



Roller-brake testers, standards and inspection manuals

skid-plate testers, however, is not clear. Whilst I believe these instruments have great merit, their use as enforcement tools should be clarified urgently in regulations. The minimum brake performance of a heavy vehicle (GVM or ATM > 4.5t) is specified in the National Heavy Vehicle (Vehicle Standards) Regulations. These have been adopted (with some minor variations) by all jurisdictions. Table 1 gives a summary of the requirements. The minimum performance standards in Table 1 are legally enforceable. Roller-brake testers measure the brake force produced by individual wheels but they do not measure vehicle stopping distance. Therefore, they do not directly assess the legal performance. The passenger car ADR deceleration level is shown in Table 1 for comparison. It is 6.43 m/s², which is 170 per cent of the truck requirement. A truck tyre is often assumed to have a peak friction level of 70 per cent of that of a car tyre on the same

road. Another reason for having lower performance levels for heavy vehicles is that the brake compatibility between vehicle parts in a combination is often poor. For that reason the in-service performance standard is set at 2.8 m/s², which is less than half the passenger car design level. Use of roller-brake testers and shakers are considered in the National Heavy Vehicle Inspection Manual (NHVIM). The NHVIM manual was originally developed by the National Transport Commission and has been further developed by the National Heavy Vehicle Regulator. Whilst these standards have merit, they have no legal status because the NHVIM is not referenced in the regulations. Enforcement officers of the state and territory jurisdictions may consult it when assessing vehicle roadworthiness, but it is not the law. Because brake testers are only considered in the NHVIM, their test results are only a guide to roadworthiness.

Roller-brake testers are used by authorities to check truck and trailer brake performance. Portable units are used for roadside enforcement (see photo) and permanently installed units are used in test stations. These units often also have a 'shaker' function to allow for suspension and steering tests to be carried out. The legal status of roller-brake testers and

The relevant performance brake standards from the NHVIM are in Table 2. The main specification is 4.5 kN per tonne of vehicle weight. This value is generally consistent with the design rule requirements for a new vehicle; which are (approximately) for an average deceleration performance of 4.5 m/s². Before the start of the NHV Law on 10th February 2014, there were two different roller-brake tester performance levels in use. The 4.5 kN / vehicle-tonne requirement was applied outside NSW, whilst the NSW requirement was 3.0 kN / vehicle-tonne. Some NSW enforcement officers are still using the 3.0 kN / vehicle-tonne level. Brake force is limited either by the capability and condition of the brake or by the available friction between the tyre and the road. Roller-brake testers are only useful for measuring brake force at a wheel end. Wheel lock-up is allowable during road testing, but is disturbing during roller-brake testing. Therefore, the rollers or skid-plate must have a high friction surface and the test weight on the axle must be adequate. As a guide, a wheel should not be tested unless it is carrying at least 1.5 t (3t per axle). Another consideration is that slightly different force values can be obtained across the roller. Table 2 shows that the NHVIM has a performance level for emergency brakes when they are tested on a skid-plate tester. It is impractical to test emergency brake performance on a roller-brake tester



A mobile roller-brake tester at a roadside check

because wheel lock-up, which is likely to occur when the park brakes are applied, will disturb the measurement. The law requires that every wheel on a heavy vehicle has a functioning brake. There is no minimum performance level for each wheel brake specified in the NHVIM (or in the design rules). However, the 4.5 kN/ vehicle-tonne performance level in Table 2 will usually be applied to each wheel. The requirement that wheel brake force differences not exceed 30 per cent means that the difference between wheel-end values on one axle divided by the average of the wheel end values on that axle be no more than 0.3. When police investigate the brake performance of a heavy vehicle that is involved in a road crash, they may engage a workshop with a roller-brake tester or a skid-plate tester to measure the brake performance of each wheel. This allows an estimate of the total brake force available to the driver to be estimated and hence

the maximum available deceleration without wheel lock-up to be estimated. It is no substitute for a road test, because the wheel forces are probably measured at different brake pedal positions. Further, wheel lock-up, which can occur on the road but is not tolerated on a roller-brake tester. And dynamic load transfers between axles cannot be measured on a tester. Starting speed also affects the average deceleration road-test results. Roller-brake testers and skid-plate testers have much to offer operators because they allow individual wheel brake performance to be measured. This information can be used to tailor the maintenance and hence keep the brakes in good condition. Hopefully testers will become routine in professional workshops. Hopefully also, their legal status for road worthiness assessments can be clarified.

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Table 1: Legal standards

| Vehicle Type | Applicable ADR category | Initial Speed (km/h) | Minimum Average Decel'n (m/s ²) | Implied stopping distance (m) |
|---|--|----------------------|--|--|
| Passenger Car | MA | 100 | 6.43 | 60 m from 100 km/h |
| Truck with GVM > 3.5t | NB, NC | 100 | 3.78 | 102 m from 100 km/h ¹ Estimated performance from 60 km/h ~ 34m (4.1 m/s ²) 35 km/h ~ 11m (4.4 m/s ²) |
| Passenger bus | MB, MC, MD | 100 | 4.19 | 92 m from 100 km/h ¹ Estimated performance from 60 km/h ~ 31m (4.5 m/s ²) 35 km/h ~ 10m (4.8 m/s ²) |
| Trailer with ATM > 4.5 t | TB, TC, TD | 60 | 4.5 | 31 m from 60 km/h ¹ 10 m from 35 km/h |
| In-service heavy vehicle including combinations | Service brake (footbrake) - all trucks, buses and combinations. | 35 | 2.8 (Minimum peak level is 4.4) ² | 16.5m from 35 km/h ¹ Estimated performance from 60km/h is ~55m (2.6 m/s ²) 100 km/h ~175m (2.3 m/s ²) |
| In-service heavy vehicle including combinations | Emergency brake (park brake) - all trucks, buses and combinations. | 35 | 1.1 (Minimum peak level is 1.5) ² | 31.5m from 35 km/h ¹ . Additionally, a park brake must hold the vehicle on a 12 per cent (6.8°) slope |

Notes: 1. Vehicle must stay within a 3.7m lane width when road tested. 2. A decelerometer is sometimes used to measure instantaneous deceleration. Roller-brake testers or skid-plate testers cannot provide a 'peak' deceleration. The design rules specify average and not peak deceleration values. 3. There is no ADR Emergency Brake performance level for a motor vehicle.

Table 2: NHVIM performance levels for roller-brake testers and skid-plate testers

| Vehicle Type | Equipment | Initial Speed (km/h) | Standard in National Heavy Vehicle Inspection Manual | Minimum Average Decel'n (m/s ²) |
|--------------------------------|---------------------|----------------------|--|---|
| All heavy vehicle wheel brakes | Roller-brake tester | ~ 2 | Add the total brake force for each axle and divide by the vehicle mass. The value should be at least 4.5 kN / tonne. Additionally, there should be less than 30 per cent difference between forces on wheels on the one axle. Additionally the brake drag must not exceed 1 kN for a drive axle or 0.5 kN for a steering axle. | Implied capability is 4.5 m/s ² at low speed. |
| All heavy vehicle wheel brakes | Skid-plate tester | ~ 5 | As for roller-brake tester. Additionally the emergency brake (dynamic park brake) performance must be at least: 1.1 m/s ² (average) and 1.5 m/s ² (peak). These are vehicle levels because emergency brakes are not required on every axle. | Implied capability is 4.5 m/s ² at low speed. The implied emergency brake capability is 1.1 m/s ² . |