Extract taken from: Heavy vehicle specialist certification > Brakes > Brakes (Electric)

5-4 Brakes (Electric)

Reasons for rejection

1. A vehicle, unless exempt, does not have a service brake operating on all wheels

2. A vehicle, unless exempt, does not have a parking brake operating on at least 40% of the wheels, (except a semitrailer first registered before 1 November 1990 that must have a service brake only).

3. A vehicle, unless exempt, does not have an emergency brake, (except a semitrailer first registered before 1 November 1990 that must have a service brake only).

4. The service brake of a vehicle is not able to be applied by the driver from the driver's normal driving position in a controlled and progressive manner.

5. The service brake of a vehicle, unless exempt, must not have any device fitted by which the driver would be able to adjust the brake force distribution between the axles or between the vehicles that are used in a combination vehicle (Note 1).

6. The service brake of a vehicle, whether or not it is being operated as a combination vehicle, does not have one control only except where a trailer brake hand control has been fitted

7. A service brake of class MD3, MD4, ME, NB, NC, TC and TD vehicles first registered in New Zealand on or after 1 November 1990 must act on each wheel.

8. The parking brake of a vehicle, whether or not it is being operated as a combination vehicle, is not able to be applied by the driver from the normal driving position using one control only (Note 1).

9. For a semi-trailer first registered in New Zealand on or after 1 November 1990, the total brake forces generated by the parking brake is not at least 20% of the maximum weight that can be carried on the axle or axle set.

10. The emergency brake of a vehicle does not have a separate circuit and is not combined with either:

    a) the parking brake, or

    b) the service brake of a powered vehicle, if the vehicle is fitted with a full dual-circuit service brake, and either:

        i. one of those circuits activates the brake on all the front wheels and the other circuit activates the brake on all the rear wheels, or

        ii. each circuit activates the brake on at least 1/3 of the wheels

11. The emergency brake of a trailer does not operate immediately and automatically to stop and hold the trailer stationary if it becomes disconnected from the towing vehicle.

12. The emergency brake of a semi-trailer does not act on the wheels that remain in contact with the ground if the semi-trailer becomes disconnected from the towing vehicle during operation.

13. The emergency brake of a vehicle first registered in New Zealand on or after 1 November 1990 does not:

    a) act on at least 1/3 of the wheels, unless there is a front/rear split

b) act as directly as practicable on those wheels without the interposition of any differential gearing.

c) have capacity to:

i. stop the vehicle at any load condition up to the gross vehicle mass or gross combination mass, as applicable, within a distance of 18 m from a speed of 30 km/h, or

ii. for a semi-trailer, generate brake forces the sum of which are at least 20% of the maximum weight that can be carried on the axle or axle set.

14. A vehicle that needs it is not fitted with a device that can be operated by the driver from the driver's normal driving position to keep the vehicle stationary temporarily (Note 1)

15.A vehicle is fitted with a device that can be operated by the driver from the driver's normal driving position to keep the vehicle stationary temporarily but the device prevents the safe operation of the service brake or the parking brake of the vehicle.

16. A device in requirement 13 which can only be de-activated by the driver does not have a label permanently attached displaying the words: “NOT FOR PARKING” (Note 1)

17. A device in requirement 13 which can be de-activated by the control system of the vehicle does not have either:

a) a label permanently attached displaying the words: “NOT FOR PARKING”, or

b) an audible warning device that operates when the driver's door is open while the device is activated and the parking brake is not fully applied.

18. A heavy vehicle certified for compliance with one of the codes or specifications in *Schedules 1* to *4* before 1 March 2007 does not continue to comply with that code or specification.

19. A heavy vehicle certified for compliance with one of the codes or specifications in *Schedules 1* to *4* before 1 March 2007 and has been modified on or after 1 March 2007, and does not continue to comply with that code or specification.

20. A heavy vehicle certified for compliance with one of the codes or specifications in *Schedules 1* to *4* before 1 March 2007 does not continue to comply with that code or specification in that it is not being operated in a combination vehicle that has a gross mass exceeding 39,000 kg, but not exceeding 44,000kg.

21. A vehicle in requirement 17 or 23*,* first registered in New Zealand or modified on or after 1 March 2007 and before 1 July 2008 that is being operated in a combination vehicle with a gross mass exceeding 39,000kg but not exceeding 44,000kg, does not comply with either:

a) the *New Zealand Heavy Vehicle Brake Code*, Second Edition (1997) in *Schedule 4*, or

b) the *Interim Specification for Heavy Vehicle Braking* in *Schedule 1*, or

c) the specific performance requirements for vehicles manufactured or modified in New Zealand in the Heavy-vehicles Brake Rule (Note 1).

22. A vehicle of in requirement requirement 17 or 23 first registered in New Zealand on or after 1 July 2008, or modified on or after that date, must comply with the specific performance requirements for vehicles manufactured or modified in New Zealand in the Heavy-vehicles Brake Rule (Note 1).

23. An anti-lock braking system of a vehicle of class NB, NC, TC or TD first registered in New Zealand on or after 1 July 2008, or that was fitted to a vehicle of those classes in New Zealand on or after that date, are not able to continuously control and adjust the braking effort on the wheels during braking to prevent:

a) the wheels from locking, and

b) the loss of directional control of the vehicle that could be caused by the application of the brake.

24. A control device in requirement 26 does not meet the technical requirements in

a) one or more of the approved vehicle standards inthe Rule, if those standards specify requirements for that device, or

b) requirements 27 to 32.

25. A control device to which requirement 27(b) applies does not act on each axle or is not capable of modulating the brake force separately for:

a) each axle set, and

b) each side of all axle sets except steering axles.

26. A control device to which requirement 27(b) applies does not have sensors to monitor the rotational speed of the wheels.

27. The sensors in requirement 29 are not fitted to at least one wheel on each side of all axle sets.

28. If an axle set consists of more than one axle, the sensor in requirement 29 is not fitted as follows:

a) if the axle set consists of two axles and they are designed to carry the same or a similar load, the sensors must be fitted to the axle on which the wheels are more likely to lock during braking.

b) if the axle set consists of two axles and they are designed to carry significantly different loads, the sensors must be fitted to the axle that carries the greater load.

c) if the axle set consists of more than two axles and they are designed to carry the same or a similar load, the sensors must be fitted to the axle on which the wheels are neither the most likely nor the least likely to lock during braking.

d) if the axle set consists of more than two axles and one of them is designed to carry a significantly greater load than other axles in the set, the sensors must be fitted to the axle that carries the greatest load.

e) if the axle set consists of more than two axles and two or more of them carry a greater load than the remaining axle or axles in the set, the sensors must be fitted to an axle:

i. that is one of the axles carrying a greater load, and

ii. the wheels of which are most likely to lock.

f) if the axle set consists of more than two axles and two or more of them carry a greater load than the remaining axle or axles in the set and the likelihood that their wheels will lock is similar, the sensors may be fitted to any of the axles that carries the greater load.

g) if the axle set consists of two or more axles that carry a similar load, and the likelihood that their wheels will lock is similar, the sensors may be fitted to any of the axles.

29. A control device in requirement 26 that is fitted to a trailer of class TC or class TD does not:

a) comply with the requirements in requirement 26 to 36 without being connected to the control device of the towing vehicle, or

b) is not capable of being supplied with power for its operation by means of an electric cable from the towing vehicle.

30. The power connection between vehicles that can be operated in a combination vehicle does not comply with Parts 1 and 2 of *ISO 7638: 1997*, *Road vehicles – Electrical connectors for braking systems*[1].

31. The brake force applied to a wheel of a heavy vehicle first registered in NZ or modified on after 1. July 2008during braking on a hard, dry, clean and level surface is not approximately proportional to the load on the wheel, taking into account the dynamic load transfer that occurs during braking between the axles of a vehicle and that also may occur between the vehicles of a combination vehicle, at all conditions of loading up to the vehicle's gross vehicle mass even if not fitted with ABS other than a vehicle covered in 35(c).

32. The brake force applied to a wheel of a heavy vehicle first registered in NZ or modified on after 1. July 2008during braking on a hard, dry, clean and level surface is not, for a vehicle with ABS, be approximately proportional to the load on the wheel without relying on the operation of ABS, taking into account the dynamic load transfer that occurs during braking between the axles of a vehicle and that also may occur between the vehicles of a combination vehicle, when the vehicle is loaded to its gross vehicle mass.

33. A vehicle does not comply with the requirements in the specific performance requirements for vehicles manufactured or modified in New Zealand and it has been certified for compliance with the requirements in *Schedule 5* and is within safe tolerance of its state when certified.

34. A repair to a brake, or to a vehicle that affects its braking performance, does not comply with **Land Transport Rule: Heavy Vehicle Brakes 2006** and with **Land Transport Rule: Vehicle Repair 1998**.

35. When a brake lining or a brake pad on an axle has been replaced and all the brake linings or brake pads on that axle have not been replaced

36, When a brake lining or a brake pad on an axle has been replaced and the replacement brake linings and brake pads on that axle are not of the same make, type and grade.

37. A component used in a repair does not have equivalent performance characteristics to that of the original component.

38. A repair or adjustment does not comply with **Land Transport Rule: Vehicle Repair 1998**.

39. A modification to a vehicle that affects the braking performance of the vehicle does not ensure that the modification does not prevent the vehicle from complying with this Rule.

40. A modification to a vehicle that affects its braking performance is not certified by a person or organisation appointed to carry out specialist inspection and certification of heavy vehicle brakes.

41. An electric braked vehicle has not been certified as part of a dedicated combination (Note 1)(Note 2).

42. An electric braked vehicle in a dedicated combination has been certified without both vehicles in the combination being plated with the required certification details (Note 1).

43. An electric braked vehicle is fitted with an operating variable proportioning device (Note 1).

44. An electric braked vehicle is fitted with a brake proportioning switch that provides two levels of braking, laden and unladen, and the switch does not operate automatically when the load is laden or unladen (Note 1).

45. An electric braked vehicle is fitted with any form of indirect application controller (Note 1).

46. An electric braked vehicle has been certified without an exemption from meeting the requirement for compliance with *Schedule 5* of the Rule (Note 1).

Note 1

Electric braked TC trailers must continue to be certified to comply with the Heavy-vehicle Brakes Rule by a HVS certifier with the ‘brakes’ category (HVEK) and have an exemption from the requirements of Schedule 5.

Please view the content under the **Procedure** tab.

Note 2

An electric braked class TC trailer may be towed by a light vehicle and there are additional requirements for this covered in **Technical Bulletin 6**.

Summary of legislation

Applicable legislation

- **Land Transport Rule: Heavy Vehicle Brakes 2006**

General safety requirements

1. A vehicle, unless exempt, must have a service brake, a parking brake and an emergency brake, except a semitrailer first registered before 1 November 1990 that must have a service brake only.

2. A brake must:

a) be easily adjustable to compensate for wear or have a means of automatic adjustment, and

b) be maintained in good condition and efficient working order, and

c) enable the vehicle to comply with the requirements in *2.2(5)*, *2.2(8)*, *2.3(3)*, *2.3(5)* to *2.3(7)*, *2.3(11)* to *2.3(13)* and *2.3(17)*, when the brake is applied by the driver:

i. on a hard dry surface that is free of loose material, and that is level except when the parking brake is applied on a slope, and

ii. without assistance from the compression of the vehicle's engine or other auxiliary braking device in *section 5* that is not part of the vehicle's service brake.

Service brake

3. The service brake of a vehicle:

a) must be able to be applied by the driver from the driver's normal driving position in a controlled and progressive manner, and

b) except for a heavy haulage trailer or a military trailer, must not have any device fitted by which the driver would be able to adjust the brake force distribution between the axles or between the vehicles that are used in a combination vehicle.

4. The service brake of a vehicle, whether or not it is being operated as a combination vehicle, must have one control only except where a trailer hand control has been fitted

5. A service brake of class MD3, MD4, ME, NB, NC, TC and TD vehicles first registered in New Zealand on or after 1 November 1990 must act on each wheel

Parking brake

6. The parking brake of a vehicle, whether or not it is being operated as a combination vehicle, must be able to be applied by the driver from the normal driving position using one control only.

7. Despite *6*, the parking brake control of a class TC vehicle may be fitted to the vehicle if:

a) the vehicle is part of a dedicated combination and does not have an air brake or a brake that is operated with the assistance of compressed air, and

b) the vehicle is fitted with a compliant temporary brake, and

c) the control is fitted in a readily accessible position, and

d) the towing vehicle has a compliant NOT FOR PARKING markings.8. For a semi-trailer first registered in New Zealand on or after 1 November 1990, the total brake forces generated by the parking brake must be at least 20% of the maximum weight that can be carried on the axle or axle set.

Emergency brake

9. The emergency brake of a vehicle may be combined with either:

a) the parking brake, or

b) the service brake of a powered vehicle, if the vehicle is fitted with a full dual-circuit service brake, and either:

i. one of those circuits activates the brake on all the front wheels and the other circuit activates the brake on all the rear wheels, or

ii. each circuit activates the brake on at least 1/3 of the wheels, or

10. The emergency brake of a trailer must operate immediately and automatically to stop and hold the trailer stationary if it becomes disconnected from the towing vehicle.

11. The emergency brake of a semi-trailer must, as far as is practicable, act on the wheels that remain in contact with the ground if the semi-trailer becomes disconnected from the towing vehicle during operation.

12. The emergency brake of a vehicle first registered in New Zealand on or after 1 November 1990 must:

a) act on at least 1/3 of the wheels, except if there is a front/rear split

b) act as directly as practicable on those wheels without the interposition of any differential gearing.

c) be capable of:

i. stopping the vehicle at any load condition up to the gross vehicle mass or gross combination mass, as applicable, within a distance of 18 m from a speed of 30 km/h, or

ii. for a semi-trailer, generating brake forces the sum of which is at least 20% of the maximum weight that can be carried on the axle or axle set.

Devices to keep a vehicle stationary for a limited time

13. A vehicle may be fitted with a device that can be operated by the driver from the driver's normal driving position to keep the vehicle stationary temporarily, provided that the device does not prevent the safe operation of the service brake or the parking brake of the vehicle.

14. A device in 13 may utilise the service brake by:

a) applying the service brake, either partially or fully, on some or all of the vehicle's wheels, or

b) preventing the release of the service brake, when applied by the driver, on some or all of the vehicle's wheels.

15. A device in 13 which can only be de-activated by the driver must have a label permanently attached displaying the words: “NOT FOR PARKING”.

16. A device in 13 which can be de-activated by the control system of the vehicle must either have:

a) a label permanently attached displaying the words: “NOT FOR PARKING”, or

b) an audible warning device that operates when the driver's door is open while the device is activated and the parking brake is not fully applied.

Additional requirements for towing vehicles

17. The brake of a heavy vehicle that has been fitted with a towing connection to tow a vehicle of class TC or class TD must comply with 17 to 22.

18. A vehicle in 17 certified for compliance with one of the codes or specifications in *Schedules 1* to *4* before 1 March 2007 must continue to comply with that code or specification, if that vehicle:

a) has not been modified on or after 1 March 2007, and

b) is being operated in a combination vehicle that has a gross mass exceeding 39,000kg but not exceeding 44,000kg.

19. A vehicle in 17 first registered in New Zealand after 1 March 2007 and before 1 July 2008 that is being operated in a combination vehicle that has a gross mass exceeding 39,000kg but not exceeding 44,000kg, must comply with:

a) the *New Zealand Heavy Vehicle Brake Code*, Second Edition (1997) in *Schedule 4*, or

b) the *Interim Specification for Heavy Vehicle Braking* in *Schedule 1*, or

c) the requirements with which a vehicle of the same class must comply if first registered in New Zealand or modified in New Zealand on or after 1 July 2008.

20. An imported vehicle of class NB or class NC to which 17 applies that is first registered in New Zealand on or after 1 July 2008 must comply with:

a) at least one of the approved vehicle standards in the Rule that require ABS, and

b) all of the following:

i. one or more of the approved vehicle standards in the Rule, and

ii. be fitted with an anti-lock braking system except for a logging vehicle, provided that the standard with which it complies does not require an ABS function

21. A vehicle of class NB or class NC in 17 that is manufactured in New Zealand and is first registered on or after 1 July 2008, or a vehicle of class NB or class NC modified in New Zealand on or after that date, must comply with *7.5*.

22. A vehicle of class TC or class TD in 17 first registered or modified in New Zealand on or after 1 July 2008 must comply with the specific performance requirements for vehicles manufactured or modified in New Zealand.

Additional requirements for trailers

23. A vehicle of class TC or TDcertified for compliance with one of the codes or specifications in *Schedules 1* to *4* before 1 March 2007 must continue to comply with that code or specification, if that vehicle:

a) has not been modified on or after 1 March 2007, and

b) is being operated in a combination vehicle that has a gross mass exceeding 39,000 kg, but not exceeding 44,000kg.

24. A vehicle in 23, first registered in New Zealand or modified on or after 1 March 2007 and before 1 July 2008 that is being operated in a combination vehicle with a gross mass exceeding 39,000kg but not exceeding 44,000kg, must comply with either:

a) the *New Zealand Heavy Vehicle Brake Code*, Second Edition (1997) in *Schedule 4*, or

b) the *Interim Specification for Heavy Vehicle Braking* in *Schedule 1*, or

c) the specific performance requirements for vehicles manufactured or modified in New Zealand in the Heavy-vehicles Brake Rule.

25. A vehicle of class TC or class TD in 23 first registered in New Zealand on or after 1 July 2008, or modified on or after that date, must comply with the specific performance requirements for vehicles manufactured or modified in New Zealand in **Land Transport Rule: Heavy Vehicle Brakes 2006**.

Requirements for anti-lock brake systems (ABS)

26. An anti-lock braking system of a vehicle of class NB, NC, TC or TD first registered in New Zealand on or after 1 July 2008, or that was fitted to a vehicle of those classes in New Zealand on or after that date, must be capable of continuously controlling and adjusting the braking effort on the wheels during braking to prevent:

a) the wheels from locking, and

b) the loss of directional control of the vehicle that could be caused by the application of the brake.

27. A control device in 26 must meet the technical requirements in

a) one or more of the approved vehicle standards inthe Rule, if those standards specify requirements for that device, or

b) 28 to 32.

28. A control device to which 27(b) applies must act on each axle and must be capable of modulating the brake force separately for:

a) each axle set, and

b) each side of all axle sets except steering axles.

29. A control device to which 27(b) applies must have sensors to monitor the rotational speed of the wheels.

30. The sensors in 29 must be fitted to at least one wheel on each side of all axle sets.

31. If an axle set consists of more than one axle, the sensor in 29 must be fitted as follows:

a) if the axle set consists of two axles and they are designed to carry the same or a similar load, the sensors must be fitted to the axle on which the wheels are more likely to lock during braking.

b) if the axle set consists of two axles and they are designed to carry significantly different loads, the sensors must be fitted to the axle that carries the greater load.

c) if the axle set consists of more than two axles and they are designed to carry the same or a similar load, the sensors must be fitted to the axle on which the wheels are neither the most likely nor the least likely to lock during braking.

d) if the axle set consists of more than two axles and one of them is designed to carry a significantly greater load than other axles in the set, the sensors must be fitted to the axle that carries the greatest load.

e) if the axle set consists of more than two axles and two or more of them carry a greater load than the remaining axle or axles in the set, the sensors must be fitted to an axle:

i. that is one of the axles carrying a greater load, and

ii. the wheels of which are most likely to lock.

f) if the axle set consists of more than two axles and two or more of them carry a greater load than the remaining axle or axles in the set and the likelihood that their wheels will lock is similar, the sensors may be fitted to any of the axles that carries the greater load.

g) if the axle set consists of two or more axles that carry a similar load, and the likelihood that their wheels will lock is similar, the sensors may be fitted to any of the axles.

32. A control device in *26* that is fitted to a trailer of class TC or class TD must:

a) comply with the requirements for ABS in the Rule, without being connected to the control device of the towing vehicle, and

b) be capable of being supplied with power for its operation by means of an electric cable from the towing vehicle.

33. The power connection between vehicles that can be operated in a combination vehicle must comply with Parts 1 and 2 of *ISO 7638: 1997*, *Road vehicles – Electrical connectors for braking systems*.

Specific performance requirements for vehicles manufactured or modified in New Zealand

34. A vehicle to which *21*, *22*, *24(c)* or *25* applies must, in addition to complying with the other applicable requirements in this Rule, comply with the specific performance requirements for vehicles manufactured or modified in New Zealand.

35. The brake force applied to a wheel of a vehicle in 34 during braking on a hard, dry, clean and level surface must:

a) for a vehicle without ABS other than one in 35(c), be approximately proportional to the load on the wheel, taking into account the dynamic load transfer that occurs during braking between the axles of a vehicle and that also may occur between the vehicles of a combination vehicle, at all conditions of loading up to the vehicle's gross vehicle mass.

b) for a vehicle with ABS, be approximately proportional to the load on the wheel without relying on the operation of ABS, taking into account the dynamic load transfer that occurs during braking between the axles of a vehicle and that also may occur between the vehicles of a combination vehicle, when the vehicle is loaded to its gross vehicle mass.

c) for a class TC vehicle, a logging vehicle, a heavy haulage trailer or a military trailer, be the brake force specified in 35(a) only when the vehicle is loaded to its gross vehicle mass, even if ABS is not fitted.

36. A vehicle complies with the requirements in the specific performance requirements for vehicles manufactured or modified in New Zealand, if it has been certified for compliance with the requirements in *Schedule 5* and is within safe tolerance of its state when certified.

Repair

37. A repair to a brake, or to a vehicle that affects its braking performance, must comply with **Land Transport Rule: Heavy Vehicle Brakes 2006** and with **Land Transport Rule: Vehicle Repair 1998**.

38. When a brake lining or a brake pad on an axle is replaced:

a) all the brake linings or brake pads on that axle must be replaced, and

b) all replacement brake linings and brake pads on that axle must be of the same make, type and grade.

Replacement components for vehicle repair

39. Subclauses 41 and 42 apply to any component that affects the braking performance of a vehicle and that is:

a) manufactured, stocked or offered for sale in New Zealand, and

b) supplied for fitting to a vehicle to be operated on a New Zealand road.

41. A component used in a repair must have equivalent performance characteristics to that of the original component and must not prevent a vehicle from complying with this Rule.

42. A brake lining assembly used as a replacement component, whether or not the brake to which it is fitted is required to comply with an approved vehicle standard, complies with this Rule if it complies with *UN/ECE Regulation No. 90*, *Uniform Provisions concerning the approval of replacement brake lining assemblies and drum brake linings for power-driven vehicles and their trailers (E/ECE/324E/ECE/TRANS/505/Rev.1/Add.89)*.

Responsibilities of repairers

43. A person who repairs or adjusts a brake must ensure that the repair or adjustment:

a) does not prevent the vehicle from complying with this Rule, and

b) complies with **Land Transport Rule: Vehicle Repair 1998**.

Responsibilities of modifiers

44. A person who modifies a vehicle so as to affect the braking performance of the vehicle must:

a) ensure that the modification does not prevent the vehicle from complying with this Rule, and

b) notify the operator that the vehicle must be inspected and, if necessary, certified by a person or organisation appointed to carry out specialist inspection and certification of heavy vehicle brakes.

Responsibilities of vehicle inspectors and inspecting organisations

45. A vehicle inspector or inspecting organisation must not certify a motor vehicle under **Land Transport Rule: Vehicle Standards Compliance 2002** if they have reason to believe that the vehicle does not comply with this Rule.

46. During the certification of a vehicle, compliance of a vehicle's brakes with the performance requirements in this Rule must be verified by means of appropriate tests, using approved testing devices and following correct test procedures.

Functions and powers of the Transport Agency

47. The Transport Agency may revoke, by giving written notice, a record of determination issued after specialist inspection and certification that a vehicle complies with this Rule, if the Transport Agency is satisfiedon reasonable grounds that the applicable requirements have not been complied with.

Procedure

Electric braked TC trailers must continue to be certified to comply with the Heavy-vehicle Brakes Rule by a HVS certifier with the ‘brakes’ category (HVEK) and have an exemption from the requirements of Schedule 5.

This procedure is for use on electrically controlled braking systems fitted to TC trailers and their prime movers only. The purpose of the procedure is to ensure balanced braking between the vehicles in combination and is approved by exemption for the combination once all required tasks are completed and information, including the **CA11 Application for an exemption from land transport vehicle rules form** and applicable payment, are provided to:

HV Exemption Assessments

NZ Transport Agency

Private Bag 6995

Wellington 6141.

This procedure results in a dedicated combination in that only the towing vehicle that has been certified with it may tow the certified trailer. Reference should also be made to **Technical bulletin 6** where the TC trailer is towed by a light vehicle.

Park brake application and efficiency

Most TC trailers are fitted with electrically controlled brakes with no mechanical park brake mechanism. Electrically controlled braking systems on their own, are not capable of holding a vehicle stationary indefinitely because electric power is required to hold the brake on. These vehicles must be fitted with a brake system that incorporates a mechanical parking brake.

The Rule includes a clause, 2.3(9A) in the Rule, allowing a mechanical park brake control to be mounted in an easily accessible position on the towed vehicle as long as a temporary brake, operated by the driver from the normal driving position and consistent in design and operation with Section 5.3 in the Rule, is fitted to the towing vehicle. This can be in the form of a switch which controls the electric brake. This will result in a dedicated combination where only specified towing vehicle(s) may tow the specified trailer.

Variable proportioning devices

The Rule requires that no device is fitted which enables the driver to adjust the brake force distribution between axles or vehicles used in a combination [2.3(1)(b)]. So, any of these devices, which may be used by the engineer when setting up the brakes for the combination, must be permanently set or removed on certification.

Boat switch

As TC trailers are not required to be fitted with ABS there have been brake lockup problems reported with some vehicles, such as large boat trailers, with a large differential between laden and unladen weight. This issue may be addressed by switching the brake function between a ‘light’ and ‘heavy’ setting automatically by way of a switch operated by the loading and unloading of the boat or other load. Any switch must operate automatically with no independent input from the operator and be solely dependent on the actual loading or unloading of the trailer. Alternatively, there are electronic load sensing devices available from the major brake component suppliers which can be used to regulate brake force with respect to changing loads.

Inertia/timer operated brakes

The Rule requires that the service brake of a heavy vehicle, whether in combination or not, must be able to be applied from the driver’s normal driving position in a controlled and progressive manner using one control only, [2.3(1)(a) and 2.3(2)]. This means that any Inertia or timer service brake controls fitted to a TC or TD trailer are not allowed by the Rule and must be replaced by a progressive control operated from the same control as the service brake of the towing vehicle.

Preparation

The foundation brake must be in good condition with all components well maintained, bedded in and operating within the manufacturer’s tolerances. Brake shoes must be clean and dry and any wear should be even. The full face of the shoe must match up with the drum and the magnetic pad must be within the manufacturer’s tolerance for wear and that wear must be even. Some systems may require heavier wiring to prevent excessive voltage losses or heat build up in the electrical system which can lead to inefficiency and inconsistent braking. It is unlikely that proper certification will be possible if the electric brake system has not been properly maintained or adequately bedded in.

Initial preparation

Prior to commencing the actual certification task certain calculations are required. Firstly, the axle weight transfer, due to a peak deceleration of 0.45g, as required in 6.1(2), must be calculated at full GVM [from 7.5(2)(c)]. This weight transfer calculation can be completed using a centre of gravity estimated by using the same calculation as for SRT for mixed freight. Then, calculate the residual axle load, the gross axle load less the weight transfer due to the 0.45g deceleration

previously calculated and complete a laden roller test at the residual axle weight and test to achieve a 0.45g deceleration on each axle without lockup or wheel slip occurring.

Certification to HVEK

These modifications must be certified by a HVS certifier with the HVEK category who must also certify the vehicle to the Rule. While TC trailers are not required to have ABS they must still meet the performance requirements of the NZ Heavy-vehicle Brake Specification as set out in Schedule 5 or Section 7 of the Rule. This certification can be proven by a combination of physical testing and calculation. To achieve this, the following steps are to be followed:

- In the first instance a coupling voltage needs to be established for the trailer to achieve a minimum 0.5g braking efficiency.
- Ensure the vehicle has its foundation brakes fully serviced and that they are operating to achieve a minimum braking efficiency of 0.5g and balanced from left to right and between axles (+/- 10% is suggested).
- Use an approved and calibrated RBM to test the combination for service and park brake performance to the requirements of section 2.3(3) & 2.3(11), or 2.3(12) for semi trailers.
- When setting up a semi trailer combination both the towing and towed vehicle should be tested at presented weight with no tie down. This will be reflected at CoF.
- Measure trailer and get split weights for calculation purposes.
- Carry out weight transfer calculations and braking requirements for testing.
- Put trailer's first axle over brake rollers and measure coupling voltage at 0.5g (typically 3 to 7 Volts).
- Test Temporary park brake.
- Test permanent park brake if fitted to the first axle.
- Repeat the above procedure until all axles have been completed, ensuring balanced braking.
- From the testing done on all axles, the HVEK is to establish the average voltage to brake trailer at 0.50g.
- Note this trailer testing should also validate weight transfer calculations carried out earlier to meet braking requirements of the Rule.
- Once a coupling voltage has been established for the trailer the truck controller needs to be calibrated to produce a matching coupling voltage when it is producing 0.5g braking efficiency.
- With the trailer attached and, providing a majority of the imposed load is through the rear axle of the towing vehicle, put the rear axle on the brake rollers and use this to calibrate the coupling voltage. If the position of the fifth wheel connection is significantly ahead of the rear axle then an average of both front and rear axles should be used to calibrate the coupling voltage.
- Run the brake rollers and apply the truck brakes to achieve a minimum balanced braking efficiency of 0.5g.
- Measure the voltage at the coupling and calibrate the brake controller to achieve the desired voltage to allow for weight transfer (for 5^{th} Wheel trailers). A different calculation for the coupling voltage differential is required for other trailer types (simple, full etc) dependent on the load they impose on the towing vehicle.
- At the onset of braking both vehicles in the combination should commence braking as close as possible to simultaneously. Any deviation from simultaneous operation should be biased towards the trailer where possible or towards the towing vehicle if the towed vehicle is a semi trailer.
- Road test with an approved decelerometer following the requirements of Section 6 of the rule, notwithstanding that these requirements are for non towing vehicles, and a minimum of three tests for each facet of the brake test is to be carried out.

Note: when weight transfer is calculated for a 5th wheel trailer it generally requires a voltage reduction when calibrating the truck controller. From reported experience and road testing 10 – 20% works well achieving good smooth braking with no wheel lock up. For example, with a trailer coupling voltage of 5 Volts the truck coupling would typically be set at 4 to 4.5 Volts. If set at 5 Volts the trailer brakes may be set too aggressively resulting in wheel lock up.

The certifier to plate both vehicles with the following data:

- VIN numbers of both vehicles
- Brake Test Mass
- Certified Trailer Braking Efficiency
- Signal voltage/current @ Certified Braking Efficiency.

An exemption from the requirements of 7.5(3) is required as part of the certification of the combination.

Note: like all heavy vehicles, TC trailers are required to undergo CoF testing using an approved, calibrated roller brake machine.