PAVEMENT DEFLECTION AND CURVATURE USING THE PAVEMENT STRENGTH EVALUATOR (PaSE)

1. SCOPE

This test method details the measurement of pavement deflection of flexible pavement using the Pavement Strength Evaluator (PaSE).

2. DEFINITIONS

(a) **Deflection**—the measured vertical movement of a pavement surface beneath the dual wheels of a known axle load.

(b) **Deflection bowl**—a representation of the depressed shape of the pavement surface caused by a load being applied.

(c) **Curvature**—an indication of the shape of the deflection bowl. It is determined by calculating the difference between the maximum deflection recorded and the deflection measured at a point 200 mm from the point of maximum deflection.

(d) **Flexible pavement**—A pavement which obtains its load spreading properties mainly by intergranular pressure, mechanical interlock and cohesion between the particles of the pavement material. In the case of an asphalt pavement, this further depends on the adhesion between the bitumen binder and the aggregate, and the cohesion of that binder. Generally, any pavement in which high strength Portland cement concrete is not used as a construction layer.

3. APPARATUS

(a) Pavement Strength Evaluator machine which measures the deflection and curvature of a pavement in both wheel paths when a known load is applied to the pavement by a vehicle travelling over a test site.

The PaSE machine which shall be capable of travelling at speeds between 2 and 4 km/hr during testing consists of:

(i) a single-axle dual-wheeled truck with sufficient distance between the tyres on each wheel to enable a deflection measuring beam to be inserted;

(ii) a guide frame attached to the steering system of the truck that will allow the tips of the measuring beam to pass freely between the dual wheels;

(iii) a winching system and test frame assembly to which is fitted the measuring beam;

(iv) measuring beam at least 700 mm long, pivoted from an axis with a lever ratio of 22:1 with a Linear Voltage Displacement Transducer (LVDT) fitted at the short end of the lever arm with the other end capable of being placed on the pavement surface;

(v) Lever arm transducer capable of measuring a deflection of pavement to the nearest 0.01 mm;

(vi) known rear axle load (the VicRoads PaSE operates at 9.2 ±0.2 tonnes);

Note: The standard axle load is 8.2 ±0.2 tonnes. Loads other than 8.2 tonnes may only be used if values of deflection and curvaure can be converted back to figures relating to 8.2 tonnes (see VicRoads Technical Bulletin No. 37, Section 10);

(vii) rear tyres inflated to 825 ±20 kPa. (Michelin X 12.00 R20 XZY tyres have been found to be satisfactory.);

(viii) a device for measuring the distance of travel to an accuracy of ±1 m/km;

(ix) a data acquisition system to collect deflection, curvature and distance measurements.

(b) Device for measuring the tyre pressure to within ±20kPa.

(c) Device for measuring pavement temperature to within ±1°C.

(d) Device to drill holes in the pavement surface.

(e) Hydraulic oil for use when measuring pavement temperature.

4. PROCEDURE

(a) Lower the test beam onto the pavement surface at a point in front of the dual wheel which is not affected by the axle load (generally 0.7 m is satisfactory).

(b) Record or set to zero the deflection measurement.

(c) Drive the testing vehicle forward at a constant speed between 2 and 4 km/hr and allow the dual wheel to pass over the point where the tip of the beam is located, with the beam passing between the tyres without impact. Measure the deflection of the surface at 15 points (additional points may be measured) during the passage of the tyres from the start location to obtain the maximum deflection and the curvature.

(d) Record the location of the test site and the lane in which the wheel is placed.

(e) Plot the deflection and curvature versus distance.

(f) Repeat steps (a) to (e) for each test site and, if required, for each lane.

(g) During the course of testing as the temperature varies, measure the temperature of the road surface in the following manner:

(i) drill a small hole in the pavement about 30 mm deep;

(ii) fill the hole with oil;

(iii) place the temperature measuring device in the oil to full depth;

(iv) after 2 minutes immersion (when constant temperature of the oil is obtained) record the temperature reading as the temperature of the pavement to the nearest 1°C.

(h) Record the visual condition of the pavement and any apparent faults.

5. TEST REPORT

Report:

(a) The plots of deflection and curvature versus distance.

(b) The temperature of pavement.

(c) The known axle load, to the nearest 0.1 tonne.

(d) The location of the sites and relevant reference points.

(e) Visual description of the pavement and any apparent faults.