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Wet Aggregate Stability in Soil

susan.siragusa¹

¹USDA-ARS-AMRU



susan.siragusa

ABSTRACT

The wet sieving technique measures the percentage of water-stable aggregates in soils. It is a soil quality assessment analysis.

MATERIALS

Sodium Hexametaphosphate (NaPO_3)₆ (CAS 10124-56-8)

Polystyrene antistatic weigh dishes (Fisher #08-732-113)

Wet sieving apparatus (Eijkelpamp_M1-0813e with sieve cups (mesh 0.5, 0.25, and 0.1mm))

Test Sieves: 2, 1, and 0.5 mm (ENDECOTTS 008BAW2.00, 008BAW1.00, 008BAW.500)

Trays: 12x16" (Carlisle 1612FG095 Glasteel Fiberglass)

Paint Pail bucket

Wash bottles (Fisher #FB0340923K, Bel-Art #F124160004)

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Protocol status: Working
We use this protocol and it's working

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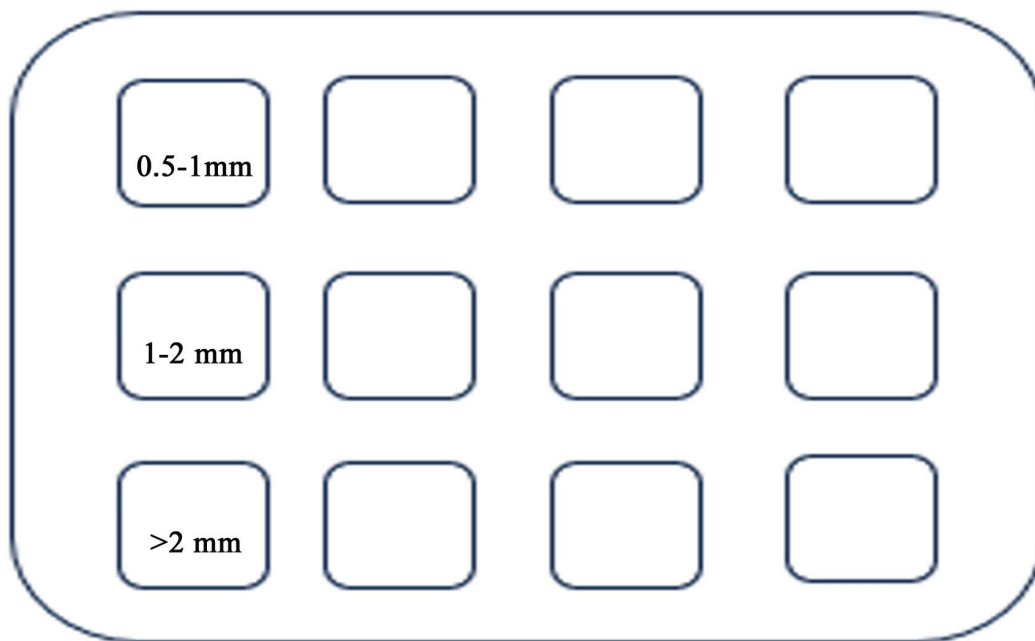
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1. **Weigh** and record the weights of numbered (use permanent marker) weigh dishes. I

recommend setting up small trays as follows: 2 mm in front, 1-2mm in middle, and 0.5-1.0mm in back.



Weigh up the appropriate amount of Aggregate Fractioned soil (refer to the chart for sample amounts). Tare out the plastic weigh dish and weigh into it. Try to get a representative sample of the aggregate fraction (not residual dust) and **avoid** plant matter (you can use lab air at a low setting or gently blown out the excess plant material with your mouth). Make sure the final sample weight is on target AFTER blowing out the plant material.

- 2 Capillary wetting:** Add the aggregate soil to the appropriate sieve cup and return it to the weigh dish. Slowly wet the soil by adding distilled water from a wash bottle to the plastic weigh dish outside the sieve cup until the soil is saturated. (Do not add water directly to the soil.) The Wet Sieving Apparatus holds eight sieves, so only wet up one set of eight at a time.

3 A. Wet Sieving:

- a. Fill the metal apparatus cups with room temperature distilled water and place them on the wet sieving apparatus.
- b. Place the sieve cups containing the capillary wetted soil samples onto the machine in an ordered fashion and run for **5 min.** (NOTE: East coast soils are run for 10 min.)
- c. While the instrument is running, rinse out the sample pans.
- d. Remove the sieve cups from the machine, making sure not to drip into the other sieves during

the transfer. Using a wash bottle with distilled water, wash out the soil remaining inside the sieve back into the appropriate labeled plastic weigh pan.

e. Rinse out the metal cups and replace with fresh water between sets. I normally run 3 sets before the water change, which is two trays for me (4 sample sets per tray), but do not run more than this before doing a water change.

f. Dry the stable soil aggregate material in the oven at 50-70° C (do not exceed 70 ° C) for an overnight period or until dry, and weigh and record the Air-dry weights.

4 Coarse Material Correction:

a. Flood the dried stable aggregate material with 0.5% Sodium Metaphosphate solution and let them sit for two hours (you can also leave them overnight) to let the chemical break up the soil structure.

Sodium Metaphosphate $[\text{Na}(\text{PO}_3)_x \times \text{NaO}]$: 0.5% solution, wgt./vol. (5 g L⁻¹)

b. Using a wash bottle of distilled water, wash the material from the weighing dish onto appropriately sized test sieve for determining coarse material (see above chart). I set the test sieve into a paint pail bucket for this. Wash the material remaining on the sieve with additional distilled water until only the coarse fragments remain (you can use your fingers to help push the soil through), and then transfer the remaining coarse material back into the weigh pan.

c. Wash the sieves when finished (The chemical will corrode them.)

d. Dry the coarse material at 50-70° C until dry. Weigh and record the Air-dry weights.

5 Calculating % Wet Aggregate Stability:

$$\% \text{ WAS} = \frac{\text{Dry Soil (g) after wet sieving} - \text{Course sand fraction (g)}}{\text{Dry Soil (g) before wet sieving} - \text{Course sand fraction (g)}}$$