Transport Roads & Maritime Services

NSW GOVERNMENT

Test method T173

Field wet density of road construction materials (Nuclear gauge in direct transmission method)

OCTOBER 2012

Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		Reformatted and Revision Summary Added	D.Dash	May 1999
Ed 1/Rev 0	All	Draft Issue		Nov 1999
Ed 1/Rev 1	3(a)	Generally Revised - For Issue- P.Walter	D.Dash	Feb 2000
Ed 2/Rev 0	All	New Issue. New clauses 4.1, 4.2, 4.3, 4.4, 5.2 and revision to clause 6. Dry Density conversion added.	G. Donald	November 2007
Ed 2/Rev 1	4.1, 4.3(a) & (b)	Automatic depth sensor required. Clarify sampling requirements.	D. Hazell	October 2008
Ed 3/ Rev 0	All	Reformatted RMS template	J Friedrich	October 2012

Note that Roads and Maritime Services is hereafter referred to as 'RMS'.

The most recent revision to Test method T173 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T173

Field wet density of road construction materials (Nuclear gauge in direct transmission method)

1. Scope

This Test Method sets out the procedure to determine the field wet density of road construction materials using a nuclear surface moisture-density gauge in the direct transmission mode of operation.

2. General

(a) This test method is applicable to earthworks and pavement layers (both unbound and bound).

(b) This test method also can be used to determine the field wet density of the lower part of a pavement layer (e.g. lower part of a deep lift stabilised pavement).

(c) Where required to determine results for other test methods, the field dry density for an unbound layer can be derived from the field wet density. However, a sample must be taken and moisture content determined.

3. Apparatus

(a) The apparatus is identical to that described in AS 1289.5.8.1.

(b) If required, sealable airtight containers.

4. Procedure

4.1 Determining Wet Density of a layer

The procedure is identical to AS 1289.5.8.1 except that Clause 4(a) has the following additional sentences:

"The gauge must be capable of carrying out direct transmission density measurements at probe depth intervals not exceeding 25 mm, within the range of 50 to 300 mm. The apparatus must be operated using the automatic depth sensor."

4.2 Determining Wet Density of the lower part of a layer

(a) Insert the probe to position 'A', located at the required depth within the layer 'X'. Record the depth 'Y' (refer to Figure 1).

(b) Record the wet density (D_Y) for the depth 'Y' with the probe at position 'A'.

(c) Extend the probe to position 'B', located at or near the bottom of the layer or at a position where the gauge has been inserted to its maximum depth. Record the depth 'X'.

Note: The probe is to remain in the layer being tested.

(d) Record the wet density (D_X) for the depth 'X' with the probe at position 'B'.

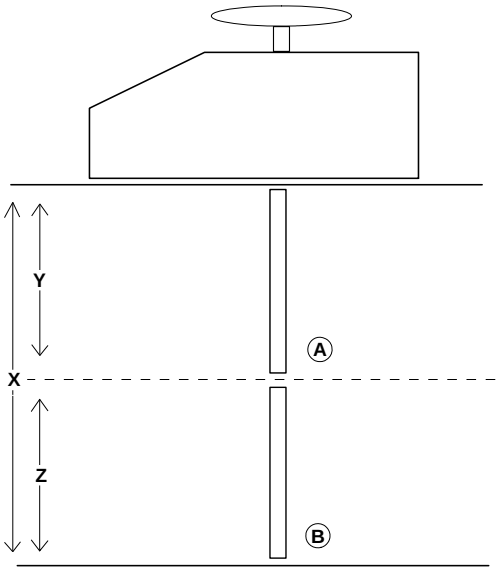

Figure 1. Probe positions within a layer

4.3 Sampling for other tests (optional)

(a) Where a sample is required for other test methods (e.g. moisture content, maximum wet density (MWD), maximum dry density), ensure that the quantity is sufficient to carry out the required tests and retesting if necessary, and to allow for oversize material.

(b) Take the sample as follows:

(i) Excavate a hole directly below the nuclear meter and to the depth of the probe. The sides of the hole are to be reasonably vertical.

(ii) Place the excavated material in a sealable container and label.

NOTE: If multiple probe depths are measured, corresponding samples that represent the depth intervals tested will be required unless otherwise specified (e.g. in deep lift where a MWD sample is taken before compaction from a predetermined location).

4.4 Conversion of Field Wet Density to Field Dry Density (optional)

(a) Where the Dry Density is required, the field Wet Density can be converted to dry density using the following procedure:

(i) Determine the field moisture content (m_f) of the sample obtained in Clause 4.3 using T120, T121 or T180.

NOTE: The field moisture content determined by the nuclear gauge is NOT to be used in calculations.

(ii) Determine the Field Dry Density (*FDD*) using Calculation 5.2.

5. Calculations

5.1. Determining Wet Density of the lower part of a layer

(a) Calculate the nominal Wet Density for the depth interval 'Z' using the formula:

$$D_Z = \frac{(D_X \times X) - (D_Y \times Y)}{(X - Y)}$$

Where:

D_Z = Calculated nominal Wet Density for the lower part of a layer (t/m^3)

D_Y = Wet Density gauge measurement at probe position 'A' (t/m^3)

D_X = Wet Density gauge measurement at probe position 'B'

(t/m³)

Y = Depth at probe position 'A' (mm)

X = Depth at probe position 'B' (mm)

5.2. Determining the Dry Density of an unbound layer (optional)

(a) Where the nominal Field Dry Density for layer 'X' is required for subsequent calculations use the following formula:

NOTE: Other parts can be similarly derived provided a moisture content is determined to represent that part.

$$DD_X = D_X \times \frac{100}{(100 + w_X)}$$

Where:

DD_X = Calculated nominal Dry Density for layer 'X' (t/m³)

D_X = Field Wet Density for layer 'X' (t/m³)

w_X = Field moisture content for layer 'X' from RTA T120, T121 or T180 (%).

6. Reporting

Include the following data and results in the report:

(a) The information required under AS 1289.5.8.1 and the following:

(i) Measured depth of the layer (mm)

(b) Where the wet density of the lower part of a layer is required:

(i) The probe depth 'Y' for position 'A' (mm)

(ii) The Wet Density (D_Y) for the depth 'Y' to the nearest 0.01 t/m³.

(iii) The probe depth 'X' at position 'B' (mm).

(iv) The Wet Density (D_X) for the depth 'X' to the nearest 0.01 t/m³.

(v) The nominal calculated Wet Density (D_Z) for the lower part of the layer to the nearest 0.01 t/m³.

NOTE: Where the result is to be used in further calculations, report density to the nearest 0.001 t/m³.

(c) Where required for further calculations:

(i) The part of the layer being tested (i.e. upper, lower or whole)

(ii) The field moisture content (w_X) to the nearest 0.1%

(iii) The field dry density (DD_X) to the nearest 0.001 t/m³

(d) Reference to this test method