PAVEMENT RUTTING
(Inertial Laser Profiler Method)

1. SCOPE

This test method sets out the procedure for measuring the rutting of a pavement using an inertial laser profiler. This test is normally performed in conjunction with testing for roughness and surface texture using VicRoads Test Methods RC 422.03 and RC 422.05 respectively.

2. APPARATUS

(a) Inertial Profiler consisting of:

(i) a vehicular platform capable of transporting testing equipment, mounting the profile measuring equipment to measure transverse profile over a 3.0 metre width and travelling at speeds up to the maximum legal speed limit (100 km/hr or 110 km/hr);

(ii) displacement transducers (laser devices) which measure the distance between the travelled surface and the vehicle mounting. The displacement measurement transducer shall ensure a precision of measurement in elevation to at least 0.2 mm.

The displacement transducers shall be set so that they will operate within mid-range during normal operations.

Displacement transducers shall be located to measure the transverse profile at the centreline of the vehicle and approximately 450 mm, 750 mm, 950 mm, 1150 mm, 1350 mm and 1500 mm offset either side from the centreline;

(iv) a distance measuring transducer capable of measuring the distance travelled to a precision of 50 mm/km. This tranducer shall provide input to the data logger to record the distance travelled from the start of the rutting survey;

(v) data logger capable of capturing the output data from the transducers at intervals of not greater than 250 mm.;

(vi) computer to analyse the data so that the maximum rut depth of each sampled profile can be calculated by simulating the movement of a 3.0 m and 1.2 m straight edge across the profile from left to right, starting with the straight edge off the left hand edge and finishing off the right hand edge. Output will need to be expressed for each 100 m length and for the total length of the lot of pavement surveyed in terms of rut depths and shall be categorised into percentage of values less than or equal to 10 mm, percentage of values greater than 10 mm and less than 20 mm and percentage of values greater than 20 mm for each wheel path in the lane under test;

(b) Operator's manual.

(c) Flat stainless steel base plate at least 25 mm thick, 75 mm wide and at least 300 mm long. The bottom of the plate shall be machined plane with an out-of-flatness not exceeding 0.1 mm.

(d) Stainless steel step gauge blocks with the two large faces parallel to within 0.1 mm. At least three blocks, one of 25 ± 0.1 mm thick, one 50 ± 0.1 mm thick and the other 75 ± 0.1 mm thick. (Other blocks of known thickness to the tolerances shown may be used but must cover a range of at least 50 mm of the transducer measurement.)

(e) Bulls eye spirit level.

(f) Straight edge a least 3 metres long.

(g) Stringline or other suitable device to check the straightness of the straight edge.

(h) Device for measuring the geographic coordinates of the start and end of survey.

3. CALIBRATION AND CHECKS

3.1 Component Checks

(a) Calibrate the vertical displacement transducers in the laboratory at least every two years.

(b) Check the vertical displacement transducers using the step gauge blocks and the flat plate at least each 300 km of use of the profiler. Make adjustments to the output of the device to ensure that readings are within 0.25 mm of the block thickness.

(d) Check the relative performance of the lasers across the longitudinal measuring device against the straight edge weekly and before commencement of a survey. The output from each laser shall not deviate by more than 1 mm from a straight line.

3.2 Verification Checks

Perform verification checks for rutting prior to and after each network survey and at least every twelve months in accordance with Test Method RC 422.10.

3.3 Repeatability and Bias Checks

Perform repeatability and bias checks prior to each network survey and at about each 3000 km tested during the survey in accordance with Test Methods RC 422.11 and RC 422.12.

4. PROCEDURE

4.1 General

Testing shall not be performed when it is raining or when there is water on the pavement surface.

Operate the vehicle smoothly at a relatively constant speed maintaining a line of longitudinal travel within the wheel paths of the traffic.

4.2 Pre-Operation Check

Repeat a previous run or bounce the vehicle whilst static about 10 times and check that the vertical movement of the vehicle due to bounce does not affect the transducer outputs and that each laser responds to the movement of the vehicle.

4.3 Lateral Profile Survey

(a) Ensure that the vehicle is operating at a constant speed as it approaches the area to be tested.

(b) Measure the lateral surface profile across each lane travelling at a relatively constant speed maintaining a line of longitudinal travel within the wheel paths of traffic. Record the profile data at least at 250 mm intervals.

(c) Record unusual physical features that may affect the rutting readings.

(d) Record the start and end geographic coordinates of the survey.

(e) Record significant cross roads, intersections, kilometre marks, reference markers (see VicRoads publication: *A Guide to SRRS Data Collection in the Field*) and other features to enable the location system used to be referenced to the data recorded. There shall be no more than 5 km between reference markers recorded within the survey.

5. CALCULATIONS

(a) Calculate the maximum rut depth at each measuring point for each 100 m section of the lot being tested for each lane of the pavement by simulating the required straight edge (3.0 m, 2.0 m and/or 1.2 m as appropriate) across the profile from left to right, starting with the straight edge on the left-hand edge of the profile and finishing on the right-hand edge.

Note: Exclude the readings from the outer most points in cases where the difference between the results from the left hand side laser and right hand side lasers exceeds 60 mm.

(b) Calculate wheel path rutting at each measuring point for each 100 m section of the lot being tested for each wheel path of each lane of the pavement using the left and right profiles on the respectiveside of the centreline using and including the centreline point by simulating the maximum rut depth under 1.2 m straight edge.

(c) Calculate the mean lane rut depth and mean wheel path rut depth for each 100 m length tested.

6. REPORT

Report the following:

(a) The start and end geographical position for the survey;

(c) The wheel path rutting and lane rutting for each 100 m section to the nearest 0.01 mm categorised as:

- percentage of each 100 m length less than or equal to a 10 mm rut depth;
- percentage of each 100 m length exceeding 10 mm and and less than or equal to 20 mm rut depth;
- percentage of each 100 m length exceeding 20 mm rut depth.

(d) The mean lane rut depth for each 100 m section to the nearest 0.1 mm.

(e) The mean wheel path rutting for each wheel path for each 100 m length to the nearest 0.1 mm.

(f) Relevant details as recorded in Steps 4.3 (c) and 4.3 (e).

7. REFERENCE

Austroads Guidelines for Road Conditioning Monitoring, Part 2 - Pavement Rutting (final draft).