Transport Roads & Maritime Services

NSW GOVERNMENT

Test method T165

Density in situ of road construction materials (fixed volume extractive method)

OCTOBER 2012

Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		Reformatted and Revision Summary Added	D. Dash	May 1999
		Date on Test Method Revised to Agree with Date on Revision	D. Dash	Feb 2001
		Generally Revised- Title Changed. Formula for sub-sample corrected. Notes revised	G. Donald	Nov 2007
Ed 2/ 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 T165 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T165

Density in situ of road construction materials (fixed volume extractive method)

1. Scope

This test method sets out the procedure to determine the density in situ of compacted road construction materials by the fixed volume extractive method.

2. General

(a) This Test Method is applicable for fine to medium grained cohesionless materials including one sized material or gap graded material

(b) The depth of the layer tested cannot be less than the effective height of the test specimen (i.e. approximately 160 mm)

3. Apparatus

(a) A taper-edged steel cylinder with flanged and handle pillars with the following apparatus designed to suit

(i) A steel template with a centrally placed hole with the diameter to suit the steel cylinder

(ii) A detachable insertion handle

(iii) A depth gauge with base plate

NOTE: Refer to 0

Appendix - Suitable Form of Apparatus.

(b) A levelling block approximately 200×300×75 mm

(c) Suitable tools for extracting material from within the cylinder, i.e. spoon, scoops, brush, pointed chisel, etc

(d) A balance of suitable capacity with a limit of performance of not greater than ± 5 g

(e) Sealable airtight containers suitable for curing moist samples

NOTE: Heavy duty plastic bags are suitable.

(f) Metal dishes of approximately 350 mm diameter

4. Procedure

(a) Free the locking nut on the stem of the gauge

(b) Place the cylinder on a firm flat surface, taper edge down

(c) Place the gauge inside the cylinder so that the bottom of the plate is flush with the tapered edge of the cylinder

(d) Screw the stem down into the plate so that the top T bar just makes contact with the top edge of the cylinder

(e) Remove the gauge from the cylinder and tighten the locking nut against the bottom plate, ensuring that the plate does not revolve on the stem

(f) Reinsert the gauge in the cylinder and check that the bottom of the plate is flush with the tapered edge of the cylinder and the top T bar is just in contact with the top edge of the cylinder. Readjust if necessary

(g) Assemble the cylinder and insertion handle apparatus

(h) Expose a flat area of the material to be tested and trim down to a level surface using the levelling block

(i) Place the template base flat on the trimmed area, firmly seating it but not forcing material into the central opening. Ensure that the template is in contact with the material over its full area

(j) Place the cylinder into the central hole of the template

(k) Force the cylinder downward through the central hole of the template into the material. Use a screwing oscillating motion and keep a constant down pressure on the handle. Do not strike or vibrate the cylinder

NOTE: Care is necessary when screwing the cylinder into the material to cause as little disruption of the material as possible.

(l) When the flange of the cylinder comes into full contact with the template, stop screwing and remove the insertion handle

(m) Excavate the material from within the cylinder and place in the sealable container

(n) Insert the depth gauge to determine how much extra excavation is necessary. Do not excavate material from below the plane of the cylinder's tapered edge

NOTE: Use the gauge at frequent intervals when the excavation is approaching the plane of the cylinder tapered edge.

(o) Determine the mass of the sample excavated from the hole (M_w)

(p) Determine either of the following:

(i) Dry the sample to a constant mass using the procedure in T120, T121 or T180, and determine the dry mass of the sample (M_d)

OR

(ii) Determine the moisture content (w) of the sample using T120, T121 or T180. Where a sub-sample is used it must be representative of the whole sample

NOTE: In cohesionless materials it is often quicker to dry the whole sample.

5. Calculations

(a) Calculate the effective cylinder volume:

$$V = \left(\frac{\pi D_m^{\,2}}{4 \times 1000}\right) \times (h - p)$$

Where:

V = Effective cylinder volume (mL)

D_m = Average internal diameter of the cylinder (mm)

h = Height of cylinder below flange (refer Figure 1) (mm)

p = Thickness of the template at the centre hole zone (refer Figure 2) (mm)

(b) Calculate the dry density of the material.

$$DD = \frac{M_d}{V}$$

OR

$$DD = \frac{M_w}{V} \times \frac{100}{(100 + w)}$$

Where:

DD = Dry Density (t/m³)

M_w = Mass of wet excavated sample (g)

V = Effective cylinder volume (mL)

w = Moisture content of material excavated (%)

M_d = Mass of dried sample (g)

6. Reporting

Include the following data and results in the report:

(a) The dry density to the nearest 0.01 t/m³

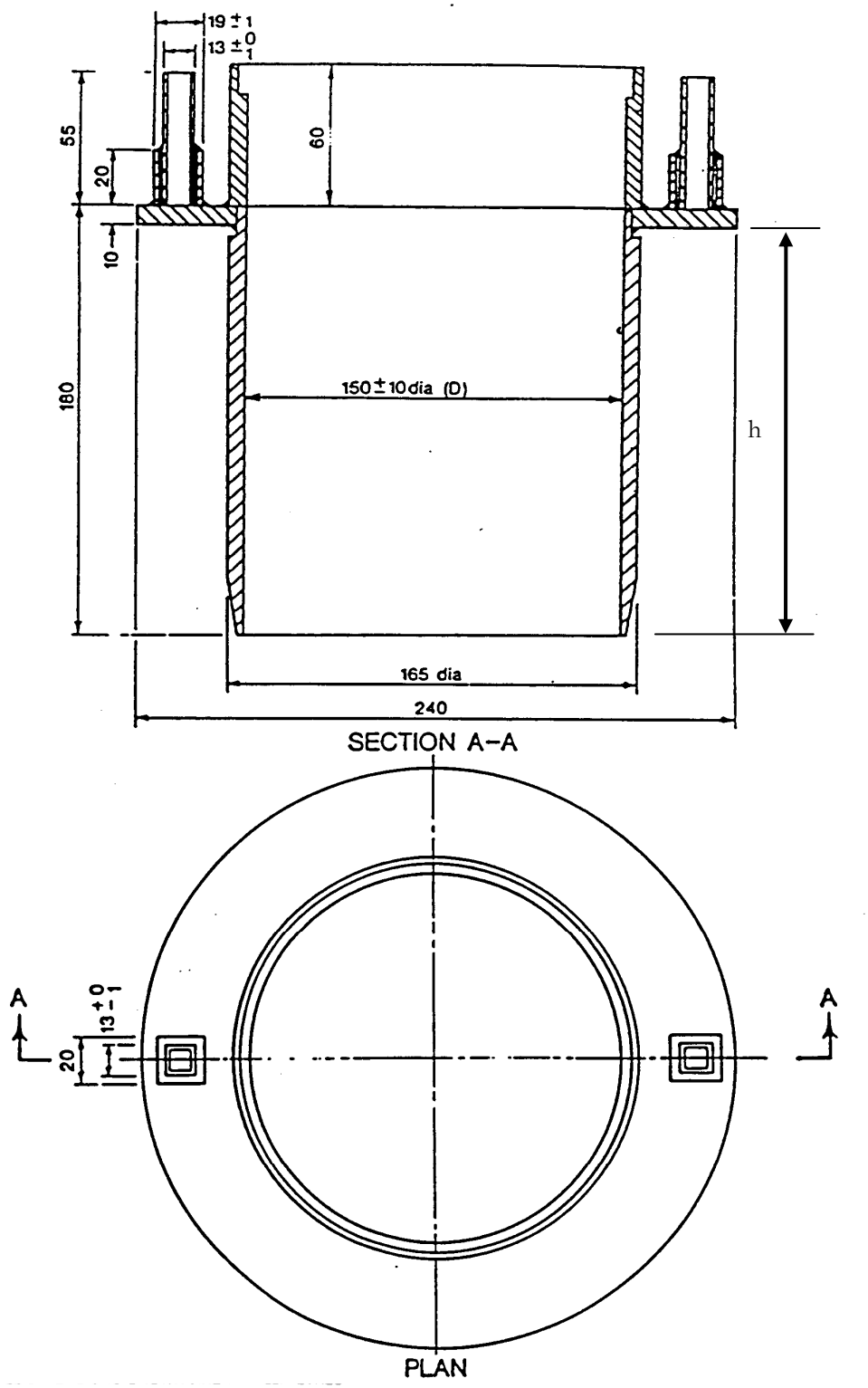
NOTE: Where the results are to be used for further calculations, report the density values to the nearest 0.001 t/m³.

(b) The moisture content of the material in situ to the nearest 0.5%

NOTE: Where the results are to be used for further calculations, report the moisture content values to the nearest 0.1%.

(c) Reference to this test method

Appendix - Suitable Form of Apparatus

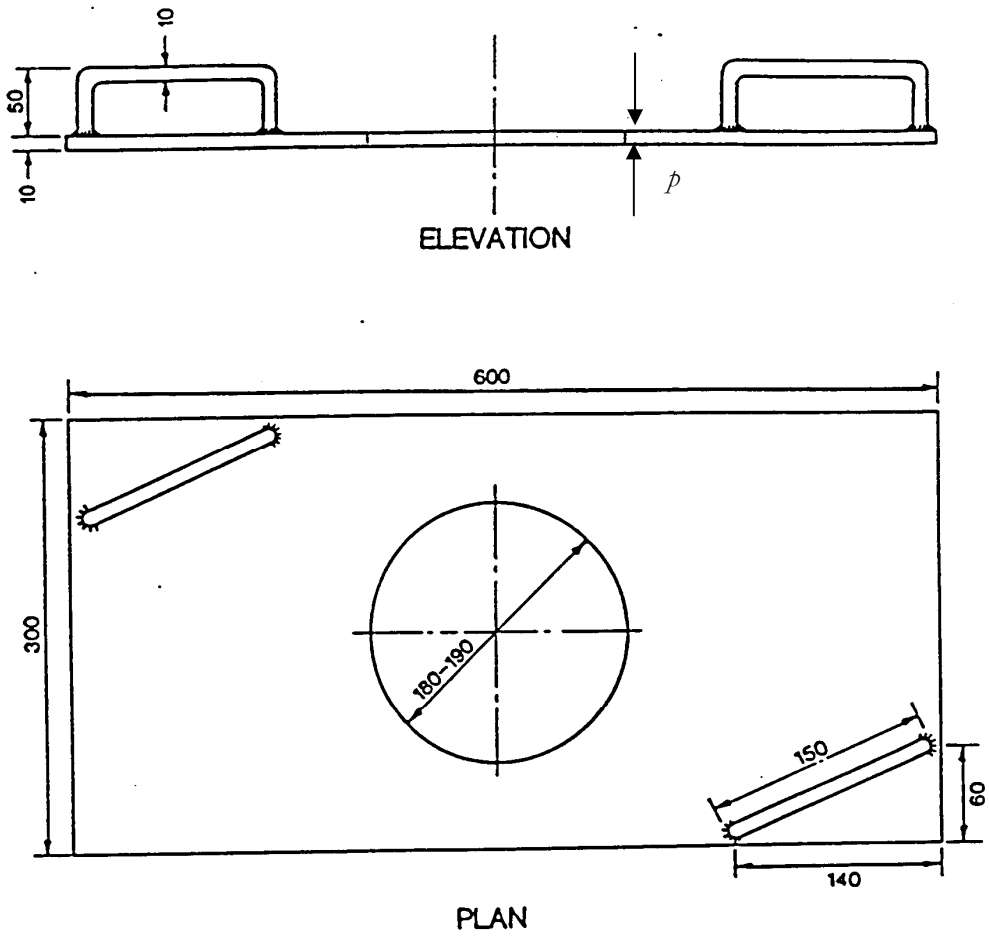


Notes: *Not to scale. All dimensions shown in millimetres*

h - Height of cylinder below flange

All dimensions are nominal except where tolerances are specified.

Figure 1. Taper-edged Steel Cylinder

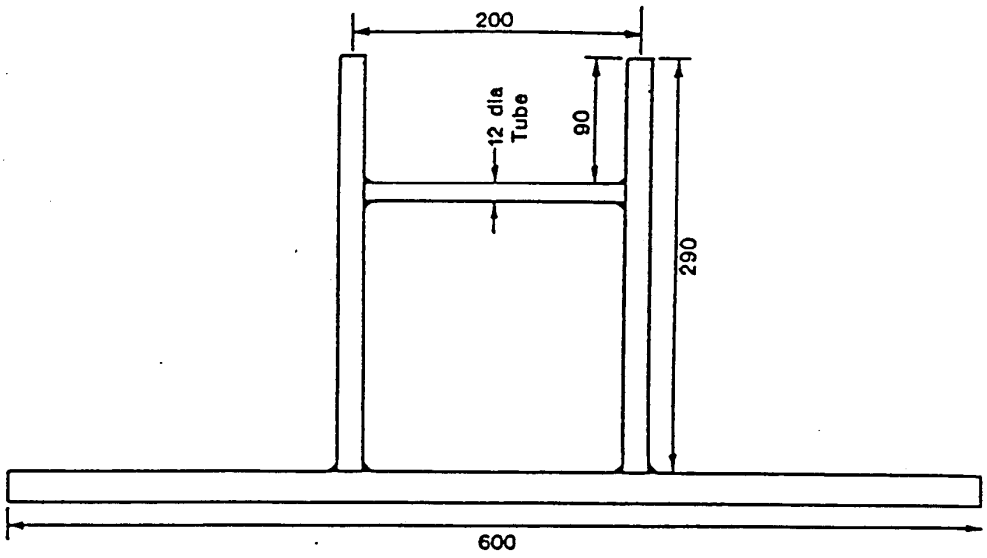


Notes: *Not to scale. All dimensions shown in millimetres.*

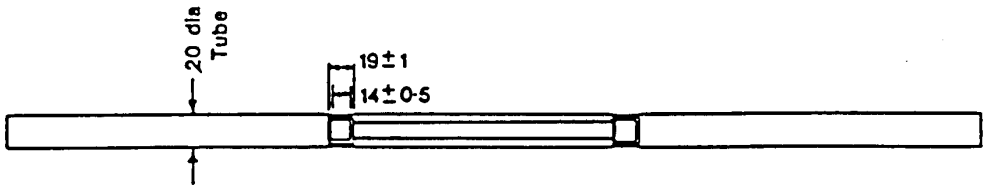
p - Thickness of the template at the centre hole zone

All dimensions are nominal except where tolerances are specified.

Figure 2. Steel Template



ELEVATION



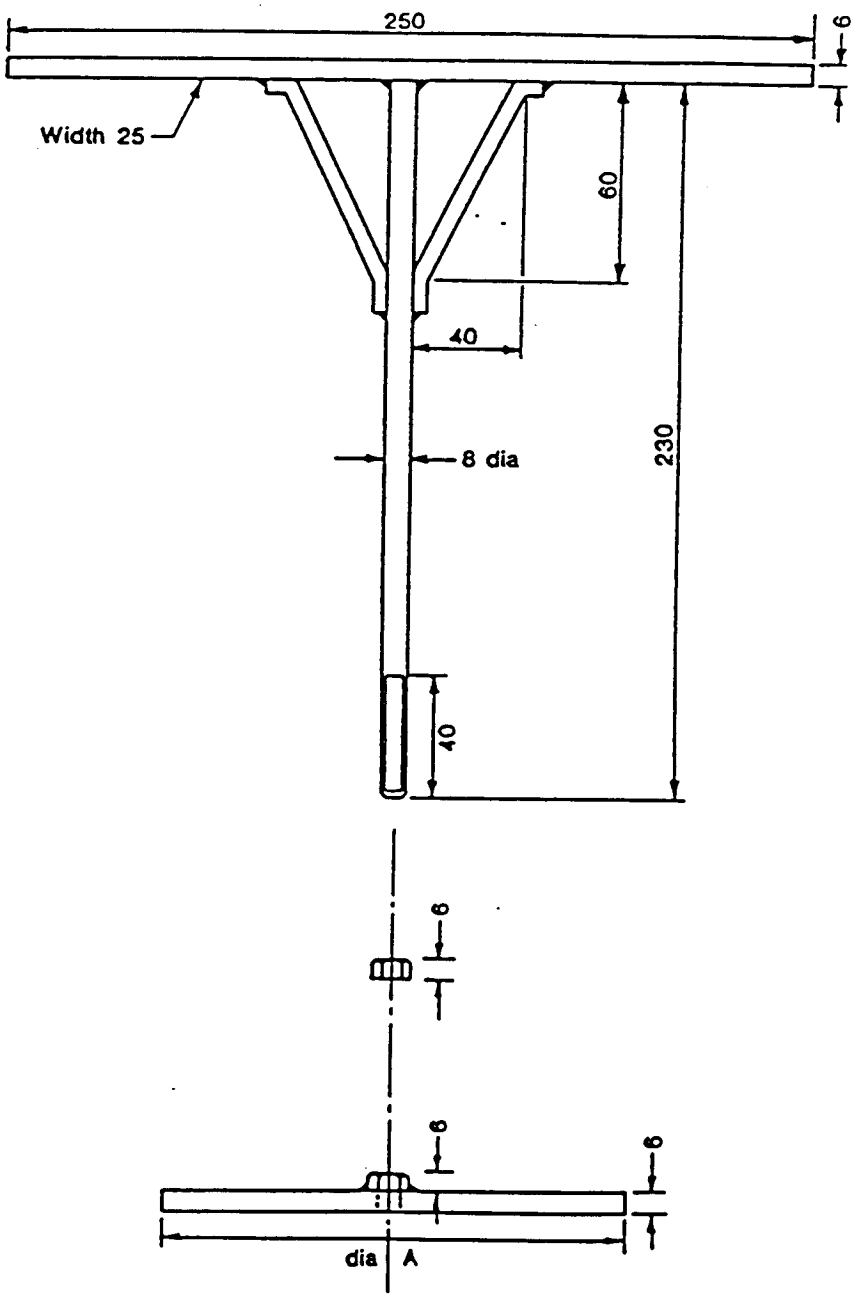
PLAN

Notes: *Not to scale*

All dimensions are nominal except where tolerances are specified.

All dimensions shown in millimetres.

Figure 3. Detachable Insertion Handle to fit cylinder



Notes: Not to scale

Diameter 'A' must be 3 to 5 mm less than the internal diameter of the cylinder.

All dimensions are nominal except where tolerances are specified.

All dimensions shown in millimetres.

Figure 4. Depth Gauge and Base Plate