SCREEN ANALYSIS

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SCREEN ANALYSIS

- Used to measure the size of particles in the size range between 3- 0.0015 in.(76 mm and 38µm)
- A set of standard screens is arranged serially in a stack, with the smallest mesh at the bottom and the largest at the top
- The sample is placed on the top screen and the stack shaken mechanically for 20 min
- The particles retained on each screen are removed and weighed, and the masses of the individual screen increments are converted to mass fractions or mass percentages of the total sample
- Any particles that pass the finest screen are caught in a pan at the bottom of the stack

SIEVE TRAYS

Pan (the finest particles retained here)

Sieve (different mesh size)

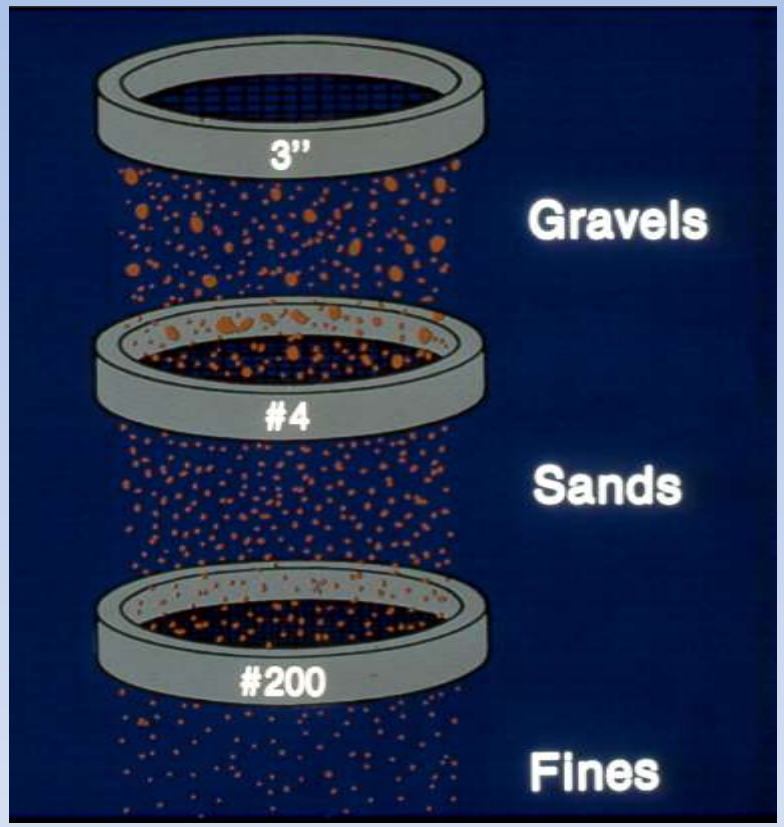
Sieve trays were put on a stack (shaker)

Screen Analysis Table

Mesh	Screen opening D_{pi}, mm	Mass fraction retained, x_i	Average particle diameter in increment, $\bar{D}_{pi}$, mm	Cumulative fraction smaller than $\bar{D}_p$
4	4.699	0.0000	—	1.0000
6	3.327	0.0251	4.013	0.9749
8	2.362	0.1250	2.845	0.8499
10	1.651	0.3207	2.007	0.5292
14	1.168	0.2570	1.409	0.2722
20	0.833	0.1590	1.001	0.1132
28	0.589	0.0538	0.711	0.0594
35	0.417	0.0210	0.503	0.0384
48	0.295	0.0102	0.356	0.0282
65	0.208	0.0077	0.252	0.0205
100	0.147	0.0058	0.178	0.0147
150	0.104	0.0041	0.126	0.0106
200	0.074	0.0031	0.089	0.0075
Pan	—	0.0075	0.037	0.0000

- **Column 1 – mesh size**
- **Column 2 – width of opening of the screens**
- **Column 3 – the mass fraction of the total sample that is retained on the designated screen**
- **Column 4 – average particle diameter Dpi in each increment**
- **Column 5 – cumulative fraction smaller than each value of Dpi. In screen analysis, cumulative fractions are sometimes written starting at the top of the stack and express as the fraction larger than a given size**

SIEVE



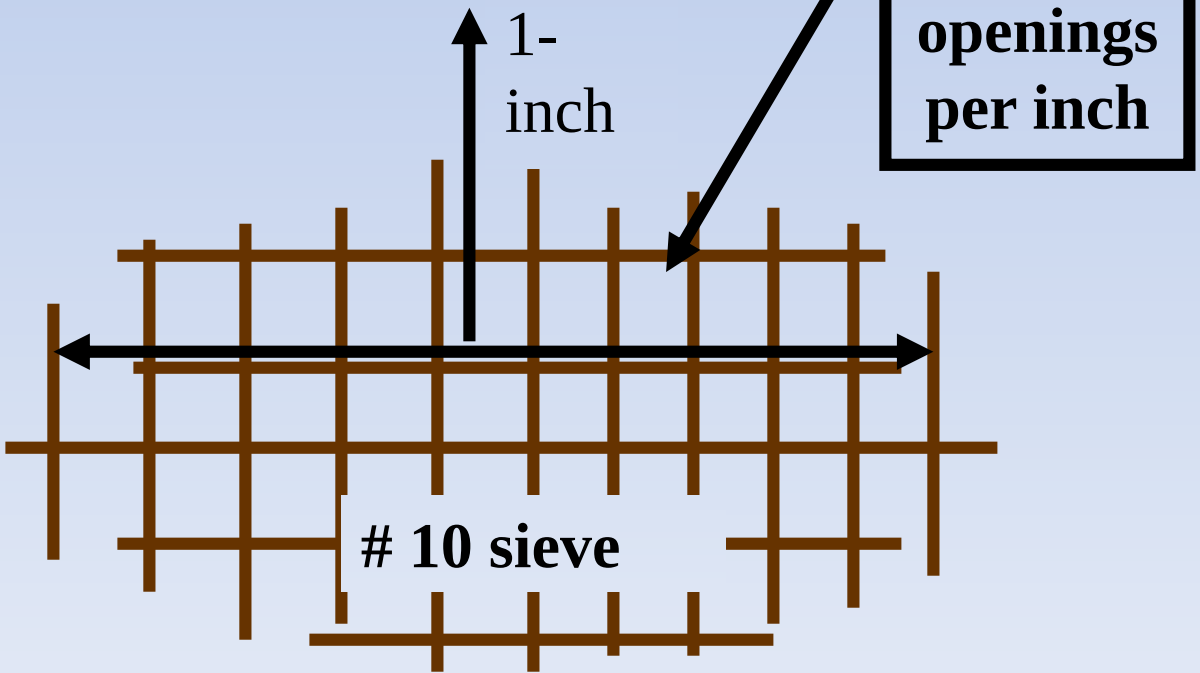
WHAT IS SIEVE?

- **Sieving is a simple technique for separating particles of different sizes.**
- **Coarse particles are separated or broken up by grinding against one-another and screen openings.**
- **Depending upon the types of particles to be separated, sieves with different types of holes are used.**
- **Sieves are also used to separate stones from sand.**

Sieve Designation : larger & Smaller

- **Sieves larger than the #4 sieve are designated by the size of the openings in the sieve.**

- **Smaller sieves are numbered according to the number of openings per inch**



Sieving procedure

(1) Write down the weight of each sieve as well as the bottom pan to be used in the analysis.

(2) Record the weight of the given dry soil sample.

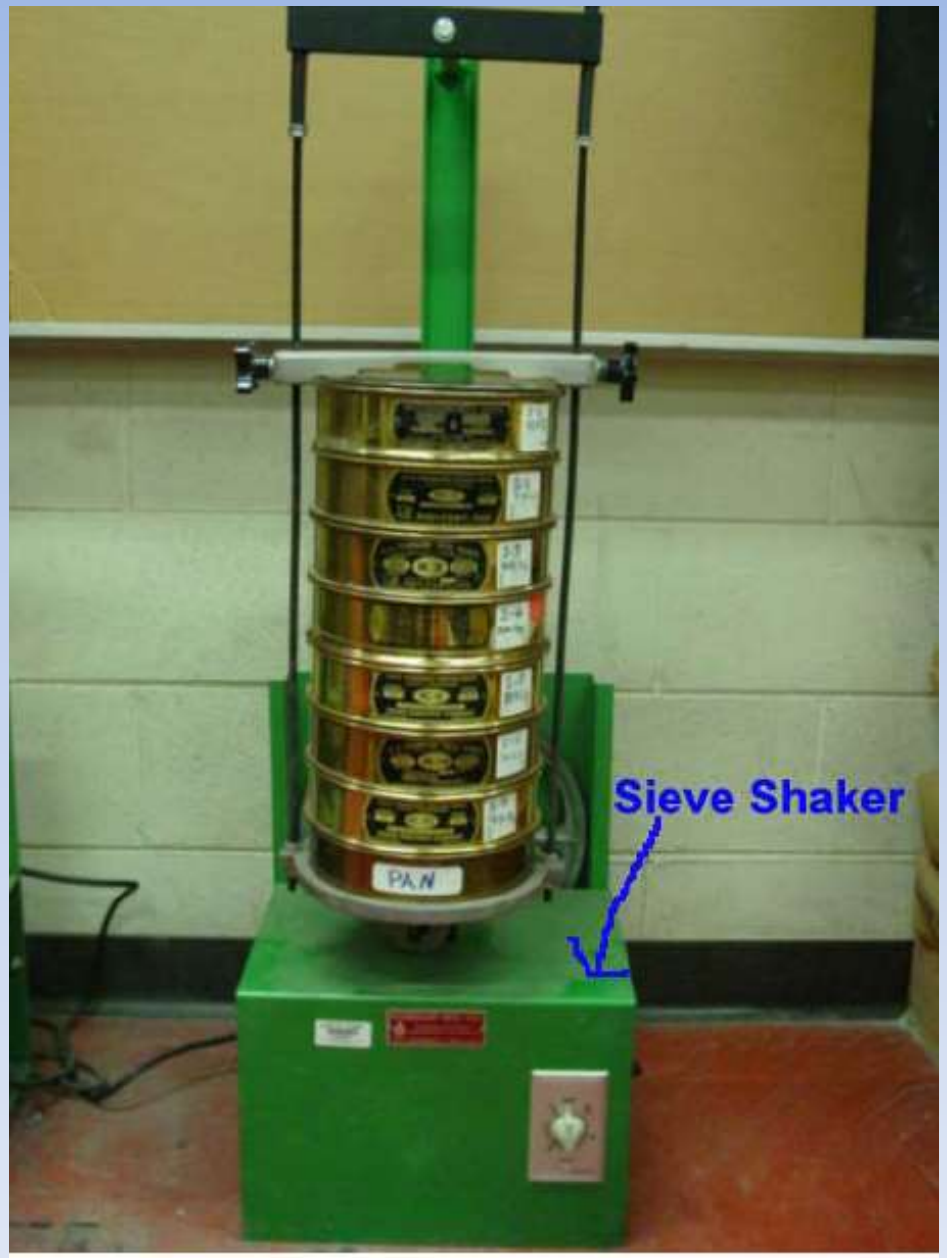
(3) Make sure that all the sieves are clean, and assemble them in the ascending order of sieve numbers (#4 sieve at top and #200 sieve at bottom). Place the pan below #200 sieve. Carefully pour the soil sample into the top sieve and place the cap over it.

(4) Place the sieve stack in the mechanical shaker and shake for 10 minutes.

(5) Remove the stack from the shaker and carefully weigh and record the weight of each sieve with its retained soil. In addition, remember to weigh and record the weight of the bottom pan with its retained fine soil.


Set of Sieves
Soil Specimen
PAN
Balance


PAN


Sieve Shaker
PAN

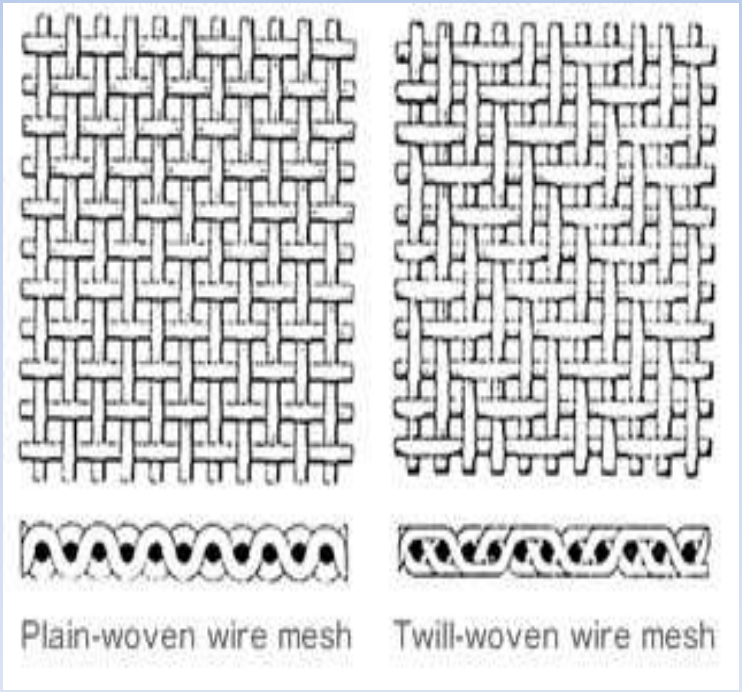

GEOTEST
ELECTRONIC SOLUTION BALANCE U-1027
MODE
OFF
SET
ON
lb
lb/oz
kg
PCS

TYPES OF SIEVE

- **Chinois, or conical sieve used as a strainer, also sometimes used like a food mill**

- **A colander (or cullender) is a bowl-shaped kitchen utensil with holes in it used for draining food such as pasta or rice. A colander is also used to rinse vegetables.**

- **A mesh is a barrier made of connected strands of metal, fiber, or other flexible or ductile materials. A mesh is similar to a web or a net in that it has many attached or woven strands.**
- **Woven wire mesh sieves Woven wire mesh sieves are according to technical requirements of ISO 3310-1.These sieves usually have nominal aperture ranging from 20 micrometers to 3.55 millimeters, with diameters ranging from 100 to 450 millimeters.**



- **Perforated plate sieves**
  Perforated plate sieves conform to ISO (the International Organization for Standardization) 3310-2 and can have round or square nominal apertures ranging from 1 millimeter to 125 millimeters. The diameters of the sieves range from 200 to 450 millimeters. Etc..

MESH NUMBER

- **Mesh number is define as the number of opening per square of inch.**

- **The smaller mesh number , the larger particales can pass through the mesh.**

PACLET NUMBER

- **The Peclet number is a dimensionless number used in calculations involving convective heat transfer.**
- **Its name given by French physicist Jean clavde Eugene Peclet.**
- **The Peclet number is the product of the Reynolds number and the Prandtl number.**
- **It depends on the heat capacity, density, velocity, characteristic length and heat transfer coefficient.**

Mathematically can be expressed as:- for Mechanical Operation

- **Peclet number Npe= UL/E**

Where ,

- **U= Longitudinal velocity of material in mixer.**
- **L= mixer length**
- **E= Diffusivity.**

Mathematically can be expressed as:- for heat transfer

$N_{Pe} = N_{re} * N_{pr}$

We have Reynold number $= \frac{\rho v D}{\mu}$

And Prandtl number $= \frac{C P \mu}{K}$

$$Npe = \left(\frac{\rho v D}{\mu}\right) * \left(\frac{Cp\mu}{K}\right)$$

$$Npe = \left(\frac{\rho v D * Cp}{K}\right)$$

Where

- ρ = Density
- V = Average velocity
- D = Diameter
- Cp = Specific heat
- K = thermal conductivity


thank you!