

Heavy vehicle brake testing

CoF and entry certification brake test protocol and procedure

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Introduction

Like almost all other road vehicles in New Zealand, heavy vehicles are required to undergo entry inspection and a periodic safety check in the form of a Certificate of Fitness (CoF) inspection. Brake testing is a crucial part of this inspection given the critical role brakes play in overall vehicle safety. However, under the previous requirements, heavy vehicle brake performance was only tested as presented, usually unladen.

Heavy vehicle braking has been identified as a significant factor in heavy vehicle accidents. In the five years between 1997 and 2002 there were 77 heavy vehicle crashes attributed to braking. These crashes resulted in four deaths, 15 serious injuries and 34 minor injuries. This was the catalyst for the development of the Land Transport Rule: Heavy-vehicle Brakes (Rule 32015) which, among other requirements, requires heavy vehicles to be capable of stopping within 7 m from 30 km/h in all conditions of loading. This equates to a minimum brake performance of 0.5 g as measured on an approved roller brake machine (RBM). The target for all heavy vehicle operators should be significantly higher than this minimum and all heavy vehicles should be maintained so that their brakes will achieve the minimum performance at all times.

On 1 March 2007, this rule came into force. Section 2.4 of the rule requires that the brakes of all heavy vehicles be tested in a way that directly or indirectly evaluates performance in all conditions of loading. The aim is to increase safety in the heavy vehicle fleet by minimising braking faults and thus reducing accidents (social costs).

The NZ Transport Agency (NZTA) has worked with the inspection industry, heavy vehicle operators and other transport users to determine the most efficient brake testing regime for New Zealand's diverse heavy vehicle fleet. This consultation process resulted in the HVBR Implementation Plan.

This protocol requires that heavy vehicles, except for those identified as 'specials', have a 'laden' brake test at entry and in service (CoF) certification. Vehicle operators may choose to have the brake test carried out by presenting their vehicle for a CoF or entry inspection in one of two ways:

- L60 The vehicle is tested in a semi-laden condition being a minimum of 60% of the maximum legal weight on each axle.

- LST Load simulation by tie down to L60, (at a TSDA that has this facility)

It is the vehicle operator's responsibility to meet these loading requirements, either by self weight (TARE), partial load or the presentation of their vehicle in a suitable state to be tied down, when presented at a TSDA where load simulation (either axle or chassis tie down) equipment is available. Where a vehicle is presented for a simulated load test and has engineered chassis tie down points fitted these must be used by the TSDA provided they are fitted in an appropriate location.

Vehicles will be tested on an approved RBM which includes vehicle weighing facilities (load cells) and is capable of providing a printout of the brake test result for the operator.

Brake testing requirements must be applied consistently across all inspection sites to prevent operators from choosing an 'easy option'. To achieve this aim, all RBMs operated by testing stations for CoF and HV entry are required to be independently calibrated and all vehicle inspectors (VIs) operating RBMs are required to be trained and assessed to a NZTA recognised level of competence.

There are a number of 'special' vehicle types which need to be treated separately. These are addressed in the protocols in Appendix 4.

Brake testing at off-sites, which are operated to provide geographical coverage, will be required to provide a test to a comparable standard to that required at main sites to maintain fairness and consistent inspection standards. Any deviation from the requirements of this procedure must be approved by the NZTA on a site by site basis.

The NZTA will continue to work with both industry, transport users and the TSDAs to resolve any issues which arise relating to the implementation of the Heavy-vehicle Brakes Rule along with ongoing monitoring of the process to ensure heavy vehicle brakes testing as part of the CoF inspection continues to meet the intent of the Heavy-vehicle Brakes Rule and enhance safety and sustainability on New Zealand's roads.

The requirements and procedures laid out in this protocol are covered by notice in the *New Zealand gazette* (No 182, 27/11/08) as required in section 2.4(2) of the Rule and, where necessary, will be referenced in the relevant VIRM or published as technical bulletins to be incorporated in the VIRM.

Premises and equipment

Site location and equipment

Land Transport Rule: Vehicle Standards Compliance 2002 requires vehicles operating on New Zealand roads to undergo periodic safety inspections. As part of this inspection, the condition and performance of a vehicle's braking system must be assessed using facilities and equipment approved by the NZTA.

Brake tests for both Entry certification and CoF inspections may be carried out at 'main sites', while brake tests for CoF inspections only may be performed at 'off-sites'. Off-sites are inspection sites operated intermittently as a satellite to a main site to provide geographical coverage. All offsites are graded based on the testing standard that can be achieved at each site and the grading then defines the vehicles that can be inspected at that site. The availability of in ground or above ground mobile RBMs with weigh scales and printers, where possible, will form part of the grading process. Terms and conditions around the use of offsites are included under 'Offsites' in this document.

Where a vehicle's brakes cannot be tested on a mobile or non load simulation equipped RBM due to insufficient weight on an axle it may be required to undertake a 'split test' (see Appendix 1) if it cannot be safely lifted by the TSDA jacking equipment to complete the CoF inspection, or be referred to a site with load simulation equipment. Decelerometers will only be able to be used by permit or exemption.

The requirements for premises are set out in the respective VIRM for entry and CoF and these must be met for all testing stations, new and existing, except where exemptions for one or more conditions have been approved by the Director of the NZTA.

This protocol must be available to Vehicle Inspectors at all CoF B testing stations and offsites.

RBM machine specifications and settings

The heavy vehicle brake testing regime depends on the accuracy and consistency of the RBMs being used, and the confidence that operators have in the fairness of the results gained. This means that all RBMs operated by TSDAs must meet the following requirements:

Be manufactured to comply with ISO 21069-1, AS/NZS 4163 or other approved standard.

Be approved for the purpose by the NZTA.

Includes vehicle weighing facilities (load cells).

Automatically calculates the deceleration rate of individual axles.

Capable of calculating the deceleration rate of the complete vehicle.

Operation must include at least one full rotation of the wheels during the brake test to ensure full analysis of inspection requirements including imbalance,

Records and highlights peak brake imbalance across an axle.

Capable of providing a printout of the brake test result.

Calculates and displays results in dynamic mode.

On termination of the test, whether from lock up or manual intervention, both rollers must stop simultaneously.

Both brake force and dynamic weight readings must be simultaneous for both sides (LH & RH) of the RBM.

Imbalance to be measured from 400 daN (4 kN) brake force at each roller. The maximum imbalance from this point to the termination of the test is to be recorded and used to determine compliance.

The printout clearly indicates test results.

Printout format to be approved by the NZTA, information required as appendix 2.

Test results to be stored either electronically or in hard copy in an approved format, and be available for audit purposes. Records must be kept for a minimum of one year.

Be independently checked for calibration and, if necessary, calibrated, for brake force, accuracy of the vehicle weighing system, 'slip'¹ setting and co-efficient of friction of rollers at regular intervals by an approved Independantly Qualified Person (IQP), as detailed in the *RBM calibration and maintenance protocol* (appendix 2).

The 'lock up' or 'slip'¹ point must be consistent across all approved RBMs however it is specified or measured. The objective of this setting is to achieve the highest possible brake force readings without damaging tyres. This function must be checked, recorded and, if necessary, adjusted when the RBM is calibrated.

The 'slip'¹ is set by factory trained technicians at installation to meet the requirements of ISO 21069-1 (slip rate 27% +/- 3%) and locked. This is not an operator adjustable setting but must be checked at each calibration.

¹ The RBM 'locks' or terminates the test when the RBM detects a speed differential or 'slip' between the tyre and the roller of 27% +/- 3%, and terminates the test [ISO 21069-1:2004(E), 1.9 c].

Where an imbalance filter is fitted its setting must not prevent the the brake force being measured and recorded at a minimum of 20Hz

The rollers² of an approved RBM must be in good condition with no ungritted areas and a co-efficient of friction (μ) for the set of at least 0.7 dry and 0.6 wet (tolerance, -0.1 in either state). Rollers must have less than 10% difference across the axle to ensure brake imbalance is not adversely affected. Where the rollers are being checked independently rather than as a set the front rollers may be as low as 0.5 μ (dry) as long as the rollers are in an undamaged state. If the rollers are checked statically then they must be measured at at least six points equally spaced around the circumference of the rollers. The measurements should be made around the most worn area of the roller

Where, due to a breakdown or the requirements of special vehicles, a RBM cannot be or is inappropriate to be used, then an approved decelerometer may be used. Where use of a decelerometer is approved the vehicle is to be tested at its presented weight. Use of a decelerometer, except were mandated in a special vehicle testing protocol (appendix 4), must be approved by the NZTA on a case by case basis and conditions will apply.

Staffing

Along with consistency of equipment, consistency of operation is essential so specialist training of vehicle inspectors (VIs) and RBM operators must also be provided. This is to a NZTA recognised level of competency provided by an NZTA approved training provider. Training records must be maintained to ensure compliance is auditable. The training curriculum is contained in Appendix 3

Heavy vehicle brake test, fundamentals and methods

As previously stated, heavy vehicles are to be tested on an approved RBM, which includes vehicle weighing facilities (load cells), capable of providing a standardised printout approved by the NZTA and be independently calibrated in all its functions. Vehicles can be presented with sufficient self load (tare or partial load) to a minimum of 60% and a maximum of 100%, of the maximum legal weight per axle, at the discretion of the TSDA to ensure OSH and vehicle safety. Alternatively, additional load can be added for the RBM test, or the vehicle tied down to simulate load, to a minimum of 60% of the vehicle's maximum legal weight limit at each axle.

Land Transport Rule: Vehicle Dimensions and Mass 2002 and its amendments, sets gross mass limits for vehicles and vehicle combinations operating in New Zealand. In some cases, these statutory weight limits are lower than the axle limits established by the vehicle manufacturer. Some vehicles have a high tare to GVM ratio; they can be presented without load or only partially laden. Where simulated loading (tie down), alternative or additional load is required, the test load per axle must be at least 60% of the vehicle's maximum legal weight limit at each axle. If weight is limited by OSH issues and the capacity of the jacks operated by the TSDA, (at the discretion of the TSDA to ensure OSH and vehicle safety, this could be up to a maximum actual weight of 10 tonne per axle set, or 6 tonne per axle, to accommodate their lifting equipment). Heavy vehicles may be tied down or have additional load added to simulate the required load. Alternatively the vehicle can be tested as presented and sent away for removal of weight before returning for the completion of the inspection, or inspected first and sent away for additional load before returning for the completion of the brake test. This is known as a split test and is defined in appendix 1.

Where the brake test lane is not installed with a 'start of lane' RBM, wheel load cells or pads, a proof of weight certificate may be required when a vehicle is presented laden to ensure the TSDA's lifting equipment is not overloaded or the vehicle is not too heavy

² Testing has identified that open mesh steel rollers do not maintain their co-efficient of friction in wet or damp conditions so are not approved for use at entry or CoF. Open mesh steel rollers may be used for brake screening tests.

to lift safely. Alternatively, at the TSDA's discretion, a vehicle may be run through the lane to be weighed and possibly tested on the RBM before going to the back of the queue for the completion of the test or undergo a split test.

The ability to meet any load requirements arising from the implementation of this rule is the responsibility of the operator. This may include providing engineered tie down points or decluttered chassis where load simulation by tie down is required. Where engineered tie down points are fitted, they must be used by a TSDA for a simulated load test provided they are fitted in an appropriate location. It must be noted that some HV manufacturers do not support or recommend direct tie down of HV chassis except through engineered tie down points.

The CoF brake test is designed to test the foundation brakes of a heavy vehicle and, as such, is not a test of any ABS, EBS or LSV system. All ABS and EBS models the NZTA has information on have a 'cut in' speed higher than the test speed of the RBMs so do not affect the foundation brake test at CoF but where a vehicle is fitted with LSV the CoF brake test must be done by either actual load or chassis load simulation to ensure the LSV does not affect the brake test.

Axle weight tolerance – Where a heavy vehicle is presented for a laden CoF brake test a lower tolerance of -50 kg of the axle test weight will be allowed to accommodate RBM manufacturers' tolerances. The upper tolerance is the maximum legal load on the axle.

Deceleration tolerance – 0.5 g (50%) deceleration must be maintained for the vehicle. This is the minimum and is required in all conditions of loading. However, the NZTA will accept a tolerance of -0.05 g (5%) deceleration on any one axle. This means that any axle is allowed a deceleration as low as 0.45 g (45%) as long as the vehicle maintains a total deceleration of at least 0.5 g (50%).

Testing options for service brakes

One option for the operator is to present their vehicle in a laden condition. This is a viable option for vehicles with a high tare to GVM ratio and some vehicles at the lighter end of the heavy vehicle spectrum. Some vehicles presented with additional load to meet the 60% requirement may be required to undergo a split test due to overloading of the TSDA lifting equipment, the risk of damage to the vehicle, or the inability to sufficiently unload the suspension to enable a complete physical inspection.

Alternatively, the vehicle can achieve the required test weight by load simulation. Load simulation is where the vehicle is tied down by attaching clamps to the chassis, hooks to appropriately designed and fitted chassis tie down points or by strops over a decluttered axle, chassis or subframe. The appropriate test weight is applied by hydraulic or mechanical pressure in a measured, controlled and limited manner to reduce the risk of damage to vehicles and wear and tear on the RBM and its ancillary equipment. It is essential that any load, either actual or applied, is evenly distributed across an axle to prevent unnecessary imbalance³. This method will allow the vehicle to have the full CoF inspection completed in one visit to the testing station.

Hydraulic and electric brakes

Statistics show that while hydraulic and electrically braked vehicles have a much lower risk than air-braked vehicles, they have similar brake deficiencies both at CoF and roadside inspections, at around 20%. Therefore, hydraulically braked and electric braked vehicles, must be tested as rigorously as those with air brakes and there is a legal requirement to do so. This means that both hydraulically and electrically braked heavy vehicles must be tested in the same laden state as air braked heavy vehicles so these vehicles have to be presented laden to 60% of their legal on road mass or have that load simulated for the test. On class NB vehicles, tie down on the front has generally proved to be unnecessary. However, rear axles are consistently light but load

³ See the NZTA commissioned report, *The effects of mass imbalances across an axle on brake forces measured on roller brake testing machines*, Doug Latto, Transport and Mechanical Consulting Ltd.

simulation by tie down can be difficult to achieve without engineered tie down points due to fragile hydraulic brake lines and bodies directly mounted to chassis. This cannot be used as a reason to avoid the laden test.

Testing procedures

Service brakes

Service brakes, except for vehicles which fall into a 'special' category, must be tested on an approved roller brake machine.

When the vehicle is presented for a CoF inspection a check sheet must be printed. This check sheet will contain the pre-calculated axle test weights if the original information has been correctly loaded in Landata. Where the information on Landata is incomplete or incorrect, an error message will appear prompting the TSDA to ensure the correct data is added. This situation will not prevent the brake test being undertaken but test weights will have to be calculated. The vehicle is to have its first axle positioned squarely in the rollers of the RBM and the weight checked. If additional weight is required then the vehicle must be tied down in the appropriate manner and load applied until the required test weight is achieved. Once the correct load is applied the axle is to be tested in the following manner:

Start RBM.

Check rolling resistance.

Using light pedal pressure apply brakes to about 400 daN (4 kN) to check brakes apply together.

Release brake to check brakes release together, then;

Apply the brakes until the RBM shows greater than 400 daN (4 kN). Then slowly and deliberately, for at least 5 seconds, apply the brakes until the slip setting is overcome and the brakes lock or maximum brake effort (deceleration) is produced and the test is manually terminated. At the VI's choice the test may be terminated before maximum brake effort or lockup is achieved but only if a deceleration of .65g has been measured on that axle.

Observe and record maximum deceleration.

When passing or failing the vehicle note that any one axle on the vehicle is allowed a deceleration as low as 0.45 g (45%) as long as the complete vehicle maintains a total deceleration of at least 0.5 g (50%) (see Deceleration tolerance page 6).

Brake imbalance is tested at the same time as the brake efficiency.

When testing for imbalance it is good practice to ensure that any load, either actual or applied, is as evenly distributed across an axle as possible to prevent unnecessary imbalance.

Imbalance at brake forces below a threshold value of 400 daN (4 kN) are ignored and not recorded unless the RBM fails to register an imbalance due to one or both of the maximum brake forces (LH or RH) not reaching 400 daN in which case the vehicle should be tested in the 'car' mode and imbalance considered throughout the range..

For a pass, service brake imbalance, throughout the range above the 400 daN threshold may be no more than 30% on any axle. Where no imbalance is registered on the RBM due to one or both brakes failing to meet 400 daN, then the imbalance at the maximum brake forces achieved must be no more than 30%. This test is to be done once per axle per test and any result showing more than 30% imbalance is a fail, however, a second test per axle may be made at the discretion of the Vehicle Inspector

Test results are then recorded on the check sheet, any applied load released and the test is repeated for subsequent axles. On completion of the complete test an electronic or paper record of the test is to be retained. Where the vehicle fails, or the operator requests it, a printout of the results **must** be supplied. When a vehicle is presented for a retest the following requirements apply.

- Retest for Brake performance (efficiency); requires all service brakes on the vehicle to be retested in the laden condition.
- **Retest for imbalance; only the affected axle set, however, where any repairs carried out to rectify the imbalance may affect other axles, at their discretion, the Vehicle Inspector may retest the affected axle set or the complete vehicle, in the laden condition.**

Parking brake

Where the parking brake is incorporated in the same brake as the service brake then the test of the axle(s) incorporating the park brake is completed following the service brake test on the same axle using the following procedure:

The vehicle is to have its first park braked axle positioned squarely in the rollers of the RBM and the weight checked. If additional weight is required then the vehicle must be tied down in the appropriate manner and load applied until the required test weight is achieved. Once the correct load is applied the axle is to be tested on the RBM in the following manner:

Start RBM.

Apply the park brake smoothly until the RBM locks or maximum brake effort is achieved.

Record maximum brake effort.

A retest for park brake performance (<20%) requires all park braked axles to be retested in the laden condition.

Test results are then recorded on the check sheet, any applied load released and the test is repeated for subsequent park braked axles. On completion of the test the RBM calculates and displays the total deceleration in 'g'. An electronic or approved hard copy record of the test is retained.

It is important that the VI checks that the correct park brake control is used for this test and, if the vehicle has only one park braked axle, except when each wheel is tested separately, then another axle must be chocked to ensure the vehicle being tested cannot climb out of the rollers, a situation which may damage the vehicle, the RBM equipment or pose a safety risk.

Alternative tests for parking brake

WABCO Park-release emergency valve (PREV) – This system is approved by exemption but must be checked on a roller brake machine. Vehicles fitted with these units can be identified by the multi port WABCO marked valve fitted midway down the chassis. This valve has two coloured knobs; a red park brake control knob and a black yard release knob. When testing on the RBM the vehicle must have the park braked axle positioned on the RBM. The RBM must then be started and the red park brake control knob pulled. The normal park brake procedure must then be followed. However, in some cases, the PREV is located in such a position that it cannot be operated without impinging on the Testing Agent's 'Operator Exclusion Zone'. In such cases the same test as required for Cardan Shaft park brakes must be used.

There are, however, some parking brake types where the use of an RBM is inappropriate and they require an alternative test:

Cardan shaft park brakes must not be tested on a RBM. To test a cardan shaft park brake, where the brake is mounted on the transmission, the park brake must be tested using the 'stall test' method⁴, or, if there is doubt it should be tested on a 1:5 gradient in both directions.

Combination park brakes - Where a heavy vehicle has a disc service brake and a drum parking brake on the same axle then the park brake must be tested using the 'stall test' method⁴ as defined unless the vehicle manufacturer approves RBM testing.

Park brakes of semi trailers (only applicable if registered prior to 1 November 1990 and unmodified) - Where the operation of the parking brake on a trailer for testing purposes means that the air hoses must be disconnected to operate the spring brakes, this test is to be performed after the service brake test on the axle has been completed. With the wheels still in the rollers and the RBM rotating to ensure the full application of the spring brakes by disconnecting the trailer air hoses. On completion of the test, operate the 'emergency release valve' to ensure the full release of the parking (spring) brakes and move the trailer so the wheels on the next axle are in the rollers. To test the park brake on this axle start the RBM and close the 'emergency release valve' to operate the park brake. Once the park brake test has been completed the air lines can be reconnected and the test can be completed normally. Where the operation of the trailer parking (spring) brake requires the draining of the service brake air tank, the parking (spring) brakes should be tested using the process outlined for testing Cardan shaft parking brakes. Ensure the trailer air tanks are full before continuing the inspection.

Mechanical or wind up park brakes are fitted to a number of trailers in the New Zealand fleet. Except for semi trailers registered prior to 1/11/90, these brakes are not approved in the rule as they are not operated from the cab of the towing vehicle using one control only. Operators must be advised that they are to be modified before their next CoF. However, to allow operators time to comply, these vehicles are to be inspected and tested in their presented state, at their first CoF inspection after 1 June 2009, and the advice noted on the check sheet and in Landata. Alternatively, if the vehicle was first registered before 1 March 2007, the operator can be advised to apply for an exemption to section 2.3(9) of the Rule. It must be noted that all exemptions are considered individually on their individual merits and are at the discretion of the NZTA. The application for an exemption is not a guarantee that the exemption will be granted. To test these parking brakes the vehicle should be stopped on a level sealed area, the trailer park brake applied and the towing vehicle moved forward with no rotation of the braked wheels on the trailer.

Alternative Brake Testing Equipment

An approved decelerometer may be used to perform brake tests on some special vehicles where approved (see appendix 4) or, with approval of the NZTA, as a short term backup when a site's RBM is unavailable.

To complete a brake test using a decelerometer the meter should be fitted to the vehicle being tested. If the test is to be carried out on a public road then appropriate 'brake test' signage must be affixed to the rear of the vehicle or the combination, if applicable. Ensure the road surface has a hard level surface free from loose material. Accelerate the vehicle to 30 km/h and, taking appropriate OSH precautions, complete a brake test following the equipment supplier's instructions. Braking shall be in a controlled and progressive manner and the wheels should not lock or skid for this test⁵. The decelerometer must show a minimum average deceleration of 50% or 0.5 g and stop without excessive imbalance (ie; no greater than 30%). For the parking brake test, except where it is a cardan shaft or similar which have their own test process, the above process should be repeated and the average deceleration should be a minimum of 20% or 0.2 g.

A stopping test may also be used, with approval from the NZTA, where a vehicle is required to stop within a marked distance of 7 m from a verified speed of 30 km/h in a controlled and progressive manner.⁵

⁴ A stall test is where the vehicle is parked on a flat, sealed area and the park brake applied. The engine is then started and an intermediate gear engaged. An attempt is then made to move the vehicle forward taking care not to overload the transmission. If the vehicle does not drive forward or the engine stalls then it can be deemed to have passed the test. This is recorded on the check sheet as a 'stall test' pass.

Results should be recorded with a note that they were achieved with a decelerometer or, alternatively by stopping test and stored, either digitally or in hard copy for a minimum period of one year.

Special vehicles

As special vehicle types are identified, CoF and entry brake testing protocols will be developed for them. For those vehicle types currently identified, brake test protocols are in Appendix 4.

Pass/Fail

The pass/fail criteria are contained in the VIRM, however, where specifically mentioned in this document, criteria such as imbalance and performance are to be applied.

Timing

Due to the investment, component supply and training requirements, this CoF and entry test procedure has had a phased rollout beginning in December 2008 with main sites operating the new regime by June 2009. CoF offsites since the end of 2009 have also been required to provide laden testing at CoF as defined in the protocol.

⁵ Brake lockup does not necessarily verify compliance as a vehicle may no longer be 'controlled' when the wheels are locked and skidding.

Offsites

Offsites

Offsites are CoF inspection sites which are not fulltime, primarily for testing local vehicles and are defined in the CoF Business Model. Offsite rollout of the brake test as required by this Protocol commenced in August 2009 with Urban Bus Sites with the remainder of the sites being compliant with the Protocol from September 2009.

Offsite Grading

Offsite CoF testing facilities are graded using a risk matrix based on volume versus site facilities and equipment. Investment can raise a facility from one grade to the next. Any new offsite will **only** be considered if the CoF business model (outside 40km/30min of a main site) is met or the facility is replacing an existing site. In this case the new facility must be of a higher standard than the one it is replacing. Critical features of a CoF testing station are; Lighting, minimum dimensions (pit, building, doors etc), fully covered inspection areas, compliant RBM, universality (vehicles). This grading does not include Urban Bus Sites which are rated separately and must provide the full inspection facility of a Grade 1 site.

Grade	Site Description	Facility Standard (Minimum)	Vehicles	Maximum Frequency
1	Existing offsite	Drive through undercover inspection facility, pit & compliant RBM, undercover. Meets calibration /maintenance requirements. Site to be substantially equivalent to a CoF testing Station including a laden brake test.	All, May be split tests.	Up to 4 days/week
2	Existing offsite	Undercover drive through inspection area, pit & compliant RBM. Meets calibration /maintenance requirements. Facility must be fit for purpose for vehicle types inspected. Site to provide a substantially equivalent inspection to a CoF testing station including a laden brake test.	All, May be split tests. Locally based vehicles*	Up to 10 days/month
3	Existing offsite	Undercover Inspection area, compliant RBM on same site. Meets calibration/maintenance requirements. Facility must be fit for purpose for vehicle types inspected. Site to provide a substantially equivalent inspection to a CoF testing station including a laden brake test.	May be split tests Locally based vehicles*	Up to 6 days/month
4	Existing offsite at remote location (e.g. island site)	Undercover Inspection area. Facility must be fit for purpose for vehicle types inspected. Brakes tested as presented using approved decelerometer.	Local vehicles	Up to 8 days/yr

Individual site details and their gradings are held and maintained by NZTA Regional Operations.

* Locally based vehicles - Vehicles that are closer in time or distance to the offsite than to a higher grade of facility

Specialist Sites

These sites service specialist vehicles that cannot move from the site or cannot fit into testing facilities. The site is usually used only twice a year for COF B services, with very low volumes. There may be more than one specialist site in a geographical area. These sites are usually only used by one transport operator and Inspection area must meet minimum requirements to facilitate a safe inspection. Choice of TSD agent is at the discretion of the operator, although an appropriate business case is required to justify a move between TSDA's.

Appendix 1

Split test at CoF – limits and requirements

A 'split test' is where a heavy vehicle is presented for a brake test but is too heavy to complete the rest of the CoF and the operator is asked to return to the same testing station, within two working days⁵, with a lighter load for completion of the CoF inspection, or, the vehicle is presented too light to complete the roller brake test and cannot be tied down (either where load simulation is not available or where the operator does not want the vehicle to undergo a simulated load test) but completes the rest of the CoF inspection and the operator is asked to return to the same testing station within two working days⁶ with a compliant load to complete the RBM component of the CoF inspection. Any failure during the RBM test or the rest of the CoF inspection would count as a failed test. The 'split test' is not intended to allow an operator the opportunity to repair faults without having a failed test recorded against the vehicle.

Requirements;

With a split test there are two inspection phases which, combined, make up the CoF inspection. These are the brake performance test (including deceleration and imbalance) and the remaining vehicle inspection as defined in the VIRM.

With a split test the brake performance test or the remaining vehicle inspection, as detailed in the VIRM, may be carried out in any order.

During a split test the brake performance test must be the only inspection carried out in that phase of the inspection.

Both phases of a split test must be completed within a time frame of two working days following the day of initial inspection.

Both phases of a split test must be completed at the same inspection site (off site or main site).⁷

Once the two phases of a split test are completed any recheck may be completed at any approved CoF B inspection site operated by the same TSDA.

Where a brake retest is required it must be done with the vehicle in the laden condition (60% of maximum legal operating weight), this may be completed using either actual or simulated load.

A recheck of brake deceleration must be in the laden condition, either actual load or simulated, and must be a test of all brakes on the vehicle.

A recheck of brake imbalance must be in the laden condition, either actual load or simulated, but may be a recheck of the failed axle set only.

⁶ Unless there is approval in writing, from the NZTA for an alternative time. Approval is not automatic and applications will be considered on a site by site basis for individual cases.

⁷ Unless there is approval in writing, from the NZTA, for an alternative site to be used on an individual basis. Approval is not automatic and applications will be considered on an individual basis.

This means that a vehicle that has failed either phase of the split test may not be driven other than to a place of repair or to a TSDA for a recheck until all faults have been rectified and the recheck inspection has been successfully completed.

The 28-day recheck window that is currently in place for a recheck to be completed on a vehicle will start at the completion of the second phase required for a split test.

Notes

A 28-day permit can only be given on completion of the CoF inspection; i.e. no vehicle can be given a 28-day permit for a fault identified in the first phase of the inspection until the second phase of the inspection has been completed.

A split test which has not been completed will be recorded as a failed inspection.

A vehicle that has a failed CoF inspection recorded against it and is not being operated for work purposes, moving from test location to repair site or returning from repair site to test location (including unloading or picking up a load for loaded test requirements within a practical distance from the inspection location) may be treated as a vehicle travelling for the purpose of repair or testing.

A vehicle that has a failed CoF inspection recorded against it and also has an expired CoF found operating on the road for work purposes should be issued with a non operational order and required to complete and pass a full CoF test prior to returning to the road

A vehicle that has a failed CoF inspection recorded against it, has a CoF which has not expired and can not show the required repairs have been completed should be issued with a non-operational order (either a G1 or G2) and be required to complete and pass a full COF test or supply relevant information to the enforcement officer, as applicable, prior to returning to the road.

A vehicle that has a failed CoF inspection recorded against it, has a CoF which has not expired and can show that the required repair(s) has been completed may continue to operate but should return to an inspection location as soon as practical for completion of recheck.

A fail at either phase of the split test will be recorded and means that the vehicle can not be operated in a transport service (for work purposes).

Any vehicle that has failed its laden brake performance test must be unloaded at the nearest practical location to the inspection centre.

The vehicle in an unladen state may then be driven to a place of repair or return to the original test site for the purpose of the completion of the split test in a condition of loading which will allow this.

In the case of a recheck of brake performance in a laden state the load is to be picked up from the nearest practical location to the inspection site.

Appendix 2

Calibration Protocol

As stated in the Heavy Vehicle Brake Testing Implementation Plan⁸, dated February 2007, all RBMs used to test brakes for periodic, in service inspections or roadside testing must be calibrated, or have their calibration confirmed, in all their functions every 12 months and after any service where the calibration of any of the four functions requiring calibration; weight, force, slip and co-efficient of friction may have been altered. Calibration of an RBM must be outcome based and verify that the required functions of the RBM remain within the manufacturer's operational tolerances (default) or the operational tolerances of the NZTA, where specified. RBMs must also be maintained to the minimum requirements as defined in the equipment's operation and maintenance manual and have all components checked to ensure they continue to perform within the tolerances⁹ as defined in those manuals. This requirement is not intended to prohibit the use of proprietary components or restrict the operator to using only manufacturer's parts during maintenance. The purpose of this is to assure transport operators that all RBM testing is conducted fairly and consistently whenever and wherever¹⁰ their vehicles are tested.

Components and/or functions requiring calibration or verification include: the brake force measuring system including deceleration force transducers, the load weighing system including load cells, 'slip' control and rollers (co-efficient of friction).¹¹ Where an imbalance filter is fitted its setting must not prevent the the brake force being measured and recorded at a minimum of 20Hz.

The 'lock up' or 'slip'¹ point must be consistent across all approved RBMs however it is specified or measured. The objective of this setting is to achieve the highest possible brake force readings without damaging tyres. This function must be checked, recorded and, if necessary, adjusted when the RBM is calibrated.

The 'slip'¹ is set by factory trained technicians at installation to meet the requirements of ISO 21069-1 (slip rate 27% +/- 3%) and locked. This is not an operator adjustable setting but must be checked at each calibration.

The rollers¹² of an approved RBM must be in good condition with no ungritted areas and a co-efficient of friction (μ) for the set of at least 0.7 dry and 0.6 wet (tolerance, -0.1 in either state). Where the rollers are being checked independently rather than as a set the front rollers may be as low as 0.5 μ (dry) as long as the rollers are in an undamaged state. If the rollers are checked statically then they must be measured at at least six points around the circumference. The measurements should be made around the most worn area of the roller

Initial calibration at time of commissioning for use with the enhanced HVBR roller brake test must be confirmed as within tolerance and recorded.

⁸ The calibration requirement was set out in the Heavy Vehicle Brake Test Implementation Plan in February 2007.

⁹ The maintenance requirement is "to operational tolerances" as set out in the operators and/or maintenance manual supplied with each RBM.

¹⁰ 'Wherever' includes all CoF B and HV Entry Testing Stations, VTNZ offsites, CVIU roadside checks, NZTA fleet audit and roadside inspections and Annex 'C' inspection sites.

¹¹ While the Rollers cannot be calibrated, as a component, their co-efficient of friction must be maintained within the tolerances stated in this protocol and must be verified to ensure compliance is maintained.

¹² Testing has identified that open mesh steel rollers do not maintain their co-efficient of friction in wet or damp conditions so are not approved for use at entry or CoF.

Calibration must be carried out by an independent qualified person¹³ (IQP) to the performance requirements as defined in the equipment's operation manual at least annually.

To ensure consistency and fairness test and calibration requirements, specifications and methods, including calibration certificates, are to be supplied to the Technical Support, Certification & MVR section of the NZTA for approval and verification. The NZTA may, at its discretion, audit or review calibration outcomes and the performance of IQPs. Any failure in performance by the IQP may result in their removal from the approved list of IQPs as listed in this protocol

Where the RBM manufacturer does not have a recommended or defined method of calibration or inspection of a function or the manufacturer's method does not directly verify testing outcomes or there is a viable alternative method, then the Technical Support, Certification & MVR section of the NZTA may approve such a suitable alternative calibration or verification method.

An operator using an approved RBM for regulatory or enforcement purposes must have a maintenance and servicing schedule to ensure the RBM's operation remains within the tolerances as stated in the operating and/or maintenance manual supplied with each machine. This maintenance is to be carried out to the performance requirements stated in the manual. The operator must ensure that the RBM remains within calibration whenever it is in use and it must be taken out of service immediately it is identified as being out of calibration and may not be reinstated until it has been successfully recalibrated.

Calibration, service and maintenance records to be recorded on individual equipment records for each RBM and must be retained on site with the RBM and available for audit at all times, to prove compliance.

These requirements are included in the gazette notice quantifying the HV Brake Test as required by section 2.4(2) of the Land Transport Rule Heavy-vehicle Brakes, Rule 32015. The list of approved Roller Brake Machines for testing heavy vehicles at CoF and roadside will be published in Table 5.1.8 on pg 5-7 of the Introduction in the In Service VIRM which comes into effect in April 2010. Copies of this table are available on request.

Approved IQP List

Name	Contact	Equipment approved
Dominic Hess Automotive Equipment Specialists – Auckland		MAHA IW4 & IW7

¹³ An IQP is a person trained and appointed by the RBM manufacturer, or their New Zealand agent, and approved by the NZTA, to calibrate approved RBMs. The IQP may only calibrate RBMs which he/she has approval for. While many IQPs are also maintainers of the equipment, when calibrating a RBM an IQP must operate independently of either the equipment supplier or his role as a maintainer and calibrate the RBM as it is presented regardless of components used during maintenance. A list of IQPs is included in this appendix.

Don Castle	Independent Hoist Specialists - Auckland	MAHA IW4
Trevor Anderson	Anderson Automation & Controls - Palmerston Nth	MAHA IW4, BM 12200,14200, 20200
Gerald Schramer	Willowbank Electronics - Napier	MAHA IW4, BM 12200,14200, 20200
Vince Kearns	Autotest Servicing - Christchurch	MAHA IW4 & IW7, BM 12200,14200, 17200, 20200
Ben Kearns	Autotest Servicing - Christchurch	BM 12200,14200, 17200, 20200
Sam Kearns	Autotest Servicing - Christchurch	BM 12200,14200, 17200, 20200
Eddie Pinkham	Townley Electrical - Rotorua	BM 12200, 14200,20200
Don Manson	Hoist Services Ltd - Christchurch	MAHA IW4, BM 12200,14200, 17200, 20200
Karl Reece	Fulcrum Innovations - Nelson	MAHA IW4
Simon Seear	Electronic Specialist - Invercargill	MAHA IW4, BM 12200,14200, 20200
Bruce Hundley	Installations Repairs Servicing Ltd-Auckland	MAHA IW4 & IW7, VIS-TF-RL, VIS-VE-RL, ESPI
Wayne Hundley	Installations Repairs Servicing Ltd-Auckland	MAHA IW4 & IW7, VIS-TF-RL, VIS-VE-RL, ESPI
Ayzaaz Ahamad	Stocks Equipment Services-Auckland	MAHA IW4 & IW7
Sharvesh Pillay	Stocks Equipment Services-Auckland	MAHA IW4
Murray George	Murray George Electrical - Dunedin	BM 12200,14200, 20200
Brett Higgins	Sulco Ltd	BM 12200,14200, 20200
Jeremy Hunia	Sulco Ltd	BM 12200,14200, 20200
Alan Brown	Sulco Ltd	BM 12200,14200, 20200
Sebastian Sell	Sulco Ltd	BM 12200,14200, 20200
Donald Du Preez	Sulco Ltd	BM 12200,14200, 20200
Karl Ryan	Sulco Ltd	BM 12200,14200, 20200

Additional comments regarding approval, calibration & maintenance of RBM Rollers

Testing has shown that plain steel mesh rollers do not perform in wet or damp conditions, giving rise to low deceleration rates, so will not be approved for use where approval from the NZTA is required. However, plain steel mesh (open mesh) rollers are approved to be operated for brake screening tests by the NZ Police and NZTA when using approved methods listed in **the Heavy Vehicle Brake Testing Roadside, Audit and Review Operation** document January 2010.

As with all other functions of a RBM subject to calibration, if the co-efficient of friction of the rollers fall outside the manufacturers' tolerances then vehicles could, unfairly, fail their brake test. The RBM manufacturers' representatives have advised that they have simple, documented methods of checking that the rollers on their RBMs remain within the stated tolerance band. Alternatively, NZTA has identified the Findlay Irvine GripTester, operated by Fulton Hogan (contact, 07 848 5127) and the Mechmesin AFG 500N roller brake machine roller co-efficient of friction calibration checking device operated by Equip Specs (Bruce Hunley 021 0333 455) , as other methods of confirming that the co-efficient of friction of the rollers remains within tolerance. These devices must be operated by a suitably trained and appointed IQP as identified in this Protocol

Sample report format

The standard layout from the RBM manufacturer may be used as long as all required data is included.

The NZTA CoF B brake performance test

Time/date

Unique test identification number _____

	Maximum brake force	Maximum imbalance	Static weight	Decel dynamic
Axle 1 Service				
Axle 1 Park				
Axle 2 Service				
Axle 2 Park				
Axle 3 Service				
Axle 3 Park				
Axle 4 Service				
Axle 4 Park				
Axle 5 Service				
Axle 5 Park				

Vehicle dynamic efficiency Service_____

 Park_____

Appendix 3

Curriculum requirements for the training of vehicle inspectors and approved RBM operators (training protocol)

Preamble

As the regulator, the NZ Transport Agency (NZTA) is mandated to ensure that systems are in place to ensure all those testing heavy vehicle (HV) brakes on a Roller Brake Machine (RBM) are fully trained to use the approved brake testing equipment accurately, consistently and fairly.

This curriculum is required to ensure consistent and reliable testing of HV braking systems throughout New Zealand. To achieve this each TSDA must provide a NZTA approved training course which will result in a competency qualification for VIs and others operating RBMs, to ensure the compliance of HVs to required brake performance standards, as listed in the Heavy-vehicles Brake Rule (HVBR) and the Heavy Vehicle Brake Rule implementation plan (HVBRIP), is required.

These training requirements for RBM operators need to cover the requirements of the HVBR and the HVBRIP. Specific pass/fail criteria is contained in the appropriate Vehicle Inspection Requirements Manual (VIRM).

This means that one or more training providers be engaged who can train to the required regulatory aspects and operator requirements for all roller brake testing equipment approved for use for heavy vehicle entry and in service (CoF) certification, nationally, to the NZTA requirements. For consistency this training will be aligned with the Inspector Competency Project currently being developed for WoF.

Equipment specific training is required to be incorporated in the training programme. Equipment suppliers are expected to supply all relevant information and assist in the development of operating procedures.

Training providers must have their training course, based on the requirements detailed below, approved by the Vehicles section of NZTA. These training courses would be auditable both in delivery and outcome.

Primary Users

Groups that will need to comply with these national training requirements are:

VTNZ

VINZ

AA Vehicle Testing

NZ Police (CVIU)

NZ Transport Agency

- Access and Use TOs, STOs & MTOs involved in HV & CoF reviews
- CORR TOs & PTOs involved in crash investigation and fleet reviews/audits.

Requirements of training;

For primary users, an NZ Transport Agency approved training programme shall include the following sections:

Understanding how an RBM works.

Approval and calibration of RBMs.

Correct use of a RBM.

Identification of different braking systems.

Test requirements.

Possible faults and causes.

Operation of a mobile RBM (additional module).

OSH requirements.

A RBM operator can only be approved to complete the HV CoF brake test if all required units are satisfactorily completed.

The following is a more detailed breakdown of the requirements of each section or module to enable the training provider to develop a curriculum which will be acceptable to the NZTA.

Understanding how an RBM works

What is brake force and how is it measured.

How axle weight is measured.

How imbalance is measured and displayed.

How brake efficiency is measured and displayed.

Approval and Calibration of RBMs

Identification of approved RBM, make, model.

Confirming approval, how often and why.

Identifying the component parts/functions of a RBM requiring calibration.

Confirming calibration, how and why.

Procedure when RBM is out of calibration or unserviceable.

Correct use of a RBM

Set up of in ground RBM.

Start up and self test procedure (including printer).

How to identify faults in RBM operation.

Reading and understanding the display.

Using the load simulation equipment (chassis and axle).

Operation of RBM and use of remote control (RBM model specific).

Positioning the vehicle on the rollers.

Completing the test and printing the report.

Understanding relationship of written information.

Ability to identify area of test (balance, brake force, rolling resistance, etc).

The pass/fail decision.

Ability to explain results.

Leave RBM ready for the next test.

Identification of different braking systems

It is important that the RBM operator identifies the following braking systems as different test procedures may be required.

Carden shaft parking brakes.

Spring brakes.

Load sensing valves.

ABS and/or EBS systems.

Electric brakes.

Test requirements

It is important that the RBM operator understands the reasons behind the laden RBM brake performance test and be able to inform the HV operator why the requirements are in place. This is background information but ensures the RBM operator understands why he is doing what he is doing and enables him to deal with operators confidently with correct and factual information.

The legal background to laden testing.

The effect of weight v brake force and the effects of axle weight in relationship to test results.

VIRM requirements. When brake performance is measured what is the minimum requirement?

Explanation of 0.5 g/50% minimum deceleration requirement.

Explain how brake performance is expressed.

What is %g of deceleration? How is this calculated from brake force readings?

Ensuring and applying the correct load.

Explanation of reasons for testing at 60% axle weight.

Is there a difference between laden and unladen?

Explain rolling resistance and its importance.

What is the balance requirement for a heavy vehicle? Is it the same for all vehicles and axles?

Explain importance and possible faults if brakes do not operate together both on application and release.

How is the axle brake performance used in the total vehicle brake performance?

Possible faults and causes

This knowledge enables the VI to target possible and probable physical problems present in the braking system and assists with further inspection.

How to identify possible faults on tested vehicle from brake test results (hub seals leaking, faulty air valves, worn suspension, non operational or incorrect load sensing valves, etc).

Operation of a mobile RBM

Set up of mobile RBM – location, area (access/entry/exit), OHS (only required when mobile RBM to be used).

OSH requirements

Must be included, but consistent with the TSDA's OSH policy and the operational safety instructions of the equipment supplier.

Summary

A RBM operator can only be approved to complete the heavy vehicle CoF RBM brake test if all applicable units are satisfactorily completed. This must be proved by examination, comprising both a practical test of knowledge and use of a RBM and theory test of the RBM operator's understanding of the brake performance testing section of the relevant VIRM including the ability to understand and interpret the test results correctly and convey those results to the owner or operator.

Appendix 4: Special vehicle brake testing protocols

Type testing protocol for PSVs

Qualification for type testing

Where a PSV operator has a vehicle or vehicles which do not meet the 60%¹⁴ laden requirement on one or more axles and the addition of actual load or simulated load by tie down is impractical then the vehicle or vehicles can qualify and take advantage of the 'type testing' protocol described in this document. Despite this, Type Testing is optional and is a choice left to the operator. Type Testing is available to all operators of heavy PSVs although the forms are supplied and charged for by the Bus and Coach Association.

Type test conditions

Multiple PSVs of the same type¹⁵ owned and operated by the same operator can use the same type test result as long as they remain in the same configuration and are presented for test within the specified weight tolerance.

Vehicles of the same type¹⁵ owned by the one operator can use the same type test result even if they don't operate from the same location.

Type Testing carried out at a CoF site using a compliant 'in ground' RBM, whether permanent or mobile, may be accepted at any CoF site.

Where a vehicle is normally inspected for its CoF at an Offsite using an 'above ground' mobile RBM the Type Test may be carried out at that site on that machine but subsequent CoF testing is restricted to that site.

At the operator's request, the vehicle manufacturer (body builder) may Type Test a vehicle or fleet of vehicles at time of manufacture and prior to sale, provided that each instance of type testing is conducted for one specific operator/customer and that operator/customer only.

Where a manufacturer has Type Tested a vehicle or fleet of vehicles for an operator/customer, subsequent testing of those vehicles on the manufacturer's initial Type Test results shall only be available to that original operator/customer.

Multiple vehicle types or variants in a fleet must have individual type tests but can use them for as long as they remain in the same configuration and are presented for testing within the specified weight tolerance.

If a vehicle has one or more axles which do not meet the 60%¹⁴ laden requirement then all axles on the vehicle must be type tested.

If a vehicle presents outside the weight tolerance of its type test, then the type test is invalid and is withdrawn for that vehicle. The vehicle must then be tested in the 60%¹⁴ laden state or be type tested again in its new state.

¹⁴ 60% - means 60% of the maximum legal weight for the axle.

¹⁵ Same type - means a vehicle which is of the same make and model chassis and running gear, with the same braking system, has the same wheelbase, the same suspension (springs/air) and number and type of axles/wheels & tyres, has a body of a similar design and manufacture and with the same seating/load configuration.

If a vehicle presents with its configuration having been changed, but remains within its specified axle weight tolerance meaning that the weight distribution remains within tolerance, then that vehicle may continue to use its type test in its new configuration. It must be tested in the 60%¹⁴ laden state or be type tested again only if it cannot meet the individual weights required on each axle when presented for its CoF.

Type testing is not applicable to vehicles which meet the 60%¹⁴ laden requirement on all axles or where the vehicle owner chooses to achieve the 60%¹ laden requirement by the addition of actual load or tie down.

Type testing must be carried out using an approved RBM operated by a TSDA at an approved CoF B site. However, where the vehicle is normally tested for CoF at an Offsite with a mobile RBM the Type Test inspection should also be done at that site.

A decelerometer may NOT be used for type testing.

Type Test procedure

- The type test is to be carried out, approved and added to Landata by a qualified CoF B vehicle inspector (VI) employed by a transport service delivery agent (TSDA).
- The type test braking result is to be identified and recorded on a NZ Transport Agency (NZTA) approved form¹⁶, which defines the vehicle(s) and its configuration and, on completion, this form is to be filed by the TSDA for audit purposes, with one copy of the form to be sent to Vehicle Certifiers Registers in Palmerston North and a copy retained by the operator. This form¹⁶ must have a unique identifier.
- The type test is to be completed by loading, using actual or simulated load, the control vehicle to at least 60%¹⁴ on all axles and brake testing each axle on a compliant, approved roller brake machine (RBM) with all its calibration certificates current. These axle weights to be recorded on the form¹⁶ as reference weights (RW).
- Type testing cannot be completed using a decelerometer.
- Provided each axle has balanced braking, (less than 30% variation across the axle) and a deceleration rate of 0.5 g or better, this result can be recorded against each axle as the reference value (R). To ensure consistency the test on each axle must be repeated three times and the minimum reference value achieved recorded, provided none of the three tests is a failed test (less than 0.5 g).
- The vehicle shall then be unloaded and presented, within the same working day, in its normal, unladen, condition without other modifications from its previously presented condition.
- Axle weights are recorded. These are the control axle weights (CAW) and used to calculate the weight tolerance.
- The axles shall then be individually tested on the same compliant, approved RBM. Again, the minimum of the three tests is to be used provided none of the tests is a failed test. This result is recorded as the control deceleration rate (CDR).
- The CAWs and CDRs are recorded on Landata for the control vehicle and each additional vehicle covered by the type test. The vehicle(s) are identified by adding the HVEX appellation in the certification box on the *ivcert* screen by the VI using the 6 digit unique identifier on Form A.
 - The format for keying the CAWs and CDRs is to use the *comments* field of the *ivcert* screen. Identify the axle with F(front), R(ear) or T(ag) then the CAW (in kg), then a dash, then the CDR followed by the percentage character. Eg ;
F2920-70%R3120-73%T3120-73%
- Each TSDA has been provided a unique certifier ID;

¹⁶ The provision of the 'approved form' will be a Bus and Coach association responsibility and will be controlled and issued through their Wellington office.

- PSVTNZ-Vehicle Testing NZ; PSVINZ-Vehicle Inspection NZ; PSVAA-AA New Zealand
- The park brake, except where it is operated by cardan shaft, must be type tested using the same procedure.
- Where the park brake is operated by cardan shaft the park brake should not be included in the type test but a note added to the type test sheet indicating that the park brake is operated by cardan shaft.
- At each subsequent CoF inspection the standard cardan shaft 'stall' test should be carried out at the presented weight.
- At each subsequent CoF a vehicle covered by a type test will be tested as presented and must be in the same configuration as the control vehicle and be within +550 kg, -350 kg of the CAW
- Each axle must have equal or greater deceleration to the CDR when measured on an approved, compliant RBM, within a tolerance of -2% to accommodate manufacturing tolerances, as long as the measured deceleration is greater than 0.5 g.
- The weight and deceleration tolerances will be monitored, with the assistance of the Bus and Coach Association, and reviewed within 18 months.

Brake testing protocol for specialist vehicles used in the heavy haulage Industry

Preamble

This protocol covers vehicles used in the heavy haulage industry which are unable to be tested on a standard roller brake machine (RBM) as installed in certificate of fitness (CoF) stations. Vehicle types identified which are eligible for this test protocol include: rows of eight, house moving trailers, heavy haulage trailers (as defined in the Rule).

Test procedure and conditions

Heavy haulage vehicles covered by this protocol are to be physically brake tested by stopping tests.

The test to be completed as part of a CoF test by a qualified CoF B vehicle inspector (VI) employed by a transport service delivery agent (TSDA).

These tests to be completed on a firm, flat surface.

Due to the significant tare weight and very high GVM of these vehicles as well as the practical difficulties associated with loading, unloading and stopping a laden heavy haulage vehicle covered in this protocol, the 60%¹⁷ laden requirement is waived for these vehicles and they are to be tested as presented.

The test to be verified by using an approved decelerometer fitted to the vehicle being tested.

A stopping test may also be used, with NZTA approval, where a vehicle is required to stop within a marked distance of 7 m from a verified speed of 30 km/h in a controlled and progressive manner. Note, brake lockup may not verify compliance as control may be lost.

It is important to ensure the test result reflects the deceleration of the individual vehicle being inspected not other vehicles in the combination.

Test speed 30 km/h.

Minimum deceleration rate: 0.5 g.

Imbalance must not be significant (ie less than 30%).

Stopping tests to be performed without loss of control.

Heavy haulage vehicles covered by this protocol may be brake tested either at the TSDA's premises, an approved location within 5 km of the TSDA's premises or at the operators premises but, only if the TSDA cannot accommodate the test.

If the brake test is completed at the operator's premises, where approved by the NZTA, it is to be treated as a split test with the CoF test completed at the TSDA's premises or an approved offsite or specialist site.

When testing the park brake of a heavy haulage trailer a 'stall' or 'drag' test is to be employed. On a flat area, , firmly engage the park brake of the combination vehicle, disconnect the air break coupling between the vehicles, release and reapply the trailer park brake. Release the park brake of the towing vehicle and with the engine of the towing vehicle at idle engage an intermediate gear or 'D' in an automatic. Drive the vehicle forward taking care not to overload the transmission. If the vehicle does not drive forward or the engine stalls then it can be deemed that the trailer has passed the test. This is recorded on the check sheet as a 'stall test' pass. If the vehicle is dragged forward then the park braked wheels must be physically checked to confirm they have locked and not rotated. If all park braked wheels have dragged then it can be deemed that the trailer has passed the test and it can be recorded on the check sheet as a 'drag test' pass.

¹⁷ 60% - means 60% of maximum legal weight.

Brake testing protocol for dedicated stock vehicles (including heavy horse floats) at testing stations without load simulation

Preamble

This protocol covers vehicles used in the stock haulage industry, including heavy horse floats, which are tested at offsites and main sites without load simulation. The reason for this protocol is that dedicated stock vehicles, including horse floats, cannot be tested with their normal load for OSH and animal welfare reasons and it is not practical for them to be loaded with an alternative load for CoF inspection. Vehicles identified which are eligible for this test protocol are:

Vehicles which are dedicated stock vehicles, including horse floats and.¹⁸

Which historically use the off-site or main site.

This protocol is not valid for use at sites which have load simulation equipment or for use at entry certification inspection (CoF).

Test procedure and conditions

Stock haulage and horse transport vehicles covered by this protocol are those tested at approved sites on approved and compliant roller brake machines (RBM).

The test to be completed as part of a CoF test by a qualified CoF B vehicle inspector (VI) employed by a transport service delivery agent (TSDA).

Due to the significant tare weight, although below the 60%¹⁹ threshold, and low numbers involved (300-500 vehicles) the 60%¹⁹ laden requirement is waived for these vehicles but only at sites without load simulation capability and they are to be tested as presented.

To pass, when tested as presented, the vehicle must have a minimum deceleration of 0.5 g (50%) on each axle.

All other test conditions and reasons for rejection in the VIRM remain in place.

The park brake should be testing using the appropriate protocol, however, where possible, the park brake should be tested on the RBM.

Comments and notes

Decelerometer or stopping test testing is not approved except in special circumstances and individual written approval will be required from the NZTA.

A vehicle presented as a stock or horse transport vehicle without a crate fitted will not be eligible for this protocol and must have a laden test, possibly resulting in a split test, or a simulated load test at a main site.

¹⁸ Dedicated Stock or Horse Transport Vehicle - where the stock crate is permanently mounted or sealed to the vehicle.

¹⁹ 60% - means 60% of the maximum legal weight.

Brake testing protocol for special overdimension vehicles at CoF

Preamble

This protocol covers all specialist overdimension vehicles which are not able to be tested on a roller brake machine (RBM). The reason for this protocol is that these vehicles cannot be tested on an RBM due to their size or weight. While this list is part of a living document, vehicles currently identified which are eligible for this test protocol are:

Mobile cranes.

Rail welders.

Overwidth emergency vehicles.

Ground spreaders.

Ground sprayers.

Overwidth specialist heavy trailers which are not heavy haulage vehicles.

Rows of Eight which are not heavy haulage vehicles.

Other vehicles may be added to this list with NZTA approval.

Test procedure and conditions

Special overdimension vehicles covered by this protocol are those tested at both main sites, approved outwork sites and specialist sites.

The test to be completed as part of a CoF test by a qualified CoF B vehicle inspector (VI) employed by a transport service delivery agent (TSDA).

Due to the significant tare weight and low numbers involved the 60%²⁰ laden requirement is waived for these vehicles and they are to be tested as presented.

The test to be verified by using an approved decelerometer fitted to the vehicle being tested.

A stopping test may also be used, with NZTA approval, where a vehicle is required to stop within a marked distance of 7 m from a verified speed of 30 km/h in a controlled and progressive manner. Note, brake lockup may not verify compliance as control may be lost.

It is important to ensure the test result reflects the deceleration of the individual vehicle being inspected not other vehicles in the combination.

Test speed 30 km/h.

²⁰ 60% - means 60% of the maximum legal weight.

Minimum deceleration rate: 0.5 g.

Imbalance must not be significant (ie less than 30%).

Stopping tests to be performed without loss of control.

All other test conditions and reasons for rejection in the VIRM remain in place.

The park brake should be tested using the 'stall test' as described on page nine of the *CoF and entry certification brake test protocol and procedure*. This is recorded on the check sheet as a 'stall test' inspection.

Comments and notes

Extra vehicles added to this protocol at the discretion of NZTA.

Individual vehicles which are not mentioned in this protocol but which the Vehicle Inspector believes can not be successfully brake tested for their CoFon a RBM must have an exemption individually applied for. Any individual exemption granted will be loaded on the notes screen in Landata. This does not include 4WD vehicles which are covered in a later protocol in this appendix; *Brake testing protocol for full-time tandem-drive vehicles*.

Brake testing protocol for special NZDF LOV (Pinzgauer) vehicles.

Preamble

This protocol covers the NZ Defence Forces Pinzgauer LOV vehicles which, by design, have a wheelbase 15 mm longer on the left (kerb-side) than the right (off-side). As a result the rear axles do not sit squarely in a RBM potentially leading to inaccurate brake efficiency readings. Also where these vehicles are in a 6x6 configuration the rear axle set is full time 4WD.

To address this the following RBM test protocol, provided in *Field information bulletin* No 8-July 2008, from BAE Systems, the manufacturer of Pinzgauer vehicles is the approved test protocol for the NZDF LOV (Pinzgauer) fleet.

The alternative test described is for the rear axle or rear axle set ONLY.

Test procedure and conditions

Notes: Caution

To prevent damage to the vehicle ensure the park brake is disengaged prior to starting the RBM brake test.

To prevent damage to the vehicle when testing the rear axle or an axle in the rear set only test one wheel station at a time.

To prevent damage to the vehicle only rotate the wheel station under test to simulate forward motion. The other wheel on the axle must be rotated in the opposite direction.

Procedure

The test to be completed as part of a CoF test by a qualified CoF B vehicle inspector (VI) employed by a transport service delivery agent (TSDA).

Test to be completed on an approved RBM.

When testing the front axle the test to be completed normally.

When positioning the vehicle for a right (off-side) rear test, centralise the wheel station in the rollers. Complete the test with the vehicle in N (neutral). Note, where load simulation is used release load until wheel station is centralised. Once wheel station is centralised reapply load before starting test.

When positioning the vehicle for a left (kerb-side) rear test, position the vehicle so the left hand side wheel station is in the rollers. Engage N and allow the engine to return to idle. With the engine at idle engage D (Drive) and allow the wheel to centralise in the rollers. Complete the test with the vehicle in D ensuring that the engine speed remains at idle. Note, where load simulation is used release load until wheel station is centralized. Once wheel station is centralized reapply load before starting test.

Minimum brake performance of 0.5 g must be achieved.

All other test conditions and reasons for rejection in the VIRM remain in place.

Park brake test

On a flat area, with the engine at idle, firmly engage the park brake and engage D. To complete the stall test, apply full throttle for a maximum of one second. The park brake will maintain the vehicle in a stationary position.

Important note: Exceeding the stall test duration may damage internal driveline components and is to be avoided.

Brake testing protocol for full-time multiple-drive vehicles

Preamble

This protocol covers all vehicles which, by design, have full-time multi-axle drive (4x4, 6x6, 6x4 etc) where it is not possible to disengage the drive on an axle not seated in the rollers of an RBM thus making it impossible to adequately test the vehicle brakes normally on an RBM.

Test procedure and conditions

Notes: Caution

To prevent damage to the vehicle ensure the park brake is disengaged prior to starting the RBM brake test (on axles fitted with a park brake).

To prevent damage to the vehicle when testing the axle(s) only test one wheel station at a time.

To prevent damage to the vehicle only rotate the wheel station under test to simulate forward motion. The other wheel on the axle must be rotated in the opposite direction.

Procedure

The test to be completed as part of a CoF test by a qualified CoF B vehicle inspector (VI) employed by a transport service delivery agent (TSDA).

Test to be completed on an approved RBM.

When testing any axle not fitted with full time drive the test to be completed normally.

When testing an axle in an axle set fitted with full time all wheel drive, test the axle one wheel station at a time. Only rotate the wheel station under the wheel being tested to simulate forward motion. To prevent damage and achieve a valid test the other wheel on the axle must be rotated in the opposite direction.

Minimum brake performance of 0.5 g per axle must be achieved.

All other test conditions and reasons for rejection in the VIRM remain in place.

Exception

Where a vehicle, as defined in Schedule 1 or Schedule 2 of this protocol, has mechanical, fully locking, interconnected differentials with a geared reduction drive, and the wheels on such an axle cannot be contra rotated without damaging the vehicle's drive system, the vehicle may have its brakes tested using an approved decelerometer. However, any axle not affected must be tested on a RBM in the laden condition and both the axle(s) tested on the RBM and the vehicle must have a minimum of 0.5g deceleration.

Park brake test

Where possible the park brake should be tested using the RBM in the normal manner otherwise the appropriate alternative as defined on pages eight and nine of the protocol should be used

Important note: Exceeding the stall test duration may damage internal driveline components and is to be avoided.

Schedule 1

Differential types/models covered by this Protocol & its exception;

Schedule 2

Individual vehicles covered by this Protocol are shown below;

Brake testing protocol for specialist ground spreading vehicles fitted with mud tyres at CoF

Preamble

This protocol covers all specialist ground spreading vehicles which are fitted with tyres as defined in Schedule 3 of this protocol, which do not allow the vehicle to be properly tested on a roller brake machine (RBM). As the attached schedule is part of a living document, tyre brands/models may be added or removed as circumstances require.

Test procedure and conditions

Special ground spreading vehicles covered by this protocol are those tested at both main sites, approved outwork sites and specialist sites.

The test to be completed as part of a CoF test by a qualified CoF B vehicle inspector (VI) employed by a transport service delivery agent (TSDA).

Due to the significant tare weight and low numbers involved the 60%²¹ laden requirement is waived for these vehicles and they are to be tested as presented.

The test to be verified by using an approved decelerometer fitted to the vehicle being tested.

A stopping test may also be used, with NZTA approval.

It is important to ensure the test result reflects the deceleration of the individual vehicle being inspected not other vehicles in combination.

Test speed 30 km/h.

Stopping distance, 7m

Minimum deceleration rate: 0.5 g.

Imbalance must not be significant (ie less than 30%).

Stopping tests to be performed without loss of control. Note, brake lockup may not verify compliance as control may be lost.

All other test conditions and reasons for rejection in the VIRM remain in place.

The park brake should be tested using the 'stall test' as described on page nine of the *CoF and entry certification brake test protocol and procedure*. This is recorded on the check sheet as a 'stall test' inspection.

Schedule 3

²¹ 60% - means 60% of the maximum legal weight.

Approved tyres by brand, type, size and description;

Brake testing protocol for CoF testing motor caravans at testing stations without load simulation equipment

Preamble

This protocol covers privately operated motorcaravans and motorhomes which are tested at offsites and main sites without load simulation. The reason for this protocol is that it can be difficult to present these vehicles for a CoF test with additional load due to door size, interior layout restrictions or because of the difficulty that some operators may have with the loading process. Vehicles identified which are eligible for this test protocol are;

Vehicles which are privately operated motorhomes or motorcaravans and.²²

Which historically use an off-site or main site where this protocol is used.

This protocol is not valid for use at sites which have load simulation equipment or for use at entry certification inspection (CoF).

Test procedure and conditions

Motorhomes and motorcaravans covered by this protocol are those tested at approved sites on approved and compliant roller brake machines (RBM)

The test to be completed as part of a CoF test by a qualified CoF B vehicle inspector (VI) employed by a transport service delivery agent (TSDA).

Due to their significant tare weight, although below the 60%²³ threshold, the 60% laden requirement is waived for these vehicles at sites without load simulation capability and they are to be tested 'as presented'.

To pass, when tested as presented, the vehicle must have a minimum deceleration of 0.5 g (50%) on each axle.

Imbalance to be no greater than 30% across any axle.

The park brake should be testing using the appropriate protocol, however, where possible, the park brake should be tested on the RBM.

All other test conditions and reasons for rejection in the VIRM remain in place.

Comments and notes

Decelerometer or stopping test testing is not approved except in special circumstances and individual written NZTA approval will be required.

A hire or commercially operated motorhome or motorcaravan will not be eligible for this protocol and must have a laden test, possibly resulting in a split test, or a simulated load test at a main site.

²² A motorhome or motorcaravan is a vehicle identified in Landata as a motor caravan.

²³ 60% - means 60% of the maximum legal weight.

Brake testing protocol for specified vehicles unable to carry alternative loads at testing stations without load simulation

Preamble

This protocol covers vehicles which are tested at offsites and main sites without load simulation but where it is inappropriate or impossible for them to carry alternative loads. The reason for this protocol is that these vehicles, identified in Schedule 1 of this protocol, cannot be tested with their normal load for OSH or operational reasons and it is not practical for them to be loaded with an alternative load for CoF inspection. Vehicles identified which are eligible for this test protocol are:

Vehicles which are identified in **Schedule 4** (next page) and.

Which historically use the off-site or main site.

This protocol is not valid for use at sites which have load simulation equipment.

This protocol is not valid for use at entry certification inspection (CoF).

Test procedure and conditions

Vehicles covered by this protocol are those tested at approved sites on approved and compliant roller brake machines (RBM).

The test to be completed as part of a CoF test by a qualified CoF B vehicle inspector (VI) employed by a transport service delivery agent (TSDA).

Due to the normally significant tare weight, although below the 60%²⁴ threshold, difficulty of obtaining appropriate alternative loads and low numbers involved the 60%¹⁹ laden requirement is waived for these vehicles **only** at sites without load simulation capability and they are to be tested as presented.

To pass, when tested as presented, the vehicle must have a minimum deceleration of 0.5 g (50%) on each axle.

All other test conditions and reasons for rejection in the VIRM remain in place.

The park brake should be testing using the appropriate protocol, however, where possible, the park brake should be tested on the RBM.

Comments and notes

Decelerometer or stopping test testing is not approved except in special circumstances and individual written approval will be required from the NZTA.

Extra vehicles may be added to **Schedule 4** at the discretion of NZTA.

²⁴ 60% - means 60% of the maximum legal weight.

Schedule 4

Specialist vehicles designed to carry unpackaged raw or processed food stuffs

Tankers either foodgrade or DG, including chemicals and bitumen

NZ Fire Service appliances carrying a full; crew, water and equipment

Mobile workshop vehicles, fully laden (not workshop tools sales vehicles)

Specialist vehicles fitted out as road markers that can not carry alternative loads.

Note that references to a single axle allowed a tolerance below 0.5g as long as the whole vehicle maintains a deceleration of at least 0.5g have been removed for all special vehicle categories which have been exempt laden testing on an RBM.