COMMENTARY TO AG:PT/T210 - VERIFICATION PROCEDURE FOR A WHEEL TRACKING DEVICE

PREFACE

This Calibration Method was prepared by National Asphalt Research Co-ordination Project Group on behalf of the Austroads Pavement Reference Group. Representatives of ARRB Transport Research, the Australian Asphalt Pavement Association and Austroads Member authorities have been involved in the development and review of this test method

FOREWORD

The determination of the deformation resistance of asphalt mixes uses a wheel tracking device which consists of testing an asphalt sample by moving it back and forth under a loaded rubber rimmed wheel. The depth of the depression left by the wheel in the asphalt sample is monitored and the final depth reported.

SCOPE

This document describes the procedures to be followed to verify that a wheel tracking test device complies to the requirements of those devices permitted for use by Austroads test Method AG:PT/T231. The procedures are advisory rather than mandatory and reference should be made to the relevant test method for required standards of specimen conformance.

FURTHER DEVELOPMENT

There are no developments planned at this time.

VERIFICATION PROCEDURE FOR A WHEEL TRACKING DEVICE

1 REFERENCED DOCUMENTS

The following documents are referred to in this test method:

AS /NZS

1683.15 Methods of test for Rubber.

AUSTROADS

AG:PT/T231 Deformation resistance of asphalt mixtures by the wheel tracking test

2 APPARATUS

The following apparatus is required:

a) Wheel tracking device conforming to AG:PT/T231

b) Stop watch

c) Steel ruler to measure the dimensions of specimens to the nearest millimetre over the range 0 to 500 mm.

d) Durometer capable of measuring rubber hardness to the nearest 1 IRHD in the range 50 to 150 IRHD.

e) Calibrated Load Ring (Dynamometer) or Load Cell capable of measuring forces up to 2 kN.

f) Calibrated temperature measuring device capable of measuring temperatures to 0.1°C over the range 55-65°C.

g) A minimum of three gauge blocks in the ranges of 3 to 7 mm, 8 to 12 mm and 13 to 17 mm with the true thickness known to the nearest 0.05 mm.

h) Metal rods with a diameter between 2 to 3 mm and a length in excess of 75 mm.

3 PRE-CALIBRATION PREPARATION

Ensure that the specimen table is clean and that the wheel has all asphalt removed from the circumference. Make sure any cabling is securely fixed so as not to interfere with the apparatus. Any routine maintenance tasks should be performed before calibration.

Ensure that the air supply and electricity supply are both disconnected.

4 PROCEDURE

Those wheel tracking devices that apply the load to the test samples using a lever principle will need to ensure that the lever arm is maintained in a level position during all calibration procedures where the procedures calls for the loaded wheel to be lowered.

Where automatic recording equipment continuously monitors either number of passes, load, displacement transducer output or temperature, additional readings can be taken from the minimum readings outlined in the following procedures.

Where the test outputs are processed from automatic recording equipment, it is the processed information which has to be checked against actual values.

4.1 Load Wheel

Tread hardness: Push the Durometer against the wheel surface in at least ten sites evenly spaced around the circumference and record the resultant average hardness value. The hardness of the wheel must be in the limits of 80 ± 10 IRHD. If outside this range, the wheel must be discarded.

Size: Measure the wheel diameter and width in four evenly spaced positions and record the average diameter and width values to the nearest millimetre. The diameter of the wheel must be within the limits 200 to 205 mm. The width of the wheel must be within the limits 50 ± 1 mm. (see note 1)

Tread thickness: Measure the thickness of the rubber tread in four evenly spaced positions and record the average thickness to the nearest millimetre. The thickness of the tread must be within the limits 10 to 13 mm. (see note 1)

4.2 Lever Arm Geometry

If the load is applied using a lever arm arrangement then this must be checked prior to verifying the load. The distance from the pivot point to the centreline of the wheel (shown as dimension 'A' in Fig.1) and the distance from the pivot point to the centreline of the load carrier (shown as dimension 'B' in Figure 1) need to be determined to the nearest millimetere.

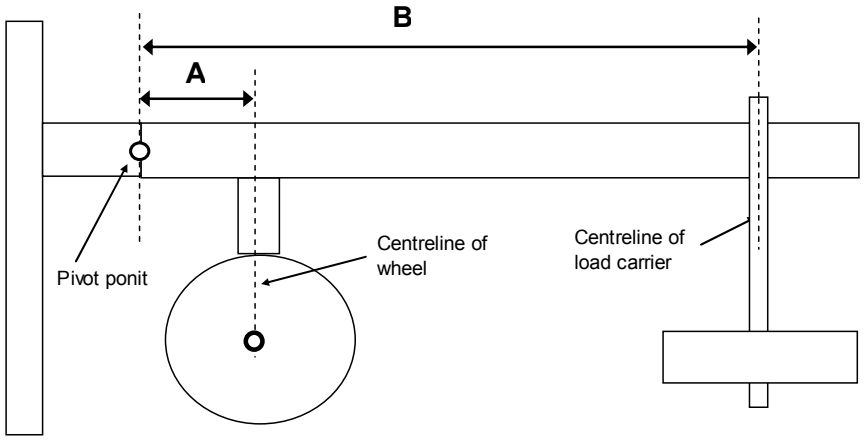

Figure 1 Diagram of a wheel tracking apparatus.

The lever arm should be adjusted to a horizontal position.

4.3 Wheel Loading

The specimen table travel mechanism should be disconnected throughout this procedure.

Firmly affix a calibrated proving ring (dynamometer) or load cell to the specimen table centrally in the wheel travel zone.

Apply a load to induce a load of 700 ± 20 Newtons to the wheel and lower onto the top of the proving ring (dynamometer) or load cell.

Record the reading on the proving ring dial gauge or load cell output and translate this reading to the equivalent force.

The force exerted by the wheel must be within the range 700 ± 20 Newtons.

4.4 Specimen Table Parameters

Specimen Table Speed:

a) Firmly affix a dummy specimen on to the specimen table and arrange as for undertaking a wheel tracking test.

b) Mark the specimen table with an easily visible mark such that the mark passes a fixed point on the wheel tracking apparatus frame.

c) Commence movement of the specimen table, lower loaded wheel (loaded to 700 ± 20 N) and allow to operate for at least ten passes.

d) Using a stop watch, measure the time for 50 passes. Calculate the number of passes per minute.

e) Repeat 2 more times and record the average number of passes per minute.

The platform speed must be within the limits 42 ± 0.5 passes per minute.

Specimen Table Travel Distance:

a) Remove the sample container from the table top.

b) Secure a piece of paper of about 400 mm in length and at least 100 mm in width to the specimen table with adhesive tape. The paper should be positioned centrally in the wheel travel zone.

c) Secure a felt pen or pencil to the transducer frame so that it is held securely in a vertical position and touches the paper on the table top when the wheel is in the lowered position.

d) Lower the wheel so it contacts the paper on the specimen table. Apply a load to the wheel so as to achieve 700 ± 20 N.

e) Commence moving the specimen table beneath the loaded wheel.

f) Raise the loaded wheel and stop the table movement after about ten passes.

g) Record the length of the trace made by the pencil.

The table travel distance must be within the limits 230 ± 10 mm.

Cycle counter:

a) Mark the specimen table with an easily visible mark such that the mark passes a fixed point on the wheel tracking apparatus frame.

b) Lower the loaded wheel and commence movement of the specimen table, and count about 100 passes.

c) Stop the table movement and record the number of passes counted and compare with the number of counts recorded by the automatic counter.

The automatic counter must be within ± 1 of the actual count.

4.5 Transducer

The specimen table travel mechanism should be disabled throughout this procedure.

d) Lower the loaded wheel (loaded to 700 ± 20 N) onto the specimen table (without any sample or sample fixtures).

e) Adjust the transducer so that there is at least 15 mm of travel. Do not adjust the transducer again throughout this procedure.

f) Note the reading of the transducer.

g) Raise the wheel

h) Firmly affix a gauge block where the loaded wheel makes contact with the table. The gauge block should be between 3 and 7 mm in thickness.

i) Lower the loaded wheel onto the gauge block and note the reading of the transducer.

j) Calculate the difference in transducer readings

k) Repeat steps (d) to (g) at least 2 more times with gauge blocks with thicknesses in the ranges 8 to 12 mm and 13 to 17 mm. Additional intermediate readings can be undertaken using other gauge blocks so as to cover the working range of the transducer.

The maximum allowable deviation from the true height is 0.1 mm.

4.6 Temperature

l) Place a dummy sample in the wheel tracking device as for undertaking a wheel tracking test. The dummy sample should have temperature measurement device fitted (See note 2). The temperature should be able to read from outside the temperature controlled chamber (See note 3).

m) Allow sufficient time for the dummy specimen to reach temperature equilibrium at 60 ± 1°C. At least five hours is recommended.

n) Take a temperature reading of the dummy specimen without breaching the temperature controlled environment (see note 2).

o) Repeat step (c) at 30 minute intervals for four hours. Temperature readings can be taken at greater frequencies if desired.

The temperature must be able to be controlled to within 60 ± 1°C throughout the test.

Note: If additional test specimens are brought to test temperature at other locations within the temperature controlled chamber prior to testing, then a dummy sample should be positioned in the same location to check that the temperature of the additional test specimens are within tolerance [using steps (a) to (d) above].

4.7 Vertical Play in Loading Mechanism

The specimen table travel mechanism should be disconnected throughout this procedure.

p) Remove the sample container from the table top.

q) Adjust the height of the height of the lever arm so that it is horizontal when resting on the specimen table (without a sample or sample container).

r) Adjust the LVDT so that it is within its working range and lock in place.

s) Apply a load of 700 ± 20 N

t) Record the value given by the LVDT

u) Gently lift the wheel from contact with the specimen table without altering the position of the LVDT. The load may need to be removed.

v) Apply steps c) to e) twice more.

None of the three LVDT readings shall differ from the mean of the three LVDT readings by more than 0.25 mm.

4.8 Location of Data Measurement Points

w) Remove the sample container from the table top.

x) Adjust the height of the height of the lever arm so that it is horizontal when resting on the specimen table (without a sample or sample container).

y) Adjust the LVDT so that it is within its working range and lock in place.

z) Apply a load of 700 ± 20 N

aa) Using the paper defined in Section 4.4 under ‘Specimen table travel distance’ still in place find the middle of the travel of the specimen table.

bb) Measure 37.5 mm either side of the middle of the travel and mark these points on the paper.

cc) Affix the two metal rods with a diameter of between 2 and 3 mm at right angles to the table travel at the two points marked in step b).

dd) Commence a wheel tracking test and determine if the two rods register in the data recorded to file.

If the data does not register the position of the rods correctly (to within 2.5 mm) the manufacturer should be contacted to determine a solution.

5 CALIBRATION REPORT

The report should include the following information:

a) Date and time of calibration

b) Name of the person undertaking the calibration

c) Identification of wheel tracking device being calibrated

d) Identification of all apparatus used in undertaking the calibration including:

e) Stop Watch

f) Steel ruler.

g) Durometer.

h) Calibrated Load Ring (Dynamometer) or Load Cell.

i) Calibrated temperature measuring device.

j) Gauge blocks.

k) Wheel(s) identification with mean diameter, mean width and mean tread thickness.

l) Specimen table speed to the nearest half pass per minute.

m) Specimen table travel to the nearest millimeter

n) Cycle counter accuracy to the nearest pass per 100 passes.

o) Loading system identification with accuracy to the nearest 1 Newton. Where appropriate, the calculated calibration constants should also be given.

p) Transducer identification with accuracy to the nearest 0.1 mm. Where appropriate, the calculated calibration constants should also be given.

q) Statement describing with the control of the temperature of the dummy specimen over a four hour period.

6 PRECISION

Not determined.

NOTES:

1 The rubber rim on the loading wheel becomes pitted with use. The measurement of the width and tread depth should cater for this normal wear and tear. Width and depth readings of the rubber tread should attempt to convey the average condition of the wheel and not focus on the worn areas to the exclusion of the non worn areas or vice versa.

2 The temperature measuring device should be located within the dummy sample and within 1 cm of an edge. (i.e. located vertically within the sample near a side or located horizontally within a 1 cm of the surface.) This position will react reasonably quickly to changes in air temperature but will measure the sample temperature rather than air temperature.

3 The temperature must be read from outside the temperature controlled chamber as opening the chamber will cause a fluctuation in the temperature of the dummy sample. Where it is common practice to allow the next sample to reach temperature equilibrium while testing another sample, it is provident to determine how long the next sample needs to be left in the testing position to attain equilibrium temperature. Removal of the finished sample and placement of the sample ready for testing will cause changes in the sample temperature.

AMENDMENT RECORD

Amendment No.	Clauses amended	Action	Date
1	Commentary Page	New	20th Apr 2005
	Amendment record	New	
	Applied new styles to whole document	Format	
	2 h) Metal rods	New	
	4.2 Checking of geometry	New	
	4.3 Editorial changes	Substitution	
	4.6 b) Altered four hours to five hours	Substitution	
	4.7 Vertical play	New	
	4.8 Data logging location	New	
	Note 1	New	
2	Title on first page	Substitution	25th Jan 2006

Key

Format	Change in format
Substitution	Old clause removed and replaced with new clause
New	Insertion of new clause
Removed	Old clauses removed