency buses, TRC found that eight of the 15 contingency fleet defects should have been noted by the operator. Of the eight defects, none were noted by operators on the Zonar reports. Last audit, operators also did not note any of the four defects that should have been listed on Zonar reports.

Other aspects of the audit revealed:

- The workshop continues to be clean.
- PMI records, filed electronically, continue to be extremely well organized and easy to locate.
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- Exterior-related body defects for the active fleet decreased to 51 for this audit compared to 53 last audit and 46 the audit before last. Exterior-related body defects continue to rank as the highest defect category after Engine Compartment defects, a total of 24 for the active fleet this audit.
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- Three categories saw a significant decrease in the number of average defects per bus: Climate Control, Lights, and Structure/Chassis/Fuel Tank.
- Three categories saw a significant increase: Driver’s Controls, Passenger Controls, and Safety.
- The road tests of the 13 buses selected at random revealed no defects this audit compared to no defects last audit.
- Refrigerant-related air conditioning (AC) repairs examined were all performed by EPA certified personnel as required by PRTC.
- First Transit management continues to show a willingness to minimize defects by immediately repairing “A” defects shortly after being identified.
- The review of PMI records revealed that First Transit continues to have a process to follow up on defects identified during PM inspections.
- Testing of fluid samples showed six alerts compared to five last audit: one engine oil, two transmission, and three coolant. Of the six alerts, five require some action to be taken before the next PM interval. Results appear to be providing an early warning of possible problems as opposed to neglected maintenance.
- Regarding fluid alerts reported last audit where First Transit was recommended by the lab to take corrective action, an examination found that follow-up action was taken in all cases.

- First Transit is compliant in three of the four workforce categories (two employees do not meet minimum work experience requirements). Required annual refresher training is at full compliance except one new hire was not on the job long enough to fulfill this requirement.
- First Transit management continues to be cooperative with regard to providing the buses and workspace needed for carrying out inspections in a timely fashion.
- A review of all contingency bus records revealed that all were driven at least 30 miles per month. All contingency buses have current registrations, all are being given required maintenance attention, and the four contingency buses selected for inspection for this audit did start prior to being inspected.

Given the current level of maintenance performance, there continues to be no maintenance specific recommendations except to continue taking steps to reduce exterior-related defects, engine/engine compartment defects, contingency bus defects, and “A” defects. In addition, however, operators need to be trained to note more defects on their Zonar records. Of the eight defects that an operator should have noted, none were found in the Zonar records. Last audit, operators also failed to note such defects.

Audit details are presented in the various sections found in the body of this report. Various tables used throughout this report are based on more complete data contained in Excel spreadsheets included on a separate CD.

BUSES INSPECTED

TRC selected at random 47 active buses and four contingency buses (51 in total) for a physical fleet inspection and then selected 13 of them at random to receive a Fluids Analysis Audit and a Records Review. Thirteen buses were also selected at random by TRC to undergo road tests. Appendix A identifies those buses.

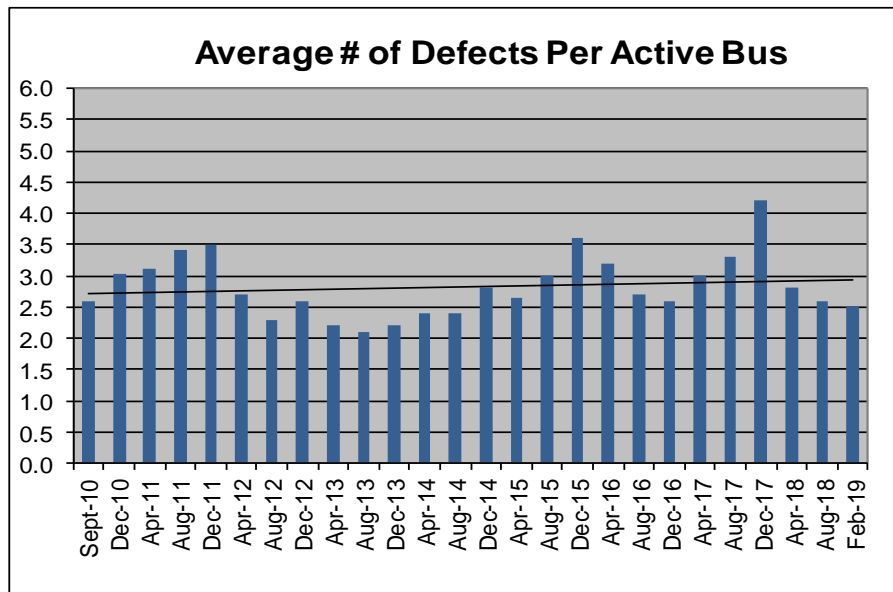
FINDINGS

Overall Fleet Condition – Active Buses

The PRTC fleet continues to be exceptionally clean. The number of interior condition defects for the active fleet remains low at four compared to one last audit and three the audit before last. Exterior body defects fell slightly to 51 compared to 53 last audit. Tight parking conditions where approximately 122 parking spots must accommodate 153 buses could be contributing to higher exterior body damage defects.

Defects continue to remain in the three-per-bus average. Only once in the past twenty-six audits did defect averages exceed four. **Table 2** which follows shows the historical defect trend for the last 18 audits of First Transit. During that 18-audit period, 15 audits averaged three defects or less per bus. Although the industry does not have a standard for per-bus defects, an average of defects in the range traditionally exhibited by First Transit is exceptional based upon similar audits conducted by TRC for other transit agencies. A more detailed analysis of the defects is provided in report sections that follow.

Table 2: Summary of Average Defects per Active Bus



Note: A December 2018 Audit was not Conducted

Overall Defect Summary – Active Buses

All defects identified during the inspections were entered in a database, which was used to generate a Master Defect Sheet. Data contained in that spreadsheet were then used to produce a series of detailed Excel reports, which are included as a CD attachment to this report.

Table 3, which follows summarizes active bus defects under each of the 18 functional categories and compares them to the previous audit. For this audit, three categories saw a significant decrease in the number of average defects per bus: Climate Control, Lights, and Structure/Chassis/Fuel Tank. Three Categories saw a significant increase: Driver's Controls, Passenger Controls, and Safety.

Nine of the active buses inspected had no defects found. In addition, as shown in **Table 3**, there were no defects found in five of the 18 functional categories for all active buses inspected: Climate Control, Destination Signs, Exhaust, Lights, and Structure/Chassis/Fuel Tank.

Defects by category for the last four audits are shown in **Table 3 which follows**. Trend tabs in the attached spreadsheet show defect trends over longer intervals.

TABLE 3 Defects by Category - Active Buses					
Defect Category	Dec. '17 Defects Avg. per Bus	Apr. '18 Defects Avg. per Bus	Aug. '18 Defects Avg. per Bus	Feb. '19 Defects Avg. per Bus	Significant Increase (+) or Decrease (-) Current vs. Prior Audit
Accessibility Features	0.17	0.15	0.19	0.21	
Air System/Brake System	0.17	0.11	0.06	0.06	
Climate Control	0.00	0.00	0.09	0.00	-

TABLE 3 <i>Defects by Category - Active Buses</i>					
Defect Category	Dec. '17 Defects Avg. per Bus	Apr. '18 Defects Avg. per Bus	Aug. '18 Defects Avg. per Bus	Feb. '19 Defects Avg. per Bus	Significant Increase (+) or Decrease (-) Current vs. Prior Audit
Destination Signs	0.09	0.02	0.04	0.00	
Differential	0.04	0.06	0.06	0.02	
Driver's Controls	0.06	0.23	0.09	0.15	+
Electrical System	0.11	0.02	0.00	0.04	
Engine/Engine Compartment	1.28	0.96	0.49	0.51	
Exhaust	0.02	0.00	0.00	0.00	
Exterior Body Condition	1.38	0.98	0.13	1.09	
Interior Condition	0.19	0.06	0.02	0.09	
Lights	0.04	0.06	0.17	0.00	-
Passenger Controls	0.00	0.00	0.00	0.06	+
Safety Equipment	1.13	0.00	0.04	0.09	+
Structure/Chassis/Fuel Tank	0.02	0.00	0.09	0.00	-
Suspension/Steering	0.34	0.04	0.04	0.09	
Tires	0.00	0.00	0.02	0.02	
Transmission	0.17	0.11	0.04	0.04	
Active Bus Defect Totals:	198	132	121	116	
Active Buses Inspected:	47	47	47	47	
Average Defects per Bus:	4.2	2.8	2.6	2.5	

As indicated above, each defect was given a severity code:

A – Indicates a critical defect that when identified during a regularly scheduled PMI requires immediate repair before the vehicle could resume revenue service.

B – Indicates a non-critical defect, the repair of which could be deferred to later time.

“A” Defect Summary – All Buses

A total of 12 “A” defects were identified for this audit for all buses inspected compared to 11 last audit and 12 the audit before last. **Table 4** which follows shows a breakdown of those defects classified under active and contingency buses.

TABLE 4 <i>A-Category Defects</i>		
Defect Category	A-Defects Active Fleet	A-Defects Contingency Fleet
Accessibility - Wheelchair related	7	
Safety Equipment - Back-up alarm	1	
Air/Brake System - Air leak	1	1
Tires - Low air	1	

TABLE 4 <i>A-Category Defects</i>		
Defect Category	A-Defects Active Fleet	A-Defects Contingency Fleet
Driver's Control - Door will not close	1	
Subtotal "A" Defects	11	1
Total "A" Defects	12	

First Transit understood they would not operate buses with "A" defects until those defects were repaired. It should be noted that not all "A" defects will keep the bus from service according to DOT standards. Air leaks, for example, have an acceptable DOT allowance and can lose three pounds of air pressure in just two minutes.

Contested Defects

First Transit did not contest any defects compared to three defects last audit. Appendix D provides further detail of contested defects (none for this audit).

Defect Analysis (Active and Contingency Buses)

Defects identified by TRC were analyzed to determine the severity or detrimental impact they pose in terms of safety, comfort and convenience, structural integrity, and life expectancy of major components.

Safety

There were 12 "A" category defects identified during this audit for all buses inspected compared to 11 found last audit. Of the 12 "A" defects, 11 should have been noted by operators during their daily inspections understanding that some may be difficult for operators to detect. There were four defects related specifically to safety equipment compared to two last audit.

Comfort and Convenience

Exteriors and interiors continue to be exceptionally clean. There were no climate control defects this audit for all buses compared to five last audit. Since August 2013 only eight climate control defects were found. There were three Passenger Control defects for this audit compared to none last audit. Interior-related defects for all buses inspected totaled four compared to the same number last audit.

Structural Integrity

There continue to be no defects that impact structural integrity.

Life Expectancy of Major Components

First Transit continued its perfect adherence to scheduled PM inspections. The changing of fluids that occurs during these inspections combined with fluid analysis maximizes the life expectancy of major components.

Regarding fluid samples taken by TRC, there were six alerts reported this audit compared to five last audit: one engine, two transmission, and three coolant. Of the six alerts, five require action to be taken before the next PM inspection. First Transit immediately responded with the action it would take in response to these alerts. The alerts are consistent with First Transit's fluid analysis program providing an early warning of potential problems as opposed to neglected maintenance.

Records also continue to show that First Transit has an aggressive program to follow up on defects noted during PMIs (i.e., getting them repaired in a timely fashion) and quickly investigating fluid sampling alerts, which together help extend vehicle and component life.

Trend Analysis

The long-term trend lines for all defects as shown in the separate spreadsheet tab continue to indicate a very gradual upwards trajectory; defects for the last three audits, however, are on a downward slope. Mechanical defects (excludes interior and exterior body defects), however, continue on a more pronounced downward slope (fewer defects). Other categories where defects are on a downward trend include Driver's Controls, Engine Compartment, Air/Brake System, Safety, Interior Body, Lights, Climate Control, Steering/Suspension, Transmission, and Passenger Controls. Categories with an overall long-term trend increase include Electrical Systems, Accessibility, and Exterior Condition. The trend for "A" defects for all buses, which had increased steadily from December of 2016 (10) to December 2017 (21), has now reversed that trend, falling to 11 last audit and increasing slightly to 12 for this audit. TRC will continue to monitor.

RECORDS REVIEW

PMI Schedule Adherence

TRC examined the records of 13 buses selected at random (12 active, 1 contingency) to determine if PMIs are being done at scheduled 6,000-mile intervals. PMI intervals are considered "on time" if performed on or before 6,600 miles ("late window" of 10% or 600 miles).

All PMI records, now filed electronically, are well organized and very easy to access and locate.

Table 5 which follows shows the PMI intervals compared to the previous PMIs performed by First Transit for each of the 13 buses selected at random.

TABLE 5		
<i>PMI Schedule Adherence</i>		
Bus #	PMI Mileage Intervals	Notes
184	6076	On time
195	5784	On time
272	5928	On time
285	6196	On time
322-C	5984	On time
349	5548	On time
355	5986	On time
369	6289	On time
386	5447	On time
291	6013	On time
1009	5951	On time
3008	5722	On time
3019	5813	On time

The review of records by TRC revealed that all 13 buses (100%) had their PM inspections done on time. The on-time performance for PMI schedule adherence remains at 100% for thirty-four consecutive audits,

an impressive accomplishment. First Transit management continues its process whereby upcoming PMIs are identified and reviewed daily to ensure on-time completion.

Repair of Defects Identified During PMIs

TRC reviewed the last three PMI e-files for all 13 buses chosen at random (39 PMI records total) to determine if repairs were performed properly and made promptly. TRC examined the PMI files to determine if First Transit has:

- A process in place to distinguish those defects identified and repaired during the PMI from those scheduled for repair at a later date; and
- Actually followed up and repaired the defects identified during the previous PMI.

Of the 39 bus records reviewed, there were six cases where similar defects seem to reappear. An in-depth review of the seven cases revealed that in all cases First Transit had deferred repairs to the next PM where action was taken to correct the defect.

With its electronic filing system, First Transit continues to have a record-keeping system that clearly distinguishes defects that get deferred or repaired as a follow-up to scheduled PM inspections.

Mechanic Training & Certification

TRC set out to determine if qualified mechanics are performing maintenance tasks by virtue of documented training and certification by selecting five HVAC repairs/inspections at random. TRC then asked First Transit to provide a copy of the repair order and the name of the mechanic performing the repair or inspection. **Table 6** which follows shows the five HVAC work orders examined.

TABLE 6 <i>A/C Repairs by Certified Mechanics</i>			
Bus #	Date	HVAC Repair	Mechanic
351	10-09-18	AC inop. Replaced leaking condenser and recharge system	Ahanda, Nickens
310	10-02-18	AC low. Replaced leaking hose and recharge system	Nickens
319	09-09-18	AC low. Replaced leaking valve and recharge system	Nanthavongsa
322	08-29-18	AC low. Repaired leaking hose and recharge system	Nanthavongsa
335	02-06-19	Freon leak. Repaired and recharge system	Nickens

TRC then compared the mechanic(s) who performed the HVAC repairs to the listing of certified technicians compiled for this audit. **Table 7** which follows shows all mechanics along with those certified to perform HVAC (refrigerant-related) repairs and their AC certification status.

TABLE 7 <i>Mechanic and Foreman Work Status</i>	
Mechanic's Name	AC Certification
Andy Velez (Foreman) (FT)	YES
S. Nanthavongsa (FT)	YES

TABLE 7 <i>Mechanic and Foreman Work Status</i>	
Mechanic's Name	AC Certification
F. Brownell (Foreman) (FT)	YES
W. Nickens (FT)	YES
R. Ahenkora (15 per week – 50%)	YES
F. Artieda (FT)	YES
J. Mitchell (30 per week – 75%)	YES
A. Romano (FT)	YES
D. Alemayehu (30 per week – 75%)	YES
A. Ahanda (30 per week – 75%)	YES
W. Morales (FT)	YES
M. Osei (FT)	YES
T. Criste (FT)	YES
M. Moore (FT)	YES
C. Graham (FT)	YES
T. Tsega (FT) (15 per week – 50%)	YES
J. Bowles (FT)	YES
B. Terrell (FT)	YES
M. Amankwah (15 per week – 50%)	YES
J. Galo (FT)	YES
F. Reinoso (20 per week – 50%)	YES
D. Betitia (Foreman) (FT)	YES
A. Gugessa	YES
D. Haile (new hire)	YES

TRC found that all HVAC repairs involving refrigerant were performed by a certified AC technician. In fact, all 26 mechanics/foremen are AC certified.

As part of this inspection, TRC also requested an updated listing of all First Transit technicians and a summary of their experience and ASE certifications to determine compliance with the following PRTC requirement:

Maintenance Personnel will be trained to proficiency on each of PRTC's vehicles and sub-systems prior to the start of service. Contractor will be required to ensure that all repairs involving warrantied vehicles, sub-systems, parts, etc., are performed at all times by maintenance personnel who are properly certified to perform such work such that qualifications cannot be questioned when submitting warranty claims. All mechanics (defined as mechanics and foremen) must have at least one ASE certification and five (5) years' experience on heavy duty trucks or buses. Alternately, mechanics may be graduates of a certified two-year technical/vocational institute and have two (2) years' experience with heavy duty trucks or buses. At least 33 percent of the maintenance staff (defined as mechanics only) shall be ASE Master Certified for medium and heavy duty trucks (or transit buses). In addition, all mechanics (defined as mechanics and foremen) shall receive a minimum of 16 hours of technical/refresher training annually.

PRTC also requires that the ratio of buses per mechanic not exceed eight. As indicated in **Table 7** above, full-time employees are classified as "(FT)"; others include the number of hours they work per week (e.g., 30 per week). Those working 15-20 hours per week are classified as 0.50; 30 per week are classified as

0.75 equivalent of a full-time worker. **Table 8** which follows shows required versus actual staffing levels, experience/certifications, and annual refresher/technical training compliance. The table is based on First Transit's current staffing levels of 21.25 full time equivalent mechanics (17 full time + 4 @ 0.50 + 3 @ 0.75 = 22.5) and three full-time foremen. There are a total of 24 maintenance employees: three full-time foremen and 21 full or part-time mechanics. Three mechanics have left PRTC and one new mechanic was hired since the last audit.

TABLE 8 <i>Mechanic Staffing Level, Certifications, and Experience</i>				
Measure	Ratio of buses to mechanics (excluding foremen)	Mechanics/foremen with ASE & 5 years exp. or voc. degree & 2 years exp.	Mechanics/w/ ASE Master Certification	Mechanics/foremen w/ min. 16 hours annual refresher/technical training
Required	Max. 8.0	100%	Min. 33% of techs	100%
Actual	7.2 (153/21.25 full time equivalent mechanics)	92% (22 of 24 total mechanics/foremen)	33% (7 of 21.25 full time equivalent mechanics)	96% (23 of 24 total mechanics/foremen)*

* One new hire has not been employed long enough to have received required 16 hours of training

Based on a review of the documentation provided, First Transit is compliant in three of the four workforce categories. Two employees do not meet the experience requirements as described above and bring compliance down to 92% instead of the required 100%. One technician has not received the minimum training requirement but has not been employed long enough to receive that training.

Management of Fluid Analysis Program

First Transit is required to send engine oil, transmission, and coolant fluid samples to a laboratory for testing and evaluation at each PMI to determine if:

- fluid samples were taken at each PMI;
- fluid records were filed and had easy access; and
- the contractor is making use of the fluids analysis results as part of its maintenance program.

Samples are sent out weekly and results are returned in about seven days. Copies are made of each report and filed; this is in addition to computerized records that First Transit maintains for each sampling. Locating fluid analysis reports for each of the 13 buses examined was again made easy because of the well-organized electronic recordkeeping system.

First Transit's fluid analysis vendor uses a coding system of 1-5, where "1" indicates the sample finding is normal and "5" indicates the most critical condition. A review of each record found that First Transit continues its practice of highlighting in yellow each lab recommendation for follow-up.

In examining the last two PMIs for each of the 13 buses selected at random (26 records), TRC found that:

- Evidence exists that in all cases fluid samples were taken at the appropriate interval.
- Recordkeeping of the fluid analysis program is adequate.

Results indicate the fluid analysis program is doing its job by providing First Transit with early warnings of potential engine and transmission-related failures. There were three cases where corrective action was

recommended by the lab for the 26 bus records reviewed for this audit. In all cases there was evidence that corrective action was taken.

TRC also drew engine, transmission, and coolant fluid samples from 13 buses selected at random (39 samples) to provide another level of fluid condition verification. The results from TRC's lab, which uses a different grading system than First Transit's lab, are shown below. In each case, First Transit responded with an action plan for resolving the deficiencies.

Engine Oil

There was one engine oil alert compared to one last audit.

272 – Caution: All wear levels appear within acceptable limits for first sample. Silicon level (dirt/sealant material) satisfactory. Water content acceptable. Fuel dilution satisfactory. Viscosity low for specified oil grade. Action: Resample at next recommended interval to monitor and establish wear trend.

FT response – PMI service coming due in about 700 miles

Transmission Fluid

There were two transmission fluid alerts compared to two last audit.

195 – Caution: Torque converter/pump wear indicated. Silicon level (dirt/sealant material) satisfactory. Water content acceptable. Viscosity within specified operating range. Action: **Resample at a reduced service interval to further monitor.**

FT response – PMI C was completed on this unit 2/19/19 and will resample on next PMI A

291 – Abnormal: Lack of information regarding time on compartment limits accuracy of diagnosis. Torque converter/pump wear indicated. Silicon level (dirt/sealant material) satisfactory. Water content acceptable. Viscosity within specified operating range. Action: **Resample at a reduced service interval to monitor and establish wear trend.**

FT response – Fluid life is nearly used up next fluid change is in 10,000 miles will resample after service gets done and on the next PMI.

Coolant

There were three coolant alert compared to one last audit.

195 – Abnormal: Glycol level is high. pH level is normal. Pressure check radiator cap, if it fails replace cap and recheck pressure. Check that proper coolant volume is being maintained. **Recommend adjust coolant to a 50/50 mix. Recommend take corrective action and resample to monitor.**

FT response – Fluid sample result verified with FT latest sample Glycol Percentage is above 50/50 Testing and adjustments will be made to correct Percentage. Radiator cap will be tested if it fails will be replaced and will change the coolant filter as well.

291 – Abnormal: Glycol level is high. pH level is normal. Pressure check radiator cap, if it fails replace cap and recheck pressure. Check that proper coolant volume is being maintained. **Recommend adjust coolant to a 50/50 mix. Recommend take corrective action and resample to monitor.**

FT response – Fluid sample result verified with FT latest sample Glycol Percentage is above 50/50 Testing and adjustments will be made to correct Percentage. Radiator cap will be tested if it fails will be replaced and will change the coolant filter as well.

1009 – Abnormal: Glycol level is high. pH level is normal. Pressure check radiator cap, if it fails replace cap and recheck pressure. Check that proper coolant volume is being maintained. **Recommend adjust coolant to a 50/50 mix. Recommend take corrective action and resample to monitor.**

FT response – Fluid sample result verified with FT latest sample Glycol Percentage is above 50/50 Testing and adjustments will be made to correct Percentage. Radiator cap will be tested if it fails will be replaced and will change the coolant filter as well.

For this audit, the number of fluid alerts from the samples taken by TRC totaled six compared to five last audit. Of the six alerts, five require corrective action before the next scheduled PM inspection. First Transit initiated corrective action as indicated above as a result of the findings. The findings are consistent with a program that provides early warning of more serious potential future problems. For alerts reported during TRC's fluid sampling last audit, there was evidence to support that First Transit followed up and took necessary corrective action as recommended by TRC's lab.

ROAD TEST INSPECTION

TRC conducted a road test of 13 buses selected at random after the static inspections had been conducted. The road testing began during the October 2007 audit. As indicated earlier, a protocol for assigning any defects identified during the road test was established for this audit. Road test defects are classified as those that would render a vehicle out of service or not according to PRTC's "Out of Service Defects – While Operating" criteria. The Road Test protocol is fully described in Appendix E.

Defects identified during the road tests are not included with the static inspection defects to maintain consistency with previous audits where road tests were not part of the audit. Details of any road test defects found are shown in the "Road Test Defects" tab of the attached spreadsheet.

No road test defects were found this audit compared to none last audit. A historical summary of road test defects, including those that would render a bus out of service, is shown in **Table 9**.

TABLE 9 <i>Summary of Road Test Defects</i>					
	Aug. '17	Dec. '17	Apr. '18	Aug. '18	Feb. '19
Total Road Test Defects	0	3	1	0	0
Out-of-Service Total	0	0	1	0	0
Nature of Out-of-Service Defect(s)	n/a	n/a	Erratic acceleration	n/a	n/a

ANALYSIS OF CONTINGENCY BUSES INSPECTED

The four contingency buses inspected averaged 3.3 defects per bus compared to 4.8 defects last audit and 11 the audit before last. The active bus fleet averaged 2.6 defects per bus by comparison. TRC will continue to monitor contingency buses. There were no "A" defects found on contingency buses for this audit compared to one last audit.

No contingency bus was found with an abnormal fluid finding.

A historical summary of contingency bus defects compared to the active fleet is shown in **Table 10**.

TABLE 10 <i>Summary of Contingency Bus Defects</i>				
	Dec. '17	Apr. '18	Aug. '18	Feb, '19
Total Defects - Contingency Bus	44	19	13	15
Average Defects per Contingency Bus	11.0	4.75	3.25	3.75
Average Defects per Active Bus	4.2	2.8	2.6	2.5
Average # of "A" Defects per Bus: Contingency Fleet	0.5	0.25	0.0	0.25
Average # of "A" Defects per Bus: Active Fleet	0.40	0.23	0.21	0.23

All contingency buses selected at random for inspection were inspected first to determine if their engines would start -- an indication if First Transit is keeping the fleet ready for operation. Of the four contingency buses inspected, all started this audit compared to the same number last audit.

ANALYSIS OF ALL CONTINGENCY BUS RECORDS

An analysis of all Contingency Bus records was conducted to determine if First Transit is meeting its contractual requirements to conduct the following:

- Perform PMIs twice per year, including oil and filter changes
- Keep batteries charged, air systems operational, etc.
- Maintain current state inspections
- Operate buses frequently and for substantial periods of time (minimum 30 miles per month)

It was agreed that a minimum of 30 miles per month (360 miles per year) would be sufficient for the contingency fleet, and two full PMs including oil and filter changes would be conducted annually regardless of accumulated mileage and regardless of the number of specialized "Contingency Bus Inspections" already conducted to check safety items. It was also agreed that subsequent audits would first begin with an inspection of the Contingency Buses selected for the audit as a way to determine if buses would start and, therefore, be ready for service on a moment's notice if needed. The 30-miles-per-month-per-contingency-bus requirement will be monitored and is subject to change.

A review of all Contingency Buses in meeting contract requirements is shown in **Table 11**. The number of designated Contingency Buses in the fleet totaled eleven this audit compared to nine last audit. The review revealed all of the eleven Contingency Buses received a minimum of two full PMIs during the past year. The review also indicated that six of the eleven Contingency Buses showed activities related to battery maintenance, and six buses had air system maintenance activity. It should be noted that not all buses need this service within a three-month period. As mentioned above, all Contingency Buses inspected did start prior to conducting the inspections. **Table 11** also shows that all annual state inspections are current.

TABLE 11 <i>Review of Contingency Bus Records</i>				
Bus Number	Last Two PMs Performed	Batteries Charged & Air Systems	Valid State Inspections	Miles Traveled Per Month (30 min.) Last 90 Days*
262	07/13/18 02/02/19	Change alternator: 11/14/18 Replace batteries 02/01/19 No air system activity found	Yes	November - 160 December - 251 January - 383
267	08/1/17 02/02/19	Replace batteries: 01/03/19 No air system activity found	Yes	November - 63 December - 117 January - 1009
268	08/1/18 11/22/18	No battery activity found No air system activity found	Yes	November - 874 December - 1708 January - 244
304	11/21/18 01/08/19	Replace batteries: 04/23/18 Air dryer: 12/04/18	Yes	November - 3485 December - 4677 January - 2992
313	11/28/18 01/11/19	No battery activity found Air dryer: 12/04/18	Yes	November - 4030 December - 4001 January - 4384
317	10/30/18 01/03/19	No battery activity found No air system activity found	Yes	November - 1953 December - 4389 January - 3747
320	10/31/18 01/07/19	Replace batteries: 02/05/19 Air dryer: 11/29/18	Yes	November - 1679 December - 4297 January - 3534
321	11/21/18 01/24/19	No battery activity found Air dryer: 02/15/19	Yes	November - 3828 December - 4385 January - 4067
322	11/01/18 01/11/19	Replace batteries: 11/21/18	Yes	November - 769 December - 3669

TABLE 11 <i>Review of Contingency Bus Records</i>				
Bus Number	Last Two PMs Performed	Batteries Charged & Air Systems	Valid State Inspections	Miles Traveled Per Month (30 min.) Last 90 Days*
		Air dryer: 11/28/18		January - 3161
329	12/17/18 02/05/19	Replace batteries: 04/20/18 Air dryer: 08/23/18	Yes	November - 3647 December - 4096 January - 3795
332	11/02/18 02/02/19	No battery activity found No air system activity found	Yes	November - 3029 December - 3710 January - 3285

* Note: Many of the Contingency Buses were recently in active service.

Additional Contingency Bus Records Inspection

As noted in Table 11 above, the average defects for the Contingency Bus fleet equaled 3.75 per bus compared to 2.5 for the active fleet, which is similar to last audit (3.3 versus 2.6). Contingency bus defects have fallen to an average of 3.9 defects per bus over the past three audits compared to an average of 11 per bus in December of 2017. It should be noted that direct comparisons between the two fleets is difficult to make because of the small sampling size of the Contingency Bus fleet. Contingency Buses are also older and are driven less frequently than active buses, which typically results in a higher number of defects. TRC will continue to conduct a separate analysis for this subfleet to include if operators are reporting defects as part of their pre and post trip inspections.

Of the four Contingency Buses inspected, the analysis found eight of the 15 defects identified were ones that an operator should have noted (see **Table 12**). Of the eight defects that an operator should have noted, none were found in the Zonar records. Last audit, operators also failed to note such defects.

Table 12 <i>Additional Review of Contingency Bus Records</i>			
Bus Number	Defects that Should Have Been Identified by Operator	Zonar Record	Action Taken by First Transit
317	- Wheelchair curb light inop - Air leak at front door dump valve - Front destination sign inop - Body damage C/S front	- No such defects noted	n/a
262	- Front destination sign inop	- No such defect noted	n/a
322	- Air pressure gauge light inop - Reading lights inop	- No such defect noted - No such defect noted	n/a n/a
267	- Wheel flare C/S missing	- No such defect noted	n/a

RECOMMENDATIONS

Given the current level of maintenance performance, there are no specific maintenance-related recommendations except to continue taking steps to reduce exterior-related defects, engine/engine compartment defects, contingency bus defects, and “A” defects. In addition, however, operators need to be trained to note more defects on their Zonar records. Of the eight defects that an operator should have noted, none were found in the Zonar records. Last audit, operators also failed to note such defects.

APPENDIX A – List of Buses Inspected

BUSES INSPECTED		
FLEET INSPECTION	RECORDS & FLUIDS ANALYSIS	ROAD TEST INSPECTION
2005-06 GILLIG 40’ Phantom 184-188		13 Road Test need to be done at random, one of which needs to be a Contingency Bus
184	184	
188*		188
2010-12 GILLIG 40’ LF 189-199,1000-1002		
191		
194		
195	195	
197		
1000		1000
2004-13 GILLIG 30’ 262, 267-288		
262-C		
267-C		
272	272	
273		
279		279
284		284
285	285	
2002 MCI 300-337		
317-C		
322-C	322-C	322-C
2003-06 MCI 338-360		
338		
343		343
345		
349	349	
350		350
352		

BUSES INSPECTED		
FLEET INSPECTION	RECORDS & FLUIDS ANALYSIS	ROAD TEST INSPECTION
355	355	
360		
2008-14 MCI 361-393		
362		
365		
369	369	
370		370
373		373
378		
382		
386	386	
388		
391		
393		
2016 Gillig 1003-1009		
1007		
1009	1009	1009
2016 Gillig Low Floor 289-294		
289		
291	291	291
2017 MCI 394-398		
395		
398		
2019 MCI 3000-3036		
3001		
3005		
3008	3008	
3012		3012
3014		
3019	3019	
3024		3024
3027		
3030		
3034		
TOTAL: 51 47 Active 4 Cont.	TOTAL: 13 12 Active 1 Cont.	TOTAL: 13 12 Active 1 Cont.

* Changed for 186

APPENDIX B – Evaluation Criteria & Methodology

TRC continued its audit process of evaluating fleet condition, records, fluids, and worker certification/training using identical procedures from the previous audits. A team of three bus inspectors was assigned to physically inspect the buses, conduct road tests, and draw oil samples. A separate Project Manager organized the overall inspection process, performed the Records and Fluids Analysis Audit, and prepared the final report.

The material which follows describes the evaluation criteria and methodology used by TRC to conduct the various audit inspections.

Fleet Inspection

Specific defects noted during the bus inspections were classified under 18 functional categories:

- 1) Accessibility Features
- 2) Air System/Brake System
- 3) Climate Control
- 4) Destination Signs
- 5) Differential
- 6) Driver's Controls
- 7) Electrical System
- 8) Engine Compartment
- 9) Exhaust
- 10) Exterior Body Condition
- 11) Interior Condition
- 12) Lights
- 13) Passenger Controls
- 14) Safety Equipment
- 15) Structure/Chassis/Fuel Tank
- 16) Suspension/Steering
- 17) Tires
- 18) Transmission

An “A/B” designation system was used to denote defects requiring immediate repair from those that could be repaired at a later time.

A – Indicates a critical defect that when identified during a regularly scheduled PMI requires immediate repair and would keep the vehicle from returning to revenue service until the defect is corrected.

B – Indicates a non-critical defect, the repair of which could be deferred to a later time.

“A” category defects were agreed upon by PRTC and First Transit early in the audit process and remain the same to keep audit comparisons consistent. A copy of the “A” defects used for all audits is attached as Appendix B. TRC informed First Transit management of “A” category defects as soon as they were

identified, which First Transit repaired immediately or scheduled for repair soon afterwards. First Transit was given an opportunity to contest defects as soon as they were brought to their attention.

TRC shared the entire list of preliminary defects found during each day's inspections with First Transit management with the understanding that the defects would need to be reviewed by TRC and may change based on that review. The sharing of defects is intended to keep First Transit informed of TRC's findings as part of a cooperative and objective evaluation process. TRC inspectors also worked with First Transit personnel to confirm operation of certain controls in advance to ensure that defects were legitimate and not the result of the inspectors not being familiar with specific PRTC bus equipment. If there was any doubt about a defect, TRC either removed it from the list or downgraded "A" defects to "B" level status.

Records and Fluids Analysis Audit

Thirteen buses were selected at random by PRTC for the Records and Fluids Analysis Audits. The records examination set out to determine if:

- Preventive maintenance (PM) had been performed correctly and at prescribed intervals;
- Repairs had been performed properly and made promptly;
- Qualified mechanics performed maintenance tasks by virtue of documented training certification; and
- The fluids analysis program is being administered properly.

PM Intervals

To determine if preventive maintenance inspections (PMIs) were performed correctly and on time, TRC examined the PMI records of the thirteen buses selected at random. Mileage between the last two PMIs was calculated to determine if the inspections were performed on time (within 10% or 600 miles of the scheduled 6,000-mile interval).

Repairs

To determine if repairs were performed properly and made promptly, two audit procedures were used:

- 1) PMI sheets going back three PMIs were examined for each of the thirteen buses selected at random to determine if and when defects noted during the PMI process were repaired.
- 2) Defects from the previous PMIs were then compared to determine if any defects were repeated from one PMI to the next.

From this comparison TRC could determine if the defects were repaired or if they were simply noted on subsequent inspections.

Mechanic Qualification

To determine if qualified mechanics performed maintenance tasks by virtue of documented training and certification, TRC selected five (5) air conditioning (AC) repairs at random from the work orders.

TRC examined AC-related work orders to identify a) the nature of the repair, and b) the mechanics performing the actual work. TRC then compared the name of the mechanic performing the repair to the list of AC certified technicians that TRC updated with First Transit to determine if the technicians were certified to perform the tasks. Technicians performing routine mechanical tasks to AC systems (i.e., those that do not involve refrigerant) are not required to be certified.

TRC also collected and reviewed a listing of Automotive Service Excellence (ASE) certifications and work experiences of all First Transit mechanics to allow PRTC to determine compliance with established requirements.

Fluids Analysis Management

To determine if the fluids analysis program is being administered properly, TRC examined oil analysis records for each of the thirteen buses selected at random for the Records Inspection. TRC noted if the fluid analysis was being performed at the appropriate PMI interval, if fluid analysis records were properly filed for easy reference, and if any actions were being taken as a result of the fluid analysis findings.

TRC also drew engine oil, transmission fluid, and coolant samples from thirteen buses selected at random and reviewed those results (39 samples total). In reviewing the results, TRC looked for evidence of inappropriate levels of deterioration. TRC also looked for evidence that First Transit is making use of the fluids analysis results. In addition, TRC reviewed the actions recommended by the lab for the samples it took during the last audit to determine if First Transit did, in fact, act on those recommendations.

Road Test Protocol

A defined protocol based on PRTC's "Out of Service Defects While Operating" list was used for assigning defects identified during the road test of 13 buses. All road test defects continue to be listed separately and are not included in the fleet defect totals. Instead of assigning an "A" or "B" designation as is done with static inspection defects, road test defects are classified as either:

- Those that in the opinion of the operator would render the vehicle out of service according to PRTC's "Out of Service Defects While Operating" list.
- Those that would not render the vehicle out of service in the opinion of the operator.

PRTC's "Out of Service Defects While Operating" list is attached as Appendix F, which also describes the entire Road Test Protocol as agreed to by PRTC and First Transit.

Contingency Bus Records Review

A review of all contingency bus records (9 in total for this audit) was made to determine if contract obligations are being met by First Transit to:

- Conduct a minimum of two PM inspections annually, including oil and filter changes
- Make sure batteries are charged and air systems operational
- Make sure current annual state inspections are maintained
- Make sure buses are operated frequently and for sustained periods of time (minimum 30 miles per month).

**APPENDIX C – Excel Spreadsheet Reports
(Attached as a CD)**

- Defect Summary – All Buses
- Defect Summary – Active Buses
- Defect Summary – Contingency Buses
- Static Defects – All Buses
- Road Test Defects – All Buses
- Defects by Category – All Buses
- “A” Defects – All Buses
- Static Defects – Active Buses
- Road Test Defects – Active Buses
- Defects by Category – Active Buses
- “A” Defects – Active Buses
- Static Defects – Contingency Buses
- Road Test Defects – Contingency Buses
- Defects by Category – Contingency Buses
- “A” Defects – Contingency Buses
- Defect Category Trends – Active Buses
- All Buses Inspected
- Active Buses Inspected
- Contingency Buses Inspected

APPENDIX D – Listing of “A” Category Defects

PRTC “A” Defect List

- Fire extinguisher (expired tag OK unless indicator in red)
- Headlights
- Wipers (either)
- Cracked windshield in driver’s view (larger than a quarter)
- Seat belts, driver
- Turn signals
- Horn
- Emergency flashers
- Brake lights (more than one)
- Air pressure/Air leaks (except series 60 EGR engines at dryer and air operated wipers on delay)
- Brake lining thickness @ 7/32-inch; Disc lining at 1/8-inch
- Tire tread depth @ 2/32 rear; 4/32 front
- Fuel leak
- Exposed wires (insulation missing)
- Oil/Grease on brakes (saturated)
- Wheelchair lift/Ramp & securement
- Sharp edges – interior
- Tripping hazard – interior
- Critical steering/Suspension play, wear
- Sensitive edges – doors – not working at all
- Tire pressure below 80 psi (tag tires 70 psi)
- Wheel lug nuts
- Exhaust leak into bus
- Back-up alarm
- Excessive slack adjuster throw: 30=2”; 36=2.5”
- Emergency window won’t open

APPENDIX E – Listing of Contested Defects and TRC Response (none for this audit)

Bus Number	Defect and Reason for Being Contested	TRC Response

APPENDIX F – Road Test Protocol

A) Process

First Transit assigns consistent operator(s) to road test approximately 25% of buses selected for each maintenance audit. The process consists of a TRC inspector accompanying the operator during the road test, asking questions if needed to ensure the operator has not overlooked a defect.

Defects and abnormalities are classified as either:

- Those that in the opinion of the operator would render the vehicle out of service according to PRTC's "Out of Service Defects – While Operating" list (see below).
- Those that would not render the vehicle out of service in the opinion of the operator.

Defects that render the vehicle out of service are then inspected by First Transit with a TRC inspector serving as an observer. First Transit indicates the findings of their investigation to the TRC inspector along with the proposed corrective action (if any). The TRC inspector records this information and gains concurrence from First Transit that the report is accurate. The TRC inspector then adds his observations separately.

All road test defects and reporting are itemized separately in the Audit Report and are not counted or reported with the static defect totals.

B) Out of Service Defects – While Operating

Per the PRTC/First Transit Bus Service Operating Procedures, the following items require the operator to stop the bus as soon as it is safe to do so and contact dispatch. If they occur during a road test, they will be noted as such in the Audit Report.

1. Transmission
 - a. slips
 - b. will not shift
 - c. overheats
2. Engine Problems
 - a. hot engine
 - b. cuts off
 - c. unusual acceleration (e.g., bucks, hesitates, sticking accelerator)
3. Oil System Problems
 - a. Oil light
 - b. Severe oil leak
4. Air System Problems
 - a. No or low air pressure (under 80 psi)
5. Brake System Problems
 - a. Hot brakes or wheels
 - b. Slack brakes

6. Fuel leak or smell
7. Excessive steering condition
8. Exhaust fumes leaking into bus (obvious smell)
9. Inoperative defroster system
10. Flat tire(s)
11. Inoperative windshield wiper(s)
12. Any other defect rendering the vehicle unsafe to operate