

Your Ref: TP/IP/67127/2018
Our Ref : CI/TPD19007272/P

17th May 2019

Fatal Accident Investigation Team

Traffic Police Department
Singapore Police Force
10 Ubi Avenue 3
Singapore 408865

MECHANICAL INSPECTION REPORT OF MOTOR BUS PC 6001C

1. I refer to your request on 29th April 2019 to conduct a physical inspection of a motor bus bearing registration number PC 6001C (herein referred to as "**Motor Bus**"), which was involved in a fatal road traffic accident on 05th December 2018.
2. The objective of this inspection is to determine if there was any possible mechanical failure to the Motor Bus that may have contributed to the accident.
3. Following the request, I had carried out a physical inspection of the Motor Bus on 15th May 2019 at the premises of Traffic Police vehicle pound, 517 Airport Road Singapore 539942. I now set out below my observations and comments with respect to this inspection.

General Condition

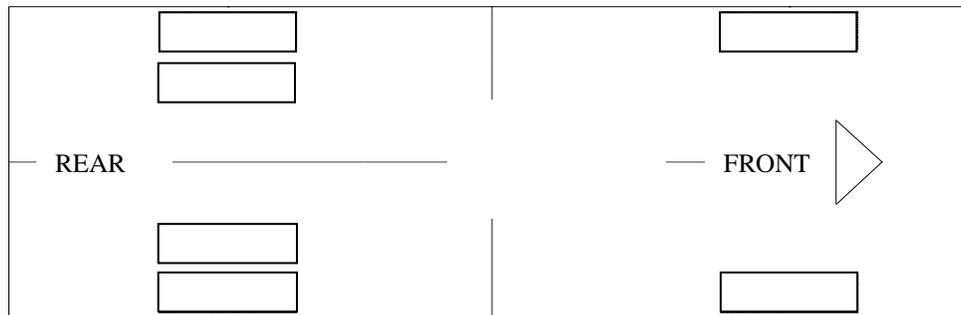
4. The mileage of the Motor bus at the time of my inspection was 267,652km.
5. The Motor Bus was observed to have sustained relatively minor damage to the front portion. Its left bumper was damaged as a result of the accident.

Tyres and Wheel Rims

6. The 6 tyres fitted on the Motor Bus were all observed to be in serviceable condition and sufficiently inflated for vehicular operation. I did not find any tear, cut or burst mark(s) on the outer and the inner sidewalls as well as across the tread of the 6 tyres. The tyre brand, tyre size and remaining tread depth of the Motor Bus's 6 tyres were recorded as follows:-

Aeolus 295/80 R22.5 (7.7mm)

Akina 295/80 R22.5 (13.6mm)



Aeolus 295/80 R22.5 (4.5mm)

Aeolus 295/80 R22.5 (6.7mm)

7. The 6 tyres were observed to be wrapped around standard alloy wheel rims that were found to be without any damage. See photo 1 – 10 below.



Photo 1 shows the mileage of the Motor bus at the time of my inspection was 267,652km.



Photo 2 shows a general view of the front of the Motor Bus was observed to have sustained relatively minor damage to the front portion. Its left bumper was damaged as a result of the accident.



Photo 3 shows a close up view of the front of the Motor Bus's left bumper (arrowed) that was damaged as a result of the accident.



Photo 4 shows a general view of the right side of the Motor Bus was observed to be in good condition at the time of my inspection.



Photo 5 shows a general view of the left side of the Motor Bus was observed to be in good condition at the time of my inspection.



Photo 6 shows a general view of the rear of the Motor Bus was observed to be in good condition at the time of my inspection.



Photo 7 shows the condition of the front left tyre of the Motor Bus, which was observed to be in serviceable condition with remaining tread depth of approximately 13.6mm. The tyre, which was wrapped around standard alloy wheel rim, was also observed to be sufficiently inflated for vehicular operation with no tear, cut or burst mark(s) on the outer and the inner sidewalls.



Photo 8 shows the condition of the front right tyre of the Motor Bus, which was observed to be in serviceable condition with remaining tread depth of approximately 6.7mm. The tyre, which was wrapped around standard alloy wheel rim, was also observed to be sufficiently inflated for vehicular operation with no tear, cut or burst mark(s) on the outer and the inner sidewalls.



Photo 9 shows the condition of the rear left tyres of the Motor Bus, which were observed to be in serviceable condition with remaining tread depth of approximately 7.7mm. The tyres, which were wrapped around standard alloy wheels rims, were also observed to be sufficiently inflated for vehicular operation. There was also no damage found on all the 6 alloy wheel rims of the Motor Bus.



Photo 10 shows the condition of the rear right tyres of the Motor Bus, which were observed to be in serviceable condition with remaining, tread depth of approximately 4.5mm. The tyres, which were wrapped around standard alloy wheel rims, were also observed to be sufficiently inflated for vehicular operation with no tear, cut or burst mark(s) on the outer and the inner sidewalls. There was also no damage found on all the 6 alloy wheel rims of the Motor Bus.

Engine Compartment & Operating Fluids

1. Upon examination of the Motor Bus engine compartment, I had observed all the parts and components inside the engine compartment to be intact and unaffected by the accident. The brake fluid, engine oil, power steering fluid and engine coolant were all found to be of sufficient level for operating purposes. Visually, there was also no contamination found to these fluids.
2. Further examination of the engine compartment revealed, there was no sign(s) or indication(s) of fresh fluid leakage and/or fluid stain within the engine compartment of the Motor Bus.
3. My subsequent checks on the underside of the Motor Bus also revealed no fluid stain. Visually, the various undercarriage components of the Motor Bus were all observed to be intact and without any visible damage. See photo 11 – 15 below.



Photo 11 shows a general view of the Motor Bus engine compartment, which was accessed by lifting the rear exterior cabin of the Motor Bus. The various parts and components inside the engine compartment were unaffected by the accident. There was also no sign(s) or indication(s) of fresh fluid leakage and/or fluid stain within the engine compartment (photograph shows the engine compartment as viewed from the rear of the Motor Bus).



Photo 12 shows the air in the air brake cylinder of the Motor bus at the time of my inspection. The air in the cylinder (arrowed) was observed to be of sufficient level & serviceable at the time of the accident.



Photo 13 shows the engine coolant reservoir level of the Motor bus at the time of my inspection. The engine coolant was observed to be of sufficient level (arrowed) and without any visible contamination.



Photo 14 shows the power steering fluid reservoir of the Motor bus at the time of my inspection. The power steering fluid was observed to be of sufficient level (arrowed) and without any visible contamination.



Photo 15 shows the engine dip stick of the Motor bus at the time of my inspection. The engine oil was observed to be of sufficient level and without any visible contamination.

Steering System & Braking System

4. Static brake tests conducted on the Motor bus revealed no abnormality. The brake booster had responded well to the various tests conducted. There was also no abnormal movement of the brake pedal when it was depressed. In general, the static brake tests had suggested that there was no internal leakage of pressure/vacuum in the braking system of the Motor bus. The braking system of the Motor bus was likely to be in serviceable condition at the material time. This was also taking into consideration that the brake fluid was of sufficient level, and also that there was no sign(s) of brake fluid leakage along the brake hoses and brake pipes.
5. Static test on the steering system of the Motor bus also revealed no abnormality to the steering system. I did not experience any abnormal free play and/or other resistance when turning the steering wheel left and right to full lock positions. My visual examination of the various steering components which had included the rack and pinion, tie rods, tie rod ends and ball joints had revealed that these components were all generally in good condition. See photo 16 - 18 below.



Photo 16 shows the front underside of the Motor Bus. My visual checks on the various mechanical components of the steering system like the steering box, steering shaft and steering linkages (arrowed) amongst others revealed all to be intact and in good condition.



Photo 17 shows the undercarriage components at the front right wheel of the Motor Bus. The various undercarriage components of the Motor Bus were all observed to be intact and without any visible damage. This had included the steering rack and steering ball joints (arrowed) of the Motor Bus. Visual examinations of the mechanical components of the steering system appear to indicate that the Motor Bus's steering system was in serviceable condition.



Photo 18 shows the undercarriage components at the front left wheel of the Motor Bus. The various undercarriage components of the Motor Bus were all observed to be intact and without any visible damage. This had included the steering rack and steering ball joints (arrowed) of the Motor Bus, which were observed to be securely attached to the front left wheel and front right wheel.

6. The braking system of the Motor Bus was noted to be of a full air-assisted braking system. Briefly, in this system, compressed air is used to press onto the brake shoes (for drum brakes) or onto the brake pads (for disc brakes), through the respective braking mechanism, thus slowing the rotation of the wheels.
7. In general, my visual inspection of the mechanical components of the Motor Bus's braking system appear to suggest that its braking system was in serviceable condition at the material time of accident. See photo 19 - 24 below.



Photo 19 shows a general view of the air tank, valves, pipes and hoses, which are some of the components for the air-assisted braking system of the Motor Bus, observed to be intact and without any visible damage.



Photo 20 shows the brake air cylinder and air pipes at the front left wheel of the Motor Bus. My visual inspection of the mechanical components of the Motor Bus's braking system appear to suggest that its braking system was in serviceable condition at the material time of accident.



Photo 21 shows the brake air cylinder and air pipes at the front right wheel of the Motor Bus. My visual inspection of the mechanical components of the Motor Bus's braking system appear to suggest that its braking system was in serviceable condition at the material time of accident.

Electronic Safety Systems

8. The Motor bus automatic self-test of the functionality of its various electronic operating systems like the Anti-Lock Brake System (ABS) & Traction Control (TC) during cranking of the engine had indicated that these systems were in working condition and without abnormality.



Photo 22 shows the warning light for Anti-Lock Brake System (ABS) and Traction Control (TC) (arrowed) appearing on the instrument panel of the Motor Bus during the self-test of its various electronic operating systems when its engine was cranked.



Photo 23 shows no warning lights illuminated on the instrument panel of the Motor Bus after the engine was cranked. This would suggest that there was no abnormality to the various electronic operating systems of the Motor Bus, like the ABS and TC etc.

Operational Behaviour of the Motor Bus

9. A short operational test of the Motor bus, to primarily determine whether there was any abnormality to its various operating systems like its engine system, its transmission system, steering system and braking system was subsequently carried out. The test was conducted by driving the Motor bus forward, stopping, before reversing and coming to a stop again.
10. During the operational test, the various transmission gears of the Motor bus were able to be engaged without any difficulty by the automatic shifting of the gears. There were no abnormal sounds heard and/or abnormal behaviour of the Motor bus engine system. It was able to move forward and backward normally. The braking system was also found to be in working condition as the Motor bus was able to slow down and come to a complete stop upon depressing of the brake pedal.



Photo 24 shows the front right wheel of the Motor bus turned to its full left. During my steering system test, I did not experience any abnormal free play and/or resistance when I had turned the steering wheel towards full left and full right. This would suggest that the steering system of the Motor bus was likely to be in serviceable condition at the material time of accident.

Conclusion

11. From my physical inspection of the Motor bus, it appears that its engine system, steering system, braking system and transmission system were all in serviceable condition. I did not find any evidence(s) to suggest that there was possible mechanical failure to the Motor bus that may have caused and/or contributed to the accident. This is also taking into consideration that the operational test of the Motor bus, which I had conducted, did not produce any sign(s) or symptom(s) to suggest that there was any abnormality to its various operating systems.
12. The 6 tyres fitted on the Motor Bus were also found to be in serviceable condition. There was no tear, cut or burst mark(s) on the outer and the inner sidewalls as well as across the tread of the 6 tyres. The 6 tyres were sufficiently inflated for vehicular operation with remaining tread depth of approximately 4.5mm to 13.6mm.

Sherwin Beh

Technical Investigator

Ang Bryan Tani

AMSOE, AMIRTE, AFF SAE, M.MATAI, AFF.Inst.AEA

Senior Technical Investigator

Technical Investigation & Reconstructionist (SAE-A)

DISCLAIMER OF LIABILITY TO THIRD PARTIES: - This Report is made solely for the use and benefit of the Client named on the front page of this Report. No liability or responsibility whatsoever, in contract or tort, is accepted to any third party who may rely on the Report wholly or in part. Any third party acting or relying on this Report, in whole or in part, does so at his or her own risk.