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Your Ref: F/IP/03085/2018 08 June 2019
Our Ref: CI/SPF19010230/D

Ang Mo Kio Division
Singapore Police Force
51 Ang Mo Kio Avenue 9
Singapore 569784

Attn: Investigation Officer Daryl Chan

MECHANICAL INSPECTION REPORT OF AN ELECTRIC SCOOTER

1. I refer to your request on 27 May 2019 to conduct a physical inspection of an electric scooter.

2. The objective of the inspection is to determine if there was any possible mechanical issue to the operating behaviour of the electric scooter.

3. Following the request, the electric scooter was transported to Block 5035 Ang Mo Kio Avenue 3 #01-355 Singapore 569538, by the Investigation Officer on 04 June 2019. A physical inspection, which includes dismantling of several parts and components of the electric scooter, were thereafter carried out.

4. I now set out below my observations and comments with respect to this inspection.

General Condition

5. The electric scooter was observed to be without any physical damage. It was fitted with 2 wheels. The tyres fitted were observed to be of serviceable condition with the tread pattern clearly visible. See photo 1 – 10 below.

6. The length, width and weight were recorded as follows: -

Length	110cm	(leading edge of front tyre to trailing edge of rear tyre)
Width	70cm	(edge of left side to edge of right side of handle bar)
Weight	26.60kg	

7. The electric motor and battery fitted on the electric scooter were checked and the following power rating information were recorded: -

Electric motor	600 Watt
Battery	52 Volt with 26 Ampere/Hour

Photo 1 shows a general view of the electric scooter that I had inspected. The electric scooter was observed to be without any physical damage.

Photo 2 shows a general view of the handle bar of the electric scooter.

Photo 3 shows a general view of the frontal body and front tyre of the electric scooter. The front tyre fitted on the electric scooter was observed to be of serviceable condition with the tread pattern clearly visible.

Photo 4 shows the rear tyre that was fitted on the electric scooter. The rear tyre was observed to be of serviceable condition with the tread pattern clearly visible.

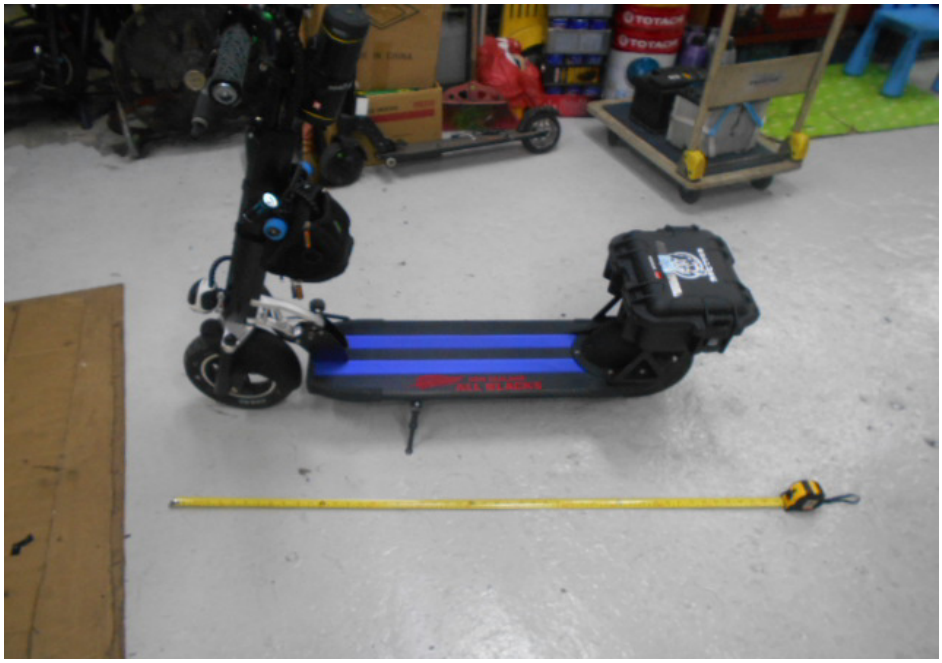

Photo 5 shows measurements being carried out to the electric scooter. The length of the electric scooter was measured to be 110cm while the width of the electric scooter was measured to be 70cm.

Photo 6 shows the electric scooter being weighed on a digital weighing scale. The yellow plastic chair supporting the electric scooter on the weighing scale was to prevent the tyres of the electric scooter from touching the ground during the weighing. The digital weighing scale was first calibrated to zero when the yellow plastic chair was placed on the scale.

Photo 7 shows the weight of the electric scooter that was recorded by the digital weighing scale. The weight recorded was 26.60kg.

Photo 8 shows the electric motor that was fitted on the rear wheel of the electric scooter. The power rating of the electric motor was observed to be 600 Watt (arrowed). The motor in this electric motor turns/rotates when electric power is supplied from the battery of the electric scooter.

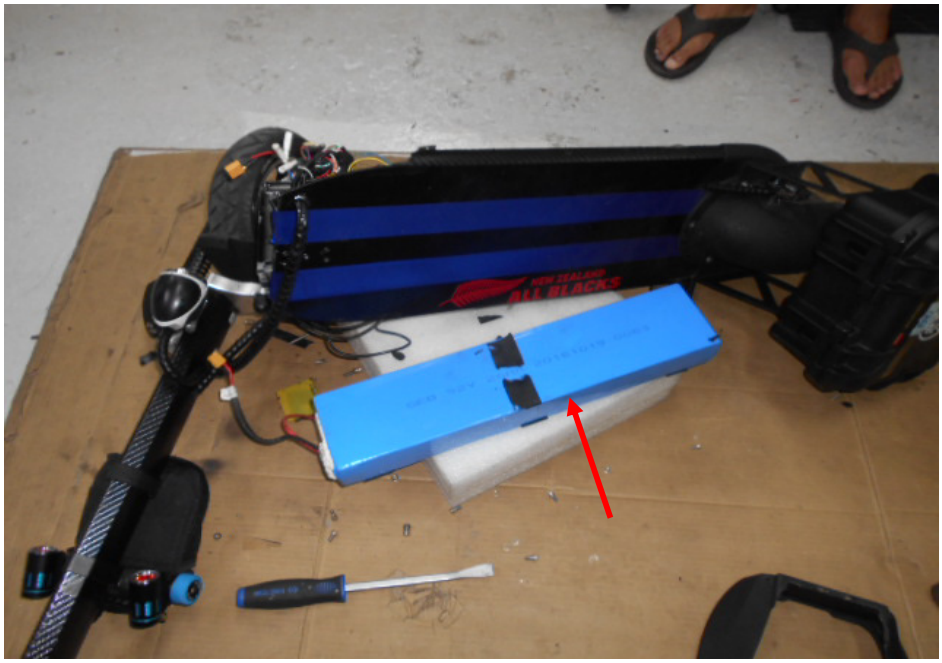

Photo 9 shows the battery (arrowed) that was fitted on the electric scooter after it was removed from within the standing board of the electric scooter.

Photo 10 shows the battery fitted on the electric scooter was a 52 Volt with 26 Ampere/hour battery. This battery supplies the electric power to the electric motor in order for the electric scooter to accelerate/move.

Operating Description of the Electric Scooter

8. The acceleration/movement function of the electric scooter is via a lever which acts as a throttle. This lever is located towards the right side of the handle bar. When manually depressed, the electric scooter will accelerate/move. To maintain acceleration/movement, the lever will have to be continuously depressed.

9. When this lever is depressed, electric power from the battery of the electric scooter is supplied to the electric motor that is fitted at the rear wheel. The motor in the electric motor then turns/rotates resulting in the rear wheel of the electric scooter to also turn/rotate. This allows the electric scooter to accelerate/move. See photo 11 & 12 below.

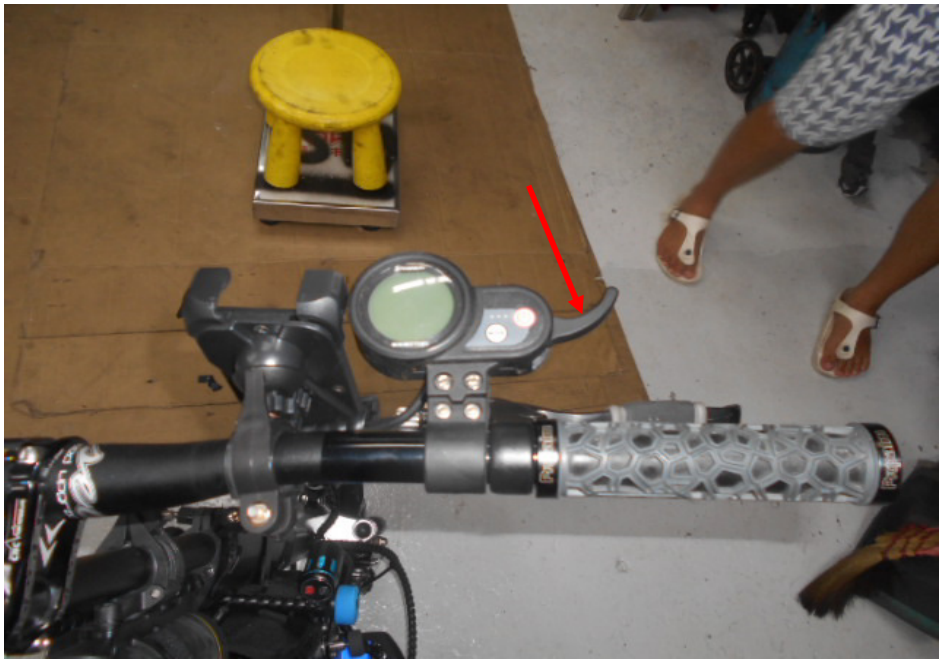

Photo 11 shows the lever (arrowed) for the acceleration/movement function of the electric scooter. When this lever is depressed, electric power from the battery of the electric scooter is supplied to the electric motor that is fitted at the rear wheel. The motor in the electric motor then turns/rotates resulting in the rear wheel of the electric scooter to also turn/rotate. This allows the electric scooter to accelerate/move.

Photo 12 shows the lever (arrowed) for the acceleration/movement function of the electric scooter being depressed with the speed (arrowed) of the electric scooter displayed on the digital meter. To maintain acceleration/movement, the lever will have to be continuously depressed.

10. The stopping function of the electric scooter is via 2 levers that are located, one at the right side of the handle bar and the other at the left side of the handle bar. The lever at the right side operates the brake for the front wheel while the lever at the left side operates the brake for the rear wheel. The 2 levers can be depressed simultaneously to operate the brake for the front wheel and rear wheel; or individually depressed to operate the respective brake for the front wheel or the rear wheel. Both the 2 levers are operated manually.

11. When the lever(s) is depressed, the brake is activated by cable and spring pushing the brake pads to clamp onto the brake disc at the wheels of the electric scooter. Frictional resistance from this clamping action reduces the rotation of the wheels, hence creating the braking effect for the electric scooter. See photo 13 – 15 below.

Photo 13 shows the levers that operates the braking function of the electric scooter. The lever (red arrow) at the right side of the handle bar operates the brake for the front wheel while the lever (yellow arrow) at the left side of the handle bar operates the brake for the rear wheel. The levers can be simultaneously depressed or individual depressed.

Photo 14 shows the braking components at the front wheel of the electric scooter. When the front brake lever of the electric scooter is depressed, the brake pad (red arrow) is pushed towards the brake disc (yellow arrow) via cable and spring. The brake pad clamps against the brake disc providing the frictional resistance to reduce the rotation of the front wheel, hence creating the braking effect for the electric scooter.

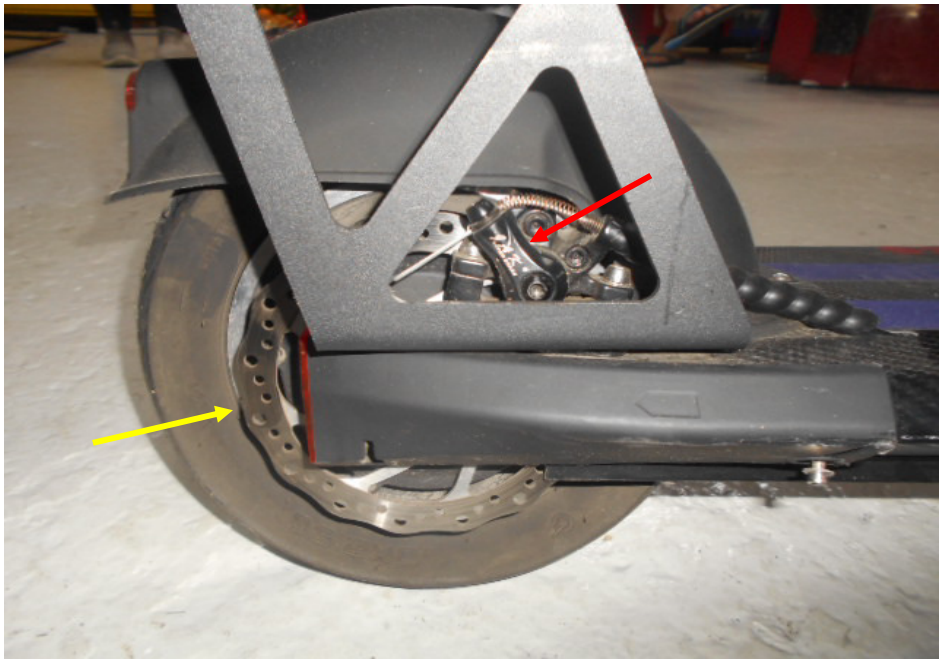

Photo 15 shows the braking components at the rear wheel of the electric scooter. When the rear brake lever of the electric scooter is depressed, the brake pad (red arrow) clamps against the brake disc (yellow arrow), via cable and spring, hence providing the frictional resistance to reduce the rotation of the rear wheel.

Steering System

12. The steering system of the electric scooter was tested by turning the handle bar to full left and full right. I did not feel any abnormal resistance and/or free-play during this action. The front wheel of the electric scooter was able to turn in the same direction to the turned direction of the handle bar. The steering system of the electric scooter was in serviceable condition.

Braking System

13. A static test to the braking system of the electric scooter was carried out during my inspection. The test carried out was purely to check on the operating behaviour and functionality of the electric scooter's braking system.

14. For the static test, the electric scooter was suspended from the ground ie wheels not touching ground. The throttle lever was depressed causing the front wheel and the rear wheel to rotate, simulating movement of the electric scooter. I then depressed the front brake lever only and it was observed that the front wheel stopped rotating almost instantaneously. The front brake lever did not require to be fully depressed for the front wheel to stop rotating. The front brake of the electric scooter was in serviceable condition.

15. With regard to the rear brake, a slightly more effort was required to stop the rotation of the rear wheel. It was noted that the rear brake lever had to be fully depressed in order for the rear wheel to stop rotating. Note that fully depressed refers to the rear brake lever almost touching the handle bar. This is an indication that the rear brake of the electric scooter needs to be adjusted/serviced due to normal deterioration of the rear brake pad.

16. Like with all motor vehicles, motorcycles and bicycles, the brake pad of an electric scooter will progressively wear off from usage over a period of time. When this happens, the gap between the brake pad and the brake disc becomes wider. Due to this wider gap, the brake pad needs to move further to clamp onto the brake disc, and correspondingly more effort is required by the operator to activate the brake in order to compensate for the wider gap.

17. For this case, although a slightly more effort was required, the rear brake of the electric scooter was still able to stop the rotation of the rear wheel during my static test. It will however translate to an overall increase in the stopping distance for the electric scooter when the brake is applied by the operator whilst riding the electric scooter. Simply put, the additional time needed (wider gap) for the rear brake pad to clamp onto the brake disc causes the electric scooter to travel more distance before the rear brake becomes engaged.

Conclusion

18. From the observations gathered during my physical inspection of the electric scooter, its steering system and its 2 tyres were of serviceable condition.

19. The front brake of the electric scooter was found to be in serviceable condition. The rear brake was however found to be in a condition that requires adjustment/servicing. I had found that engaging of the rear brake required slightly more effort by the operator. This would lead to a slightly longer stopping distance.

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