Test Method T199

Deflection testing of road formation

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About this release

Title:	Deflection testing of road formation
Test method number:	T199
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Summary of changes

Issue number	Clause number	Revision description	Authorised by	Publication date
Issue 4.1	Eq 6(2)	Equation corrected.	Director Pavements and Geotechnical	December 2020
Issue 4.0	All 1 3-5 5 7 9 App. A	Template updated. Context provided for this test method. Equipment, preparation, procedure clauses expanded. Test pattern clarified, random pattern option removed. Equations numbers added. New section added for References. Grid pattern clarified.	Director Pavements and Geotechnical	October 2020
Ed 3/ Rev2	Revision Summary	Date changed for manual reading of dial gauge	J Friedrich	June 2014
Ed 3/ Rev 1	1, 2(b), 5(c)	New sentence on Testing Officer Remove Part (b) Use of data capture device.	G Vorobieff	August 2013
Ed 3/ Rev 0	All	Reformatted Roads and Maritime template	D Hazell	October 2012

Note: The functions of the former State Government agency Roads and Maritime Services (RMS or Roads and Maritime) are now administered by Transport for NSW.

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Test Method T199

Deflection testing of road formation

1 Scope

This test method sets out the procedure for determining the stiffness and homogeneity of a road formation using a portable deflection beam under a standard wheel load and tyre pressure. This method is generally used for deflection testing during construction.

2 General

(a) The procedure is to be used on a road formation and consists of a sample of deflection tests that are statistically analysed.

(b) The surface under the beam must be sound and free of excessive loose material, large protruding objects or significant surface depressions.

(c) Where an electronic data acquisition system is used to directly capture and record test data, it must have a precision at least equivalent to the apparatus replaced.

3 Equipment

The apparatus (including beam and displacement measuring devices) used in this test method is identical to TfNSW test method T160.

NOTE: Follow TfNSW test method T160 for the calibration of the apparatus.

NOTE: Refer to TfNSW test method T160 for Beam Ratio (BR).

4 Preparation

(a) Use the same vehicle configuration and type of beam for all testing to ensure consistency between results.

(b) Set up the equipment according to the operating instructions.

(c) Sample each lot using at least 12 test points in a grid pattern at no more than 10 m spacing longitudinally along the length of a lot and no more than 3.6 m transversely across the width of the lot according to Appendix A.

NOTE: In the instance of an irregular lot, reduce the maximum longitudinal and transverse spacing to achieve a minimum of 12 test points to ensure the test lot is adequately represented.

5 Procedure

(a) Where required, clearly mark each test point to enable positioning of the test vehicle.

(b) Position the centre of the dual wheels of the test vehicle to within a ± 300 mm circle of the test point.

(c) Position the beam so that:

(i) The beam is free to operate and no part is resting on loose material or protruding objects.

(ii) The tip of the beam is between the dual wheels a distance 0 ± 50 mm from the vertical diameter of the rear wheel.

NOTE: A marker on the vehicle and corresponding mark on the beam can be used to accurately position the tip of the beam.

(iii) The tip of the beam does not rest on particles that may move during the test.

(iv) The beam is not touched by the tyres.

(d) Setup the system to measure the distance that the vehicle has travelled away from the start point.

(e) Initialise the beam and displacement measuring device ready to measure deflections according to the operating instructions.

NOTE: Ensure that the displacement measuring device is set within an appropriate range. For a manual dial gauge ensure shaft and needle move freely.

(f) Smoothly drive the vehicle forward at creep speed.

(i) Take the final reading when the vehicle has moved at least 9000 mm away from the start point.

(ii) Only the initial and final readings for each test point are required to determine the maximum deflection (D_0) at each test point.

(iii) If the displacement continues to change after the final reading, record this event.

(g) Retest the test point where a deflection measurement has been adversely affected by external influences that cause the apparatus to move (e.g. wind, passing vehicles, vibration, etc.).

(h) Repeat Steps (a) to (g) to test deflection of another test point.

6 Calculations

(a) Determine the maximum deflection (D_0) by multiplying the final reading (R_F) less any initial reading (R_0) by the beam ratio (BR).

(b) Calculate the sample mean (M) and sample standard deviation (SD) to 0.01 mm.

(c) Calculate the coefficient of variation (CV) to nearest 1% of the mean of the maximum deflections readings for each lot as follows:

$$CV = \frac{SD}{M} \times 100\% \quad \ldots 6(1)$$

Where:

CV = Coefficient of variation for the lot (%)

M = Mean of the maximum deflections (mm)

SD = Standard deviation of the maximum deflections (mm)

Equation 6(1). Coefficient of variation (*CV*)

(d) Calculate the characteristic deflection (CD) for each lot as follows:

$$CD = M + f \times SD \quad \ldots 6(2)$$

Where:

CD = Characteristic deflection (mm)

M = Mean of the maximum deflections (mm)

f = 1.65

SD = Standard deviation of the maximum deflections (mm)

Equation 6(2). Characteristic deflection (*CD*)

7 Reporting

Include the following data and results in the report:

(a) Type of beam and beam ratio (BR).

(b) Test vehicle identification.

(c) The results tabulated for each lot:

(i) Date and time of start and end of testing.

(ii) Location of lot represented.

(iii) Layer and time that compaction was completed on the layer tested.

(iv) Location of each test point and maximum deflections (D_0) to 0.01 mm for each test.

(v) When using data capture devices, submit the data with the report.

(vi) The sample mean (M) and standard deviation (SD) to 0.01 mm, and coefficient of variation (CV) to nearest 1% of the maximum deflections for the lot.

(vii) The characteristic deflection (CD) for the lot.

(d) Reference to this test method.

8 References

The following documents are referred to in this test method:

- T160. (2012). "Deflection Measurement (Portable Beam)." Transport for NSW.

Appendix A. Grid sampling pattern

(a) The grid sampling pattern has the following minimum requirements (refer to Figure 1):

(i) Consists of test points along a series in runs parallel to the road centreline.

(ii) Alternate the test point between left and right wheel paths of the test vehicle with a spacing (S) of no more than 10 m apart.

(iii) Position runs (centreline of test vehicle) to equally cover the lot at no more than 3.6 m transversely apart (i.e. T ≤ 3.6 m). Adjust the transverse position of the outermost runs to start 1.8 m from the boundary of the lot and divide the remaining width of the lot by 3.6 m to obtain the number of runs required.

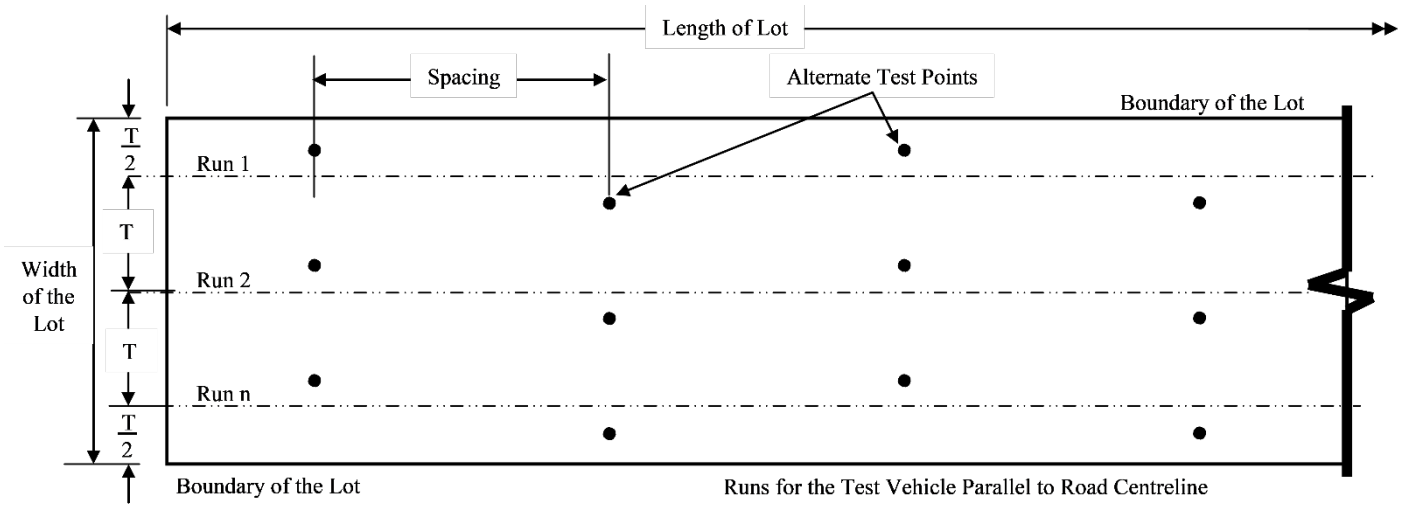

Figure 1 Sample pattern for test points within a lot

NOTE: For example, a 9 m wide lot would require 3 runs. The width of the lot is adjusted by subtracting 1.8m for both edges, which leaves 5.4m (9 m - 1.8 m - 1.8 m) as the remaining width. Divide the remaining width by 3.6m to determine the number of runs (5.4 m / 3.6 m = 1.5 runs), round up the result to whole number (2 runs). The calculated transverse spacing (T) is 2.7m (5.4 m / 2 runs), which is less than 3.6 m. So, the first run would be at 1.8 m, the second run would be approximately at 4.5 m, and the third (final) run would be approximately at 7.2 m. This will leave approximately 1.8m remaining to the nearest edge of the lot.

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