

P6# 3-24

USCS

A) % passing No. 200 = [sieve is not used]
⇒ < 50% passing #200 ∴ Coarse

% retained on #4 = 100 - 20 = 80% > 50%
∴ Gravel

Also % passing #200 < 5%

% gravel in the fraction retained on #200 = 100 - 20 = 80%
% sand in the fraction " " " " " "
From graph

$$D_{60} = 11\text{mm}, D_{30} = 7\text{mm}, D_{10} = 1.1\text{mm}$$

$$C_u = \frac{D_{60}}{D_{10}} = \frac{11}{1.1} = 10 > 4$$

$$C_c = \frac{D_{30}^2}{D_{60} \times D_{10}} = \frac{7^2}{11 \times 1.1} = 4$$

Since $C_c > 3$ the soil is GP [Poorly graded gravel]

B) % passing #200 = 12% < 50% ∴ Coarse grained

% passing #4 = 74%

∴ % retained on #4 = 100 - 74 = 26% < 50% ∴ Sand

$$P_z = 19 - 12 = 7$$

% of gravel in the fraction retained on #200 = 100 - 74 = 26%

% of sand in the fraction " " #200 = 74 - 12 = 62%

From plasticity chart of C_u in the shaded area ∴ Sand

$$C_u = \frac{2.25}{0.075} = 30$$

$$C_c = \frac{D_{30}^2}{D_{60} D_{10}} = \frac{0.5}{0.075 \times 2.25} = 1.48$$

$C_u > 6$ and C_c lies between 1 & 3

Soil classify as CL-ML

∴ Soil is SW-SC

Sample contains more than 15% gravel

∴ Well graded sand with clay & gravel

C)

% passing #4 = 77%

% passing #200 = 18% < 50% [Coarse grained]

% retained on #4 = 100 - 77 = 23% < 50% ∴ Sand

PI = 32 - 25 = 7

From the Plasticity chart for LL = 32 & PI = 7

the point lies below A-line ∴ ML or OL

% gravel in the fraction retained on #200

% sand in " " " " = 100 - 77 = 23%

" " " " #200 = 77 - 18 = 59%

[59 > 23] ∴ Sand

D₆₀ = 2; D₃₀ = 0.15; D₁₀ = 0.07

C_u = $\frac{D_{60}}{D_{10}} = \frac{2}{0.07} = 28$

More than 12% passes #200

∴ Soil is SM.

Sample contains more than 15% gravel.

∴ Silty sand with gravel.

D)

% passing #4 = 94%

% passing #200 = 16% < 50% ∴ Coarse grained

% retained on #4 = 100 - 94 = 6% < 50% ∴ Sand

PI = 24 - 12 = 12

From plasticity chart for LL = 24; PI = 12, the point lies above A-line ∴ CL

% gravel in the fraction retained on #200 = 100 - 94 = 6%

% Sand " " " " " " #200 = 94 - 16 = 78%

78 > 6 ∴ Sand

D₆₀ = 0.5; D₃₀ = 0.18

5-12% passes #200

∴ soil is SP-SC or SW-SC

Sample contains less than 15% gravel

∴ Soil is poorly graded sand with clay or well graded sand with clay

(E)

% passing # 4 = 100

% passing # 200 = 4 < 50% ∴ Coarse grained

% retained on # 4 = 100 - 100 = 0% < 50% ∴ Sand

$$\% \text{ passing } \# 200 < 5\% \therefore C_u = \frac{D_{60}}{D_{10}} = \frac{2}{0.2} = 10$$

$$C_c = \frac{D_{30}^2}{D_{60} D_{10}} = \frac{0.6}{2 \times 0.2} = 0.9 < 1$$

$$C_u > 6 \text{ \& } C_c = 1$$

∴ Soil is SW

% gravel in fraction retained on # 200 = 100 - 100 = 0%

% Sand " " " " " " = 100 - 4 = 96%

∴ Sand

Sample contains less than 15% gravel

∴ Well graded sand

SW

ASHTO

A) % passing #200 < 35%

% passing #40 = 4% [A-1 or A-2]

% passing #10 = 8% [A-1 or A-2]

∴ soil could be

A-1-a ; A-1-b ; A-2-4 ; A-2-5 ; A-2-6 or A-2-7

(B) % passing #200 = 12% < 35% ∴ Granular

% passing #200 = 12% < 25

% passing #40 = 29% < 50 and < 30% } ∴ A-1-b or A-2

% passing #10 = 58%

PI = 19 - 12 = 7 < 10 ; LL = 19 < 40

The soil is classified as A-1-b or A-2-4

(C) % passing #200 = 18% < 35% ∴ Granular

% passing #200 = 18% < 25% ⇒ A-1-b or A-2

% passing #40 = [#40 sieve is not used]

% passing #10 = [#10 sieve is not used]

PI = 32 - 25 = 7 , LL = 32

PI < 10 & LL < 40

∴ Soil is A-2-4

(D) % passing #200 = 16% < 35 & < 25 ⇒ A-1-b or A-2

% passing #40 = 55% ⇒ A-2 & 710%

LL = 24 ; PI = 24 - 12 = 12 > 11 ∴ A-2-6 or A-2-7

LL = 24 < 40 ∴ A-2-6

Soil is A-2-6

(E) % passing #200 = 4% < 15 & 25%

% passing #40 = 24% < 30% & 50%

% passing #10 = 62% > 50% ∴ not A-1-a

∴ Soil is A-2-4

NOTE: Calculate GI for all.

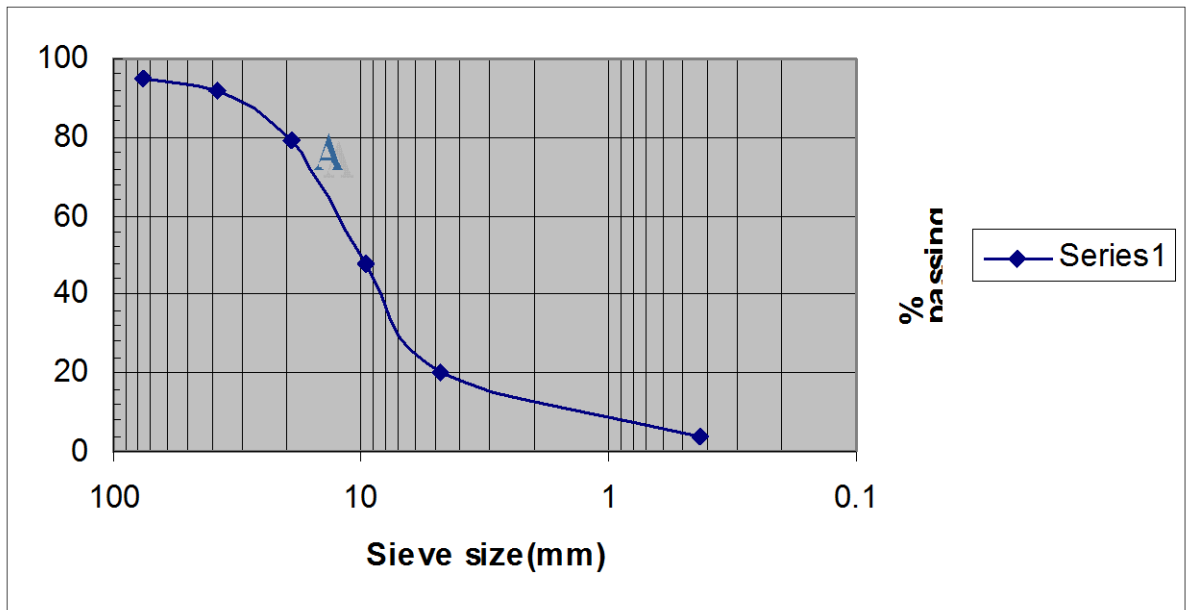
Pb- 3-20

The consistency limits help in the classification of coarse grained soils with fines & Fine grained soils. These limits permit an evaluation of the degree to which a given soil can be deformed.

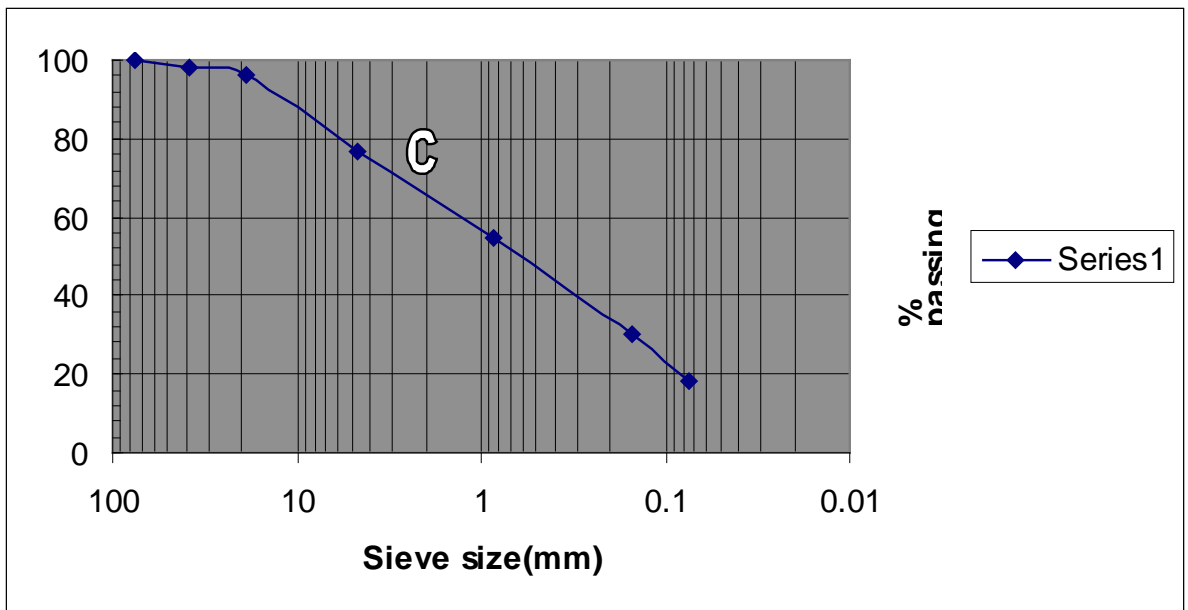
Yes.

It means the soil is in undisturbed state. The sample is highly sensitive clay. The material is very fine with large surface area that would have very high volume change in the semi-solid state.

Soil A



Soil C



Soil D

