SPECIFICATION

ROLLER BRAKE TESTERS FOR TESTING CLASS III & IV VEHICLES

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Annexes

These Annexes apply to Roller Brake Testers to be approved for use in Class IV Automated Test Lanes (ATL's) only, and will be identified as such on the VOSA list of approved Roller Brake Testing equipment.

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Annexes Cont'd

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1. INTRODUCTION

This Specification details the MINIMUM performance and constructional requirements for Roller Brake Testers (RBTs) intended to be used for the statutory annual MOT brake performance testing of Class III & IV vehicles in accordance with the Motor Vehicle (Tests) Regulations 1981, as amended.

The Specification does not rule out additional features supplied with the equipment provided that the features are acceptable on health and safety grounds and do not prevent or make it more difficult to carry out the MOT Test as prescribed.

2. TECHNICAL REQUIREMENTS

The RBT shall consist of a pair of roller sets mounted in the ground, or within a raised floor, with a separate display console. The RBT shall be safe to use, robustly constructed to acceptable engineering standards and suitable for brake testing Class III and IV vehicles.

2.1 Roller Set

The roller sets shall have:

a. a means of preventing either roller set operating unless a wheel is correctly located in it

Note 1 Except following calibration (see Section 3.1 below)

b. the ability to be driven independently or simultaneously by the use of suitable controls (for manual operation only)

c. a means of manually stopping either or both roller sets

d. an automatic means of stopping either roller set individually when the tyre to roller slip reaches a pre-set limit in the range 20 to 30%.

(to ensure that the slip value remains constant throughout the full range of brake force, and if variations occur in the power supply, the means of stopping the roller set shall include actual measurement of the speed of the sensing roller and the speed of the motor/drive roller train)

Note 1: A tyre to roller slip of 20% is when the surface speed of the vehicle wheel equals 80% of the surface speed of the RBT rollers.

Note 2: When both roller sets are in use and one wheel locks, only the relevant roller set should stop.

e. a design which allows brake testing of small-wheeled or low ground clearance vehicles (eg. Mini with 10" wheels or low sports car) without any part fouling or grounding

f. the capability of testing the single wheel of a 3 wheeled vehicle. (for manual operation Class III approvals only)

g. the capability of accepting an axle load of 2000 kg.

h a clear, durable marking showing the normal forward 'drive-on' direction of the RBT.

i no part protruding more than 50 mm above the floor surface.
(If a cross-pit RBT is offered for approval, a suitable protection device shall be installed to prevent the rollers from being started when a person is in the pit within reaching distance of the RBT.)

Note 3: Manufacturers should be aware that the latest version of the Conditions of Appointment states when a cross-pit RBT is installed for MOT use, the length of pit taken up by the RBT shall be in addition to the length of pit specified for the under-vehicle inspection. To meet this requirement, a distance of 1.5 metres will be added to the minimum pit length required. The extra 1.5 metres will be measured to the edge of the first aperture in the top of the RBT.

Note 4: As a cross-pit RBT is not suitable for testing Class III vehicles, no assessment of the requirement in 2.1(f) above will be made. If approval is granted, the RBT shall be specifically excluded from use in testing all Class III vehicles.

2.1.1 Rollers

The rollers shall have:

a. a surface that is durable and not likely to cause undue tyre damage

b. a roller to tyre co-efficient of friction of not less than 0.6 in wet conditions

c. the following dimensions

i)	minimum diameter	180 mm	
ii)	minimum length	600 mm	
iii)	not greater than	500 mm	between roller centres
iv)	not greater than	880 mm	between inner ends of the high friction surfaces of the left and right rollers

d. (when running) a constant surface speed in the range 2 to 5.5 km/h

Note 1: The speed of the rollers shall remain within the specified range throughout the full range of brake force.

2.2 Brake Force Display

The brake force display shall:

a. indicate in units of kilogram force (kgf)

b. indicate the brake force individually for each wheel on an axle.

c. be analogue and sufficiently sensitive to show the variations in brake force caused by excessive drum ovality or disc runout.

d. if a VDU is used, include an additional digital display of brake force which shall be of a size that is readable from the vehicle driving position.

Note 1 If the brake force is displayed on analogue dials, an additional digital display of brake force is acceptable.

e. have maximum brake force display values in the range 600 to 800 kgf.

Note 2 : There shall be a separate scale in the case of RBTs designed principally to measure higher brake forces

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f. be marked with graduations of not greater than;

i) 10 kgf from zero up to and including 240 kgf.
ii) 20 kgf from 240 kgf and above

Note 3: If a VDU is used, a more relaxed requirement can be applied to the analogue scale provided that the digital scale exceeds the above requirement

g. indicate individually for each roller set when a wheel lock occurs

h. retain the maximum brake force values until either the indication is manually reset or the rollers are re-started.

2.3 User Controls

Note 1: AUTOMATIC operation of a RBT is NOT permitted for MOT testing, except in the case of an ATL

The user controls shall be;

a. manually operated

b. suitably identified in English or with acceptable symbols

c. capable of starting the roller sets independently or simultaneously

d. capable of performing a satisfactory test on a 4WD vehicle

e. capable of stopping the roller sets

f. capable of being operated from the vehicle driving seat by remote control.

If the remote control unit is not hard-wired:

g. suitable secondary operating controls shall be available on the console, or equivalent

h. the unit shall be resistant to spurious signals from other sources

i.. a system shall be in place to ensure that each unit is dedicated to operate only one RBT when two or more are used in close proximity

j. provision of safe storage shall be provided for the remote control unit when not in use

In addition, there shall be;

k. a visual indication for the user on the display console showing;

i) when each roller set is in operation, and
ii) if the RBT has a bi-directional facility, whether the roller sets are operating in 'forward' or 'reverse' direction.

l a durable notice in a prominent position stating "RBT shall NOT be used in automatic mode for MOT Testing" if the RBT is equipped with an automatic test routine option, except in the case of an ATL.

m. a durable notice in a prominent position stating "RBT suitable for testing 4WD vehicles"

2.4 Brake Efficiency and Imbalance

a. There shall be a satisfactory means available for either the user to calculate or for the RBT to display the value of;

i) brake efficiency, calculated from the total brake force and expressed as a percentage of the vehicle weight, and
ii) imbalance of brake force between the left and right wheels on an axle, expressed as a percentage of the higher brake force.

b. If the RBT is equipped with a means of automatically calculating brake efficiency, the algorithm used shall be in accordance with that defined in the latest version of the relevant MOT Inspection Manual.

c. If the RBT is equipped with a device for indicating maximum brake imbalance it shall;

i) be inhibited when both left and right brake forces are 40 kgf or less,
ii) function when one or both brake forces exceed 40 kgf and one brake force is less than 75% of the other, and
iii) display the numerical difference between left and right brake forces as a percentage of the higher brake force, ie

$$\text{Imbalance (\%)} = \frac{\text{high force - low force}}{\text{high force}} \times 100$$

3. CALIBRATION

A means of calibrating the brake force shall be available and the RBT display shall be capable of showing negative numbers close to zero.

A means of calibrating an ATL weighing facility shall also be available.

The applicant shall provide an assurance that a system is in place to ensure all of its calibration devices used for the subject RBT are checked and certified by an accredited organisation on a regular basis.

3.1 Brake Force Measurement

The calibration equipment shall;

a. be capable of checking brake force accuracy at the following values;

0, 100, 200, 400 and 600/800 kgf

Note 1: If the brake force measurement is displayed on analogue

dials, the accuracy of the calibration shall be assessed via the dials and not from any secondary means.

Note 2: If the brake force measurement is displayed on a VDU, the accuracy of the brake force measurement shall be judges against the digital values

b. have a method and operational accuracy that is traceable to a national physical standard

c. be certified by a UKAS accredited laboratory or an equivalent European laboratory, that the whole calibration device is traceable to a national physical standard

Note 3: All component parts of the calibration device, including any weights, shall be individually marked with an identity number to enable all parts to be kept together as a set. The certificate shall relate to the set and each calibration device produced shall require its own certificate.

Note 4: If the certificate or any other relevant document produced for the calibration device is not in English, the applicant shall make available a translation into English.

When the static calibration has been completed, to assess the level of torque required to rotate the RBT drive train mechanism, including any unexpected cause of increased friction such as a failing roller bearing, the following test shall be carried out:

With the RBT in 'calibration mode' and with NO vehicle in the rollers, the rollers shall be rotated and the brake force displayed shall not exceed:

3% x 800 kgf (max brake force)

= 24 kgf

3.1.1 Accuracy

RBT

The RBT brake force readings shall be accurate to within;

+/- 3 kgf	of the true value from zero up to and including 100 kgf.
+/- 3 per cent	of the true value for all readings above 100 kgf.

The RBT brake force calibration device shall be accurate to within:

+/- 0.3 kgf	of the true value from zero up to and including 100 kgf.
+/- 0.3 per cent	of the true value for all readings above 100 kgf.

ATL Weighing Facility

A method must be available of certifying that the facility is accurate to within +/- 3% between 200kg and 3000kg imposed weight.

4. INSTRUCTION MANUAL

A comprehensive Instruction Manual shall be supplied with each RBT.

The Instruction Manual shall:

a. be written in English

b. explain how to operate the RBT, including the function of each control, and how to interpret the results

c. detail how to use the RBT to carry out a brake performance test and make reference to the need to follow the brake test procedure detailed in the latest version of the relevant MOT Inspection Manual when carrying out a statutory MOT test

d. detail the procedure for calibrating the RBT.

Note 1 Inclusion of the calibration procedure in the Instruction Manual is applicable only if calibration equipment is to be offered to the purchaser of the RBT. If not, a separate Calibration Manual for use by the service engineer shall be available for assessment at the approval stage.

5. IDENTIFICATION

The equipment shall be marked with a durable identification as shown on the approval certificate, on the exterior, clearly identifying the make, model and serial number and, which must be readily visible after the equipment has been installed. A copy of the approval certificate will also be issued to the Vehicle Testing Station after installation, showing the make/ model / serial number, and the address of the place of installation.

ANNEX 1 Equipment Test Procedure Requirements for Automated Test Lane Roller Brake Testers

The brake roller tester must incorporate a computer controlled system (C.C.S). The C.C.S must provide the tester with an automated system that:-

- Before commencing the test, provides the person carrying out the test the option of selecting the correct test type for vehicle under test.

- Has automatic start up of the rollers after a minimum period of 2 seconds

- By means of written on screen prompts, guides the person carrying out the test through the correct procedure for that particular vehicle (as defined in the relevant inspection manual or other VOSA guidance).

- Carries out all the required brake performance calculations specified for the type of vehicle under test (as specified in the relevant inspection manual or other VOSA guidance).

- Provides an analogue visual display of each aspect of the brake test.

- Produces a detailed printed report of brake test results on service and parking brake efficiency at the end of each brake test. Must also provide figures for parts of the test that is a manual assessment of pass or fail.

- Incorporates a manual mode facility and records on print out whether manual or automatic mode was used to conduct the brake performance test.

- Provides the facility to store data from each test result for a minimum period of 52 weeks with a rolling self deleting facility after that period.

- Provides the ability to weigh axles and record these weights (either incorporated in the equipment or a remote facility that automatically transfers axle weight data to the equipment). This weighing facility must remain accurate to +/- 3% between 200kg and 3000kg imposed weight.

Annex 2 Test procedure by Class of Vehicle

Testing the Front Axle

Step:

1. With the RBT switched on drive into the rollers.

2. Rollers start and allow vehicle to centralise for 2 seconds.

3. Gradually apply the service brake until wheel lock occurs or maximum brake effort is achieved, release the brake and store results.

4. Rollers restart and note/record any significant brake effort from a wheel without any brake being applied.

5. With the rollers still running gradually apply the service brake and watch how the braking effort for each wheel increases, continue until just before wheel slip occurs (noted from step 2) . If wheel slip does occur then step 4 must be repeated. Gradually release the service brake and note/record how the brake effort at each wheel reduces then stop rollers.

6. If the parking brake is on the front wheels rollers start and step 2 is repeated but applying the parking brake instead of the service brake.

Testing the second axle

Step:

1. If the parking brake is on the second axle move the vehicle forward so as the second axle is in the rollers, allow 2 seconds for the vehicle to centralise then gradually apply the parking brake until wheel lock occurs or maximum brake effort is achieved, release the brake and store results.

2. Rollers restart and conduct steps 2, 3, 4 & 5 on the second axle

Annex 3 Brake Test Calculations

8.1 Brake Efficiency

Total up the braking effort recorded from all the wheels of the vehicle when the service brake is applied. Total up the braking effort recorded from the appropriate wheels when the parking brake is applied.

Calculate the service brake and parking brake percentage efficiencies by following the procedures detailed below according to the Class of vehicle tested.

Class IV Vehicles	**Class VL & VII Vehicles**
From the presented weight calculate the percentage efficiency by dividing the total brake effort achieved when the service brake is applied by the vehicle weight and then multiplying the result by 100. **i.e Total brake effort x 100 = % Efficiency** **Vehicle Presented Weight** Calculate the parking brake percentage efficiency by dividing the total brake effort achieved when the parking brake is applied by the vehicle weight and then multiplying the result by 100, as above.	Obtain the vehicle Design Gross Weight (DGW) from the Department of Transport plate (commonly called 'Ministry' plate) fitted to the vehicle. If a Ministry plate is not fitted to the vehicle then obtain the DGW from the manufacturer's plate fitted to the vehicle. Calculate the service brake percentage efficiency by dividing the total brake effort achieved when the service brake is applied by the vehicle DGW and then multiplying the result by 100. **i.e Total brake effort x 100 = % Efficiency** **DGW** Calculate the parking brake percentage efficiency by dividing the total brake effort achieved when the parking brake is applied by the vehicle DGW and then multiplying the result by 100, as above.

8.2 Brake Out-of-Balance

The out of balance of the braking effort on the front steered wheels when the service brake is applied is obtained by comparing the brake efforts at each front wheel when they are tested simultaneously Carry out the following calculation to determine the percentage imbalance:

$$\frac{\text{(Higher brake effort - Lower brake effort)}}{\text{Higher brake effort}} \times 100 = \%\ \text{imbalance}$$

Note: *The service brake percentage efficiency is considered satisfactory providing wheel lock occurs on* ***more than half*** *of the wheels braked by the service brake. The results printout must show that the vehicle has passed on the locked wheel criteria.*

Note: Class VII vehicles only

When testing service brake performance on unladen vehicles premature wheel lock can occur, and less than the required brake effort is achieved.

The required brake effort might not be achieved due to the action of load sensing/pressure reducing equipment in the service brake system.

In either or these cases, the service brake percentage efficiency is considered satisfactory if

i) more than half the wheels lock, or

ii) both front wheels lock and at least 100kg (220lb) is achieved by each rear wheel, or

iii) for three axle vehicles; both front wheels lock and at least 50kg (110lb) is achieved by each rear wheel.