Department of Sustainable Natural Resources

SOIL SURVEY STANDARD TEST METHOD

EMERSON AGGREGATE TEST

ABBREVIATED NAME	EAT
TEST NUMBER	P9
TEST METHOD TYPE	B
VERSION NUMBER	2

SCOPE

This test classifies the behaviour of soil aggregates, when immersed, on their coherence in water. Testing is done only on soils with suitable aggregates. Sands and gravels are usually unsuitable for the test.

PRINCIPLE

This method describes the procedure for the determination of the Emerson class number of a soil. Soils are divided into seven classes on the basis of their coherence in water, with one further class being distinguished by the presence of calcium-rich minerals.

SPECIAL APPARATUS

- 250 mL beaker or similar container allowing a minimum depth of 30 mm of water.

- Spatula.

- Mixing bowl.

- Wash bottle containing deionised water.

- Test tubes.

PROCEDURE

1.   Select 3 air-dry aggregates, 5–10 mm diameter.

2.   Place 75 mL deionised water in the container. Place the 3 aggregates in the container of water, spaced equally around the side. Do not stir or otherwise disturb.

3.   Record the time placed in the water. After 2 hours and 20 hours, assess aggregate behaviour according to the following:

     - Record whether slaking has occurred. (See Figure 1.) If there has been no slaking, record if there has been any swelling of the aggregate.
     - If the aggregate has dispersed, note the degree of dispersion. (See Figure 1.)

4.   If the aggregate slakes but does not disperse, place about 20–40 g of soil (<2 mm) in the mixing bowl and add sufficient deionised water to bring the soil to a moisture content within the plastic range. Mix for 30 seconds.

5.   Without using your fingers, form a 5 mm cube of the reworked soil using a spatula or mould. Place the cube of reworked soil into another container of deionised water. Do not stir or otherwise disturb. After 2 hours and 20 hours, rate the degree of dispersion. (See Figure 1.)

6.   If the reworked aggregate disperses, note the degree of dispersion. (See Figure 1.)

7.   If the reworked aggregate does not disperse, take 5 g of unworked soil and add a few drops of 1M HCl. Effervescence indicates carbonate is present.

8.   If there is no carbonate present, prepare a 1:5 soil:water suspension. Shake for 10 minutes. Allow to stand for 5 minutes and note whether the suspension is dispersed or flocculated.

9.   If the supernatant of the 1:5 soil:water suspension is clear, check for the presence of gypsum using 10% barium chloride solution.
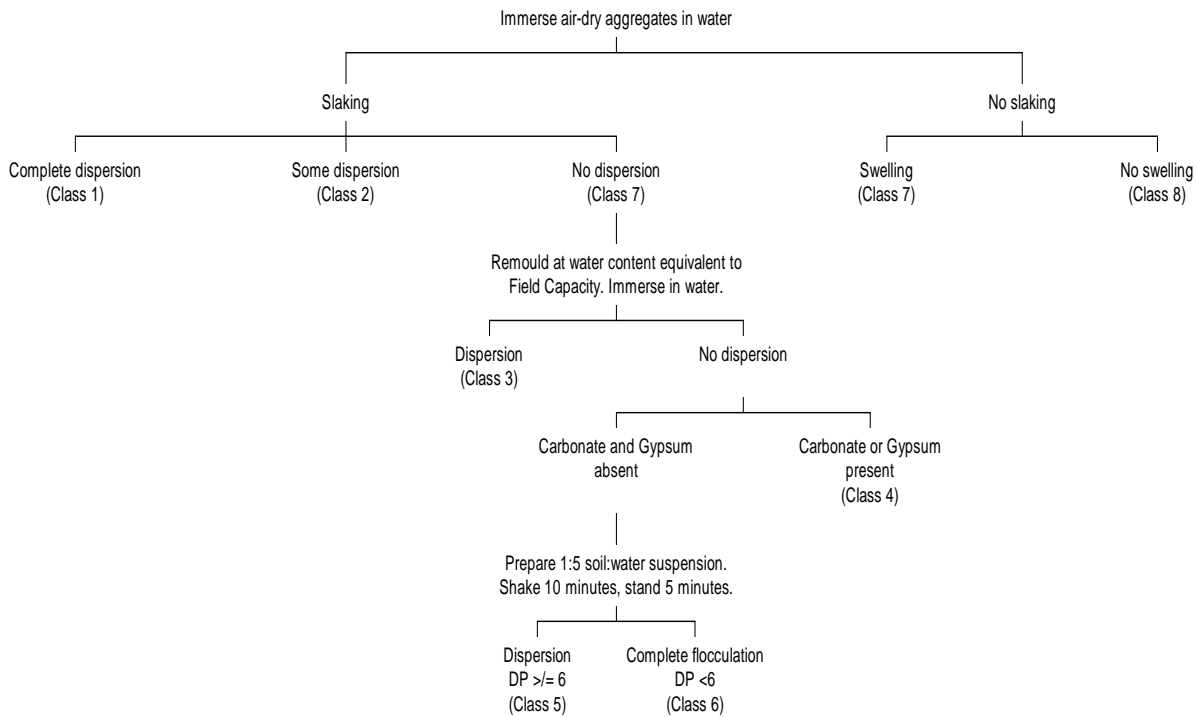
DETERMINATION OF THE EMERSON AGGREGATE CLASS

Determine the Emerson Aggregate Class Number from Figure 1. Classes 2 and 3 are subdivided according to the degree of dispersion observed.

REFERENCES

Charman, PEV 1989, *Soils of New South Wales: Their Characterisation, Classification and Conservation*, Technical Handbook No 1. Soil Conservation Service of New South Wales.

Charman, PEV & Murphy, BW (eds) 1991, *Soils: Their Properties and Management: A Soil Conservation Handbook for New South Wales*, Sydney University Press in association with Oxford University Press, Sydney.

Emerson, WW 1967, A classification of soil aggregrates based on their coherence in water. *Australian Journal of Soil Research*, 5: 47-57.

Standards Australia. *AS 1289.C8.1-1980: Methods of testing soils for engineering purposes - Soil classification tests - Dispersion - Determination of Emerson class number of a soil.*

Figure 1. Determining the Emerson Class Number of Aggregates

Immerse air-dry aggregates in water

Slaking | No slaking

Complete dispersion (Class 1) | Some dispersion (Class 2) | No dispersion (Class 7) | Swelling (Class 7) | No swelling (Class 8)

Remould at water content equivalent to Field Capacity. Immerse in water.

Dispersion (Class 3) | No dispersion

Carbonate and Gypsum absent | Carbonate or Gypsum present (Class 4)

Prepare 1:5 soil:water suspension. Shake 10 minutes, stand 5 minutes.

Dispersion DP >/= 6 (Class 5) | Complete flocculation DP <6 (Class 6)

DISPERSION SUBCLASSES FOR TYPE 2 AND 3 AGGREGATES

1   Slight milkiness
2   Obvious milkiness, less than 50% of the aggregate affected
3   Obvious milkiness, greater than 50% of the aggregate affected
4   Total dispersion leaving only sand grains

Note: Class 2 (4) is equivalent to Class 1.

SLAKING

In situations where the degree of slaking is considered important,
a slaking subclass is allowed:

0   No change
1   Aggregate breaks open but remains intact
2   Aggregate breaks down into smaller aggregates
3   Aggregate breaks down completely into sand grains