

Department of Sustainable Natural Resources

SOIL SURVEY STANDARD TEST METHOD

DISPERSION PERCENTAGE

ABBREVIATED NAME	DP
TEST NUMBER	P8
TEST METHOD TYPE	A
VERSION NUMBER	2

SCOPE

This method is a useful and quick way of indicating the potential for dispersion and tunnelling susceptibility of soils.

PRINCIPLE

The dispersion percentage is the ratio of the soil material <0.005 mm after limited mechanical dispersion without dispersants to the total material, <0.005 mm, expressed as a percentage. As it is necessary to know the total soil material <0.005 mm, this procedure is usually carried out in conjunction with [Particle Size Analysis \(P7B/3\)](#).

SPECIAL APPARATUS

- Soil hydrometer (ASTM 152H hydrometer preferred).
- Uniform set of sedimentation cylinders with internal depth of 340 ± 20 mm.
- End-over-end shaker, 15 rpm.

REAGENTS

Dissolve 250 g of sodium hexametaphosphate (calgon) in 900 mL of warm deionised water. When cool, add sufficient sodium carbonate to bring to pH 8 or 9 and make to 1 L.

PROCEDURE

1. Weigh 50 g of air-dry soil (<2.0 mm) into a shaking bottle. Add 200 mL of deionised water and 20 mL of 25% sodium hexametaphosphate and shake end-over-end at 15 rpm for 16 hours (overnight).
2. Weigh 50 g of air-dry soil (<2.0 mm) into another shaking bottle. Add 200 mL of deionised water and shake end-over-end at 15 rpm for exactly 10 minutes.
3. Transfer the entire contents of the shaking bottles into two 1 L measuring cylinders. Make to volume with deionised water and stir with a plunger for 30 seconds to bring all material into suspension. Take a hydrometer reading 93 minutes after sedimentation has started. Read to the top of the meniscus to the nearest 0.5 g/L.
4. Fill a 1 L cylinder with deionised water. Fill another 1 L cylinder with deionised water and 20 mL of dispersant (25% sodium hexametaphosphate). Keep these at the same temperature as the unknowns. Take hydrometer readings at 93 minutes. Place the hydrometer into the unknown suspension 30 seconds prior to reading at 93 minutes.

CALCULATIONS

Calculate the dispersion percentage (DP).

$$\text{Dispersion Percentage (\%)} = \frac{100 \times (RL - RW)}{(RP - RD)}$$

Where:

RL	=	Hydrometer reading of soil suspension without dispersant and limited mechanical dispersion (g/L)
RP	=	Hydrometer reading of soil suspension with dispersant and prolonged mechanical dispersion (g/L)
RW	=	Hydrometer reading of deionised water (g/L)
RD	=	Hydrometer reading of deionised water plus dispersant (g/L)

REPORTING THE RESULTS

Report the dispersion percentage results to the nearest whole number.

REFERENCES

- Craze, B & Hamilton, GJ 1991, Soil physical properties, in Charman, PEV & Murphy, BW (eds) *Soils: Their Properties and Management. A Soil Conservation Handbook for New South Wales*. Sydney University Press, Sydney.
- Richie, JA 1963, Earthwork tunnelling and the application of soil testing procedures. *Journal of Soil Conservation NSW* 19:111-129.
- Standards Association of Australia. *AS 1289.C8.2-1980: Methods of testing soils for engineering purposes - Soil classification tests - Dispersion - Determination of the percent dispersion of a soil*.