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Analysis of Soil Quality Parameters and Study of Their Impact

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ABSTRACT

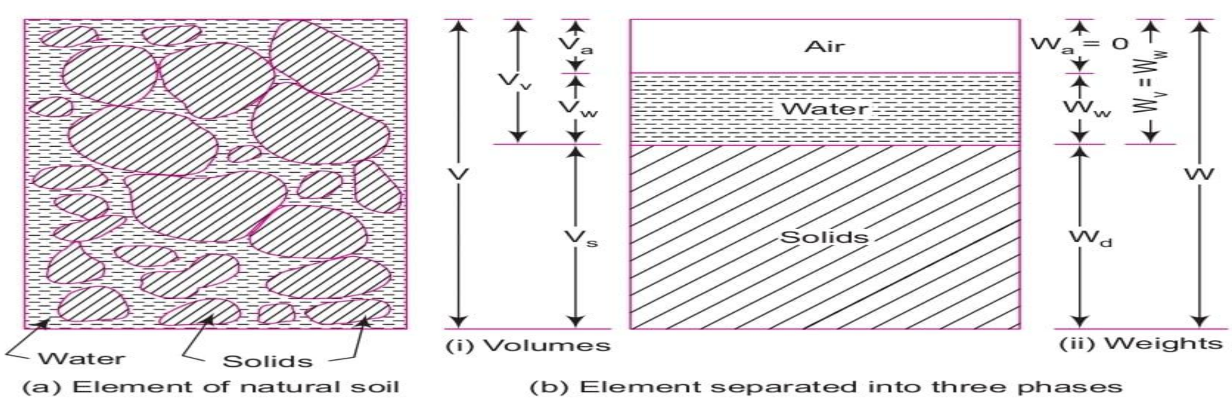
There are different properties of soil that are considered at the time of making any form of construction activities. These are the ones that decide the suitability of the soil for use in construction. There are two types of parameters are there. The first one is the physical parameters. Another one is chemical parameters. The first one defines the physical characteristics of the soil. The other ones do the work of describing the different forms of chemical changes in the soil because of the chemical structure of the soil. So, in this project, the properties of soil that determine the effectiveness of soil were considered. Moreover, the mechanism of each of the factors for defining the quality of soil was also determined here in this report. Moreover, the different views of several scholars were also checked here in this report. Moreover, the different results in terms of the effectiveness of soil after finding these factors were also checked here.

INTRODUCTION

It is known that soil is the most important material for any construction work. It is because on the soil every structure that is prepared rests. So, it is needed that the properties that decide the quality of the soil are determined first before actually starting the construction work. It can be seen that the ultimate load is born by the soil. So, it becomes very much important to design the soil in such a way that it can bear the load coming from the structure easily. It is to be noted that there are different factors that decide the effectiveness of soil. So, in this project, the properties of soil that determine the effectiveness of soil were considered. Moreover, the mechanism of each of the factors for defining the quality of soil was also determined here in this report. Moreover, the different views of several scholars were also checked here in this report. Moreover, the different results in terms of the effectiveness of soil after finding these factors were also checked here. The different recommendations that can be given for the betterment of the research are also present in this report.

REVIEW OF LITERATURE

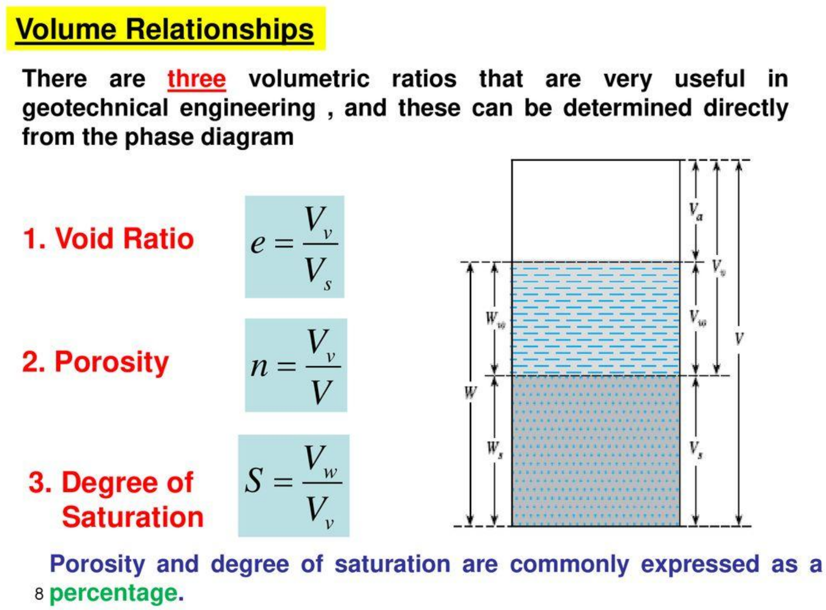
According to Sintim*et al*. 2019, there are different properties of soil that are considered for the determination of suitability of the soil. These mainly consist of the physical & chemical properties (Sintim*et al*. 2019). According to these properties, the soils are selected for the activities of construction.



(Source: https://civilengineering.blog)

Figure 1: Soil as three phase system

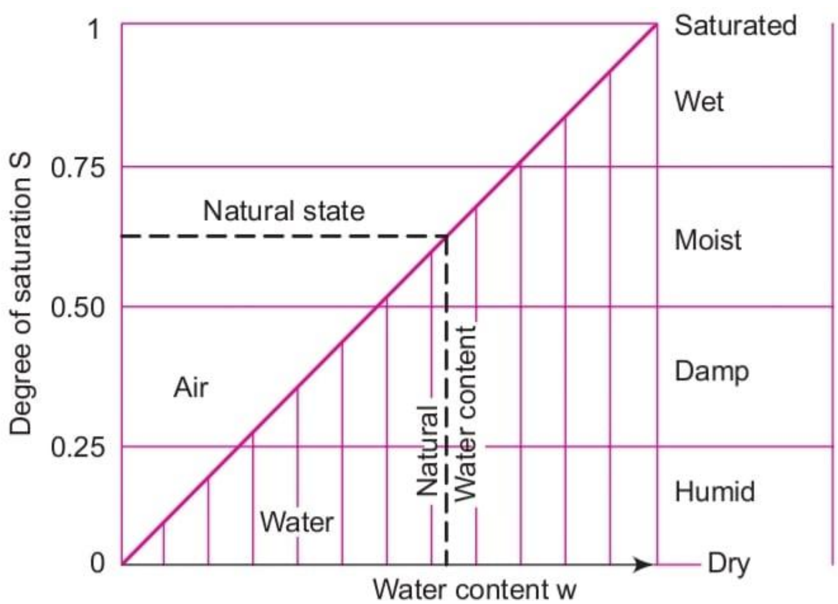
According to Česonienė *et al*. 2020, one of the main parameters of soils that is considered in engineering is the "bulk density" of soil (Česonienė *et al*. 2020). It is the measure of the mass of the soil per unit volume. This determines the weight of the soil. This is also the measure of the pore spaces present in the soil in an indirect way.



(Source: https://slideplayer.com)

Figure 2: Void ratio. Porosity & degree of saturation of soil

According to Bai *et al*. 2019, it can be seen that different soils have different textures. This is mainly dependent on the type of material by which it is made. Soils having different textures shows different properties (Bai *et al*. 2019). The test that is used for checking the texture of the soil is "Robinson`s pipette method".

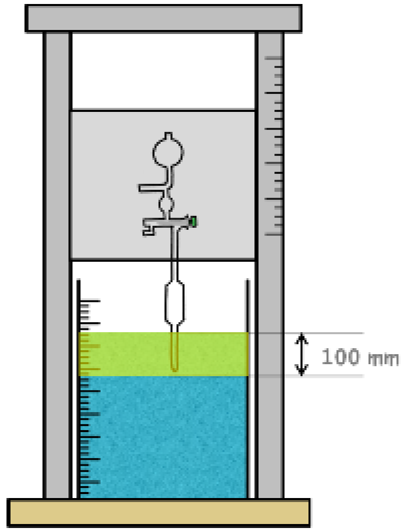


(Source: https://civilengineering.blog)

Figure 3: Degree of saturation vs water content of soil

According to Feng *et al*. 2019, there are many methods that are used for measuring the "bulk density" of soil. According to the different standards of different countries, these tests differ. Although there are some popular practices that are mostly used (Feng *et al*. 2019). Among these one of the most popular methods is the "core sampling method".

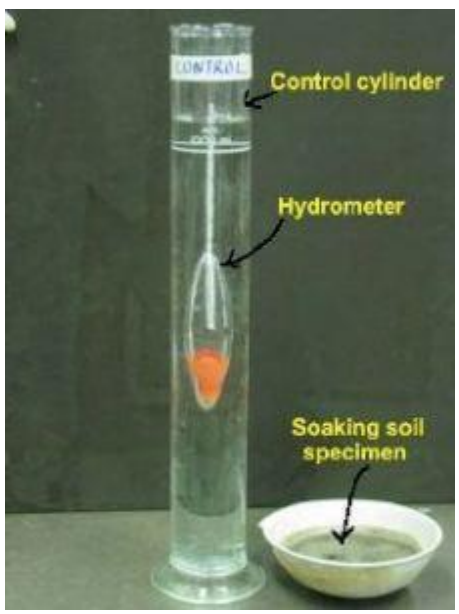
Sedimentation Analysis



(Source: https://www.elementaryengineeringlibrary.com)

Figure 4: Pipette method of sedimentation analysis

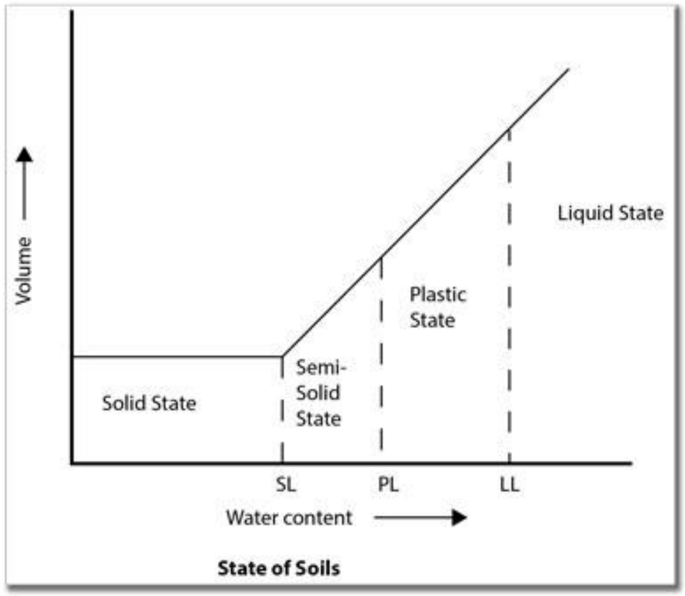
According to Wang *et al*. 2019, the physical characteristics of soil decide the reaction of the soil when load from the structure acted on the soil (Wang *et al*. 2019). So, it is needed that depending on the physical characteristics the behaviors of soil are determined prior to the starting of the construction work.



(Source: https://i0.wp.com)

Figure 5: Hydrometer method of sedimentation analysis

According to Ronchi *et al*. 2019, there are many minerals are present in the soil. Some of these are helpful for making the soil fit for construction work. Although, there are also some minerals that deteriorate the property of soil when used in the process of construction (Ronchi *et al*. 2019). All of these come under the chemical characteristics of the soil.



(Source: https://www.globalgilson.com)

Figure 6: Consistency limits of soil

According to Karlen *et al*. 2019, the grain size of soil is one of the most important properties of soil that is required to be determined in the different applications of engineering. There are different forms of grains can be observed in soil (Karlen *et al*. 2019). These are coarse & fine-grain soils. There also exists a further subdivision of soil.

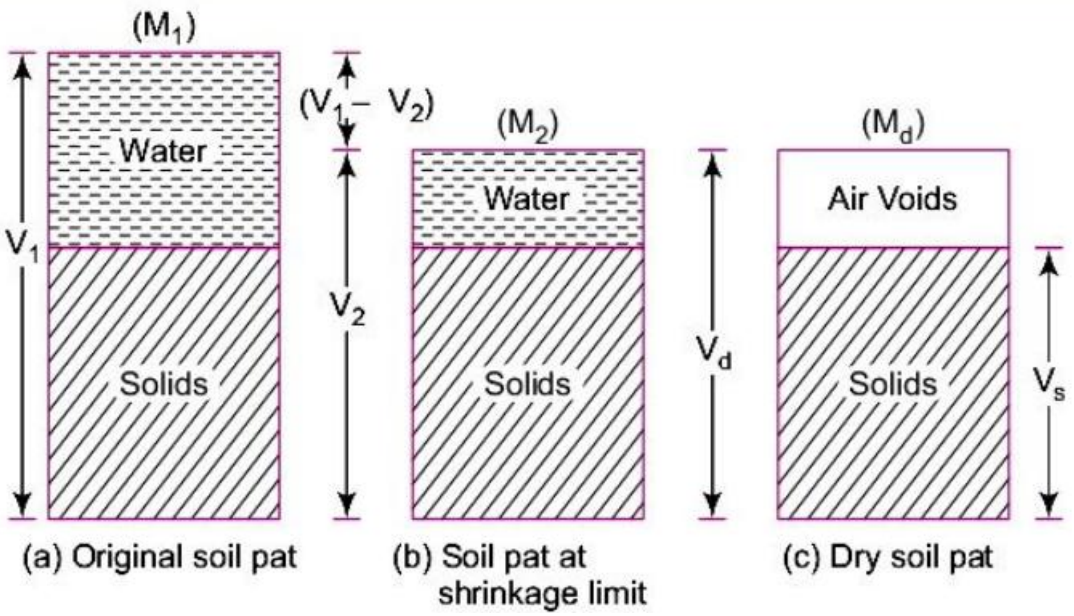
Liquid & Liquid Limit

(Source: https://www.civilengineeringweb.com)

Figure 7: Casagrange`s apparatus

According to Li *et al*. 2019, it can be noticed that in different temperatures soils acts in a different way. So, it is very much required to determine the maximum & minimum temperatures one soil can attain in a particular place (Li *et al*. 2019). It is mainly dependent on the climate of the area.

Shrinkage limit test

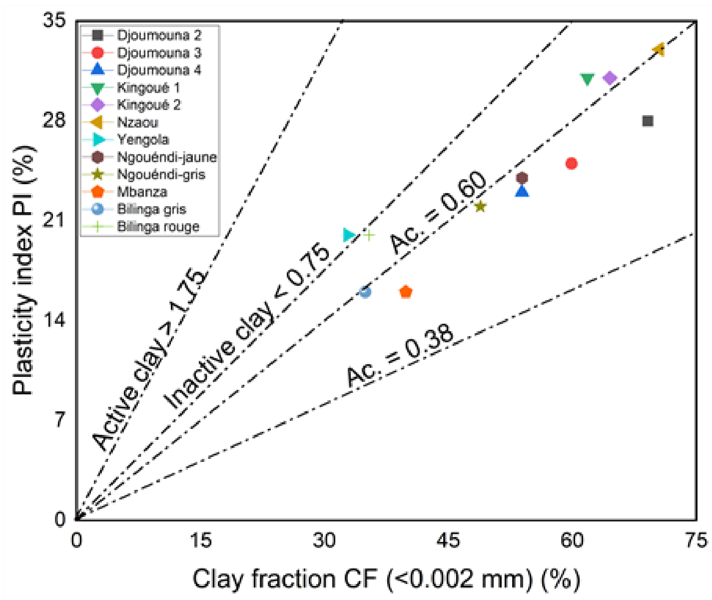


(Source: https://www.researchgate.net)

Figure 8: Shrinkage limit test

According to Xie *et al*. 2020, it is to be noted that in soil both organic & inorganic materials can be present. So, depending on this the properties of soils also change (Xie *et al*. 2020). This is one of the most important factors that decide the application of the soil in different applications of engineering.

Activity of clays

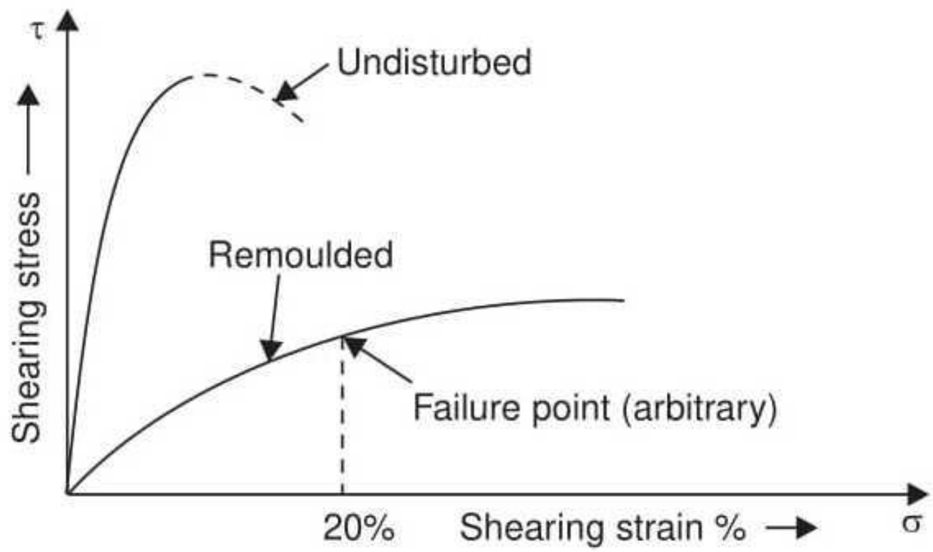


(Source: https://html.scirp.org)

Figure 9: Activity of clays

According to Cetin, 2019, one of the best methods of checking the quality of soil is to determine the characteristics of each of the grains of the soil. According the type of grain and soil can be classified into some types (Cetin, 2019). Some of these are "gravel", "sand", "silt" and "clay".

Sensitivity of clays

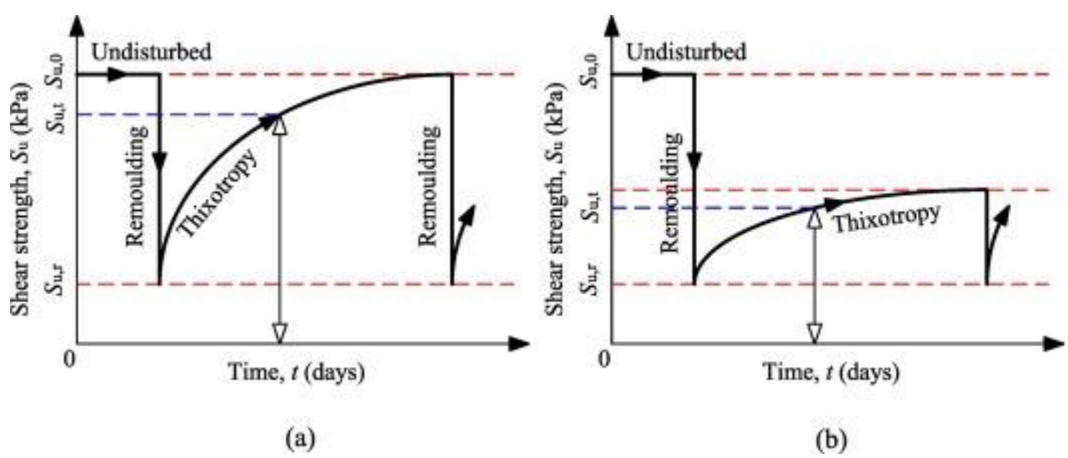


(Source: https://i0.wp.com)

Figure 10: Sensitivity of clays

According to Pressler *et al*. 2019, the pH of the soil is one of the most important factors of the soil that is needed to be considered for checking the suitability of a project to be built on the soil (Pressler *et al*. 2019). It is the measure of how much the soil is acidic or basic.

Thixotropy of clay



(Source: https://i0.wp.com)

Figure 11: Thixotropy of clays

According to Jian *et al*. 2020, the chemical nature of the soil is mainly defined by the pH of the soil. Depending on the materials present in the soil the pH values of the soil are determined. The presence of acidic materials makes the soil acidic (Jian *et al*. 2020). Whereas the presence of oxides of metal makes the soil basic.

Different soil tests

Sr. N.	Soil Property	Analysis Method	Unit
1	Bulk density	Core sampling method	Gm/cm^3
2	Texture	Robinson's pipette method	-
3	Temperature	Soil thermometer	
4	Moisture content	Oven drying method	In Percantage
5	pH	pH meter	-
6	Organic matter	Titrimetric method (Walkley and Black, 1934). % Soil organic matter =% organic carbon x 1.724	In Percantage
7	Available Nitrogen	Micro Kjeldhal Method	Kg/ha
8	Available phosphorus	Spectrophotometric method	Kg/ha
9	Available otassium	Flame photometer method (1986)	Kg/ha
10	EC	Digital portable water analyzer kit (Model 161 E)	m mhos
11	Chloride	Volumetric titration	mg/100gm
12	Fluoride	Selective Ion meter	ppm

(Source: https://juniperpublishers.com)

Figure 12: Soil parameters & their tests

According to Okereafor *et al*. 2020, one of the main characteristics of soil that determine the interparticle attraction of the soil is the cohesion between the particles of soil (Okereafor *et al*. 2020). So, in this regard, it can be noticed that “gravel & sand” have the minimum cohesion and clay has maximum cohesion.

According to Vongdala *et al*. 2019, the amount of water present in the soil also decides the reaction of soil underloading (Vongdala *et al*. 2019). So, the presence of soil is needed to be determined first for the determination of the characteristics of the soil.

According to Fan *et al*. 2019, the presence of potassium determines the biological activities that are taken place in a project. So, this needs to be determined (Fan *et al*. 2019). It is to be noted that soil that is less “biologically active” is preferred for construction works.

According to Khosravi *et al*. 2019, the type of soil is dependent on the location where the lotion is present. It can be noticed that depending on the location of the soil differences in the characteristics of the soil can be observed (Khosravi *et al*. 2019). In hilly areas hard rocky soils can be observed and at the same time in tropical areas mashy clayey soils that undergo a large change in volume under moisture changes can be observed.

According to Abdalla *et al*. 2019, one of the main characteristics of soil is the “electrical conductivity” that the particles of soil have (Abdalla *et al*. 2019). It can be noticed that depending on the type of material by which the soil is built the “electrical conductivity” of soil differs.

According to Palansooriya *et al*. 2019, nitrogen is one of the materials that is abundant in most of soil types. The presence of this can affect the property of soil to a large extent (Palansooriya *et al*. 2019). So, the determination of the content of nitrogen present in the soil becomes crucial.

According to Wiesmeier *et al*. 2019, another material the presence which can affect the property of soil is chloride. So, in this case, the presence of chloride is determined (Wiesmeier *et al*. 2019). The method used for this purpose is “volumetric titration”.

According to Boots *et al*. 2019, depending on the location of the sol there can be seen a change in the content of salt. The more the soil is close to the sea the more it contains salt (Boots *et al*. 2019). Depending on this the different applications of engineering are determined.

According to Yang *et al*. 2020, the presence of fluoride is also another parameter that is considered for checking the quality of the soil (Yang *et al*. 2020). It is mainly determined by the process named as “selective ion meter”.

According to Li *et al*. 2019, it can be noticed that in the soil there are particles having different sizes present. So, the presence of these particles decides the property of the soil (Li *et al*. 2019). This can be determined in the form of the distribution of the different grain sizes.

According to Buras *et al*. 2020, another important parameter that is considered in the soil is the presence of voids. Depending on the size & distribution of particles the voids are determined (Buras *et al*. 2020). The more the void the less the strength of the soil becomes.

According to Pour *et al*. 2020, one of the most important parameters that are considered for soil is the "degree of saturation" of the soil. It can be noticed that depending on the "void ratio" the "degree of saturation" of soil changes (Pour *et al*. 2020). It is the measure of the amount of voids present in the soil that is filled by water.

According to Tamiminia *et al*. 2020, the "specific gravity" of soil is another measure of the characteristics of the soil (Tamiminia *et al*. 2020). It is to be noted that it defines the weight of the soil in excess of water at a temperature of 4 degrees centigrade.

According to Shakoor *et al*. 2021, one of the main things that are determined for soils is the index properties of the soil. There are some standard methods that are employed for this purpose (Shakoor *et al*. 2021). This mainly describes the behavior of soil under changing "moisture contents".

According to Ostad *et al*. 2021, the presence of different chemical compounds can adversely affect the property of the soil (Ostad *et al*. 2021). So, it is needed that the percentage of each of the materials is determined and removed to the extent that is needed.

According to Chai *et al*. 2022, the chemical structure of soil particles is also another parameter that defines the characteristics of the soil (Chai *et al*. 2022). It can be seen that depending on the chemical structure of the soil there are different responses after imposing loading on the soil can be observed.

According to Ye *et al*. 2020, there are mainly three types of soils are there depending on the chemical structure of the soil. These are "kaolinite", "montmorilonite", & "illite" (Ye *et al*. 2020). All of these shows different response under pressure & moisture change.

According to Alengebawy *et al*. 2021, soils especially in clay there is an important factor that is needed to be determined for using it in construction applications. It is the activity of the clay. It defines the change in the volume of the soil with the change in moisture in the soil (Alengebawy *et al*. 2021). Clays show this property more than the other types of soils.

MATERIALS & METHODOLOGY

The different methods of obtaining the results of the different parameters of soil are as follows.

Water content

Table 1: Water content tests of soil

Sl No.	Test name
1	"Oven drying method"
2	**"Sand bath method"**
3	**"alcohol method"**
4	**"calcium carbide method"**
5	**"pycnometer method"**
6	**"radiation method**
7	**"Torsion balance method"**

(Source: Self-created)

Specific Gravity

Table 2: Specific gravity tests of soil

Sl No.	Test Name
1	"Density bottle method"
2	"Pycnometer method"
3	"Measuring flask method"
4	"Gas jar method"
5	"Shrinkage limit method"

(Source: Self-created)

Mass Density

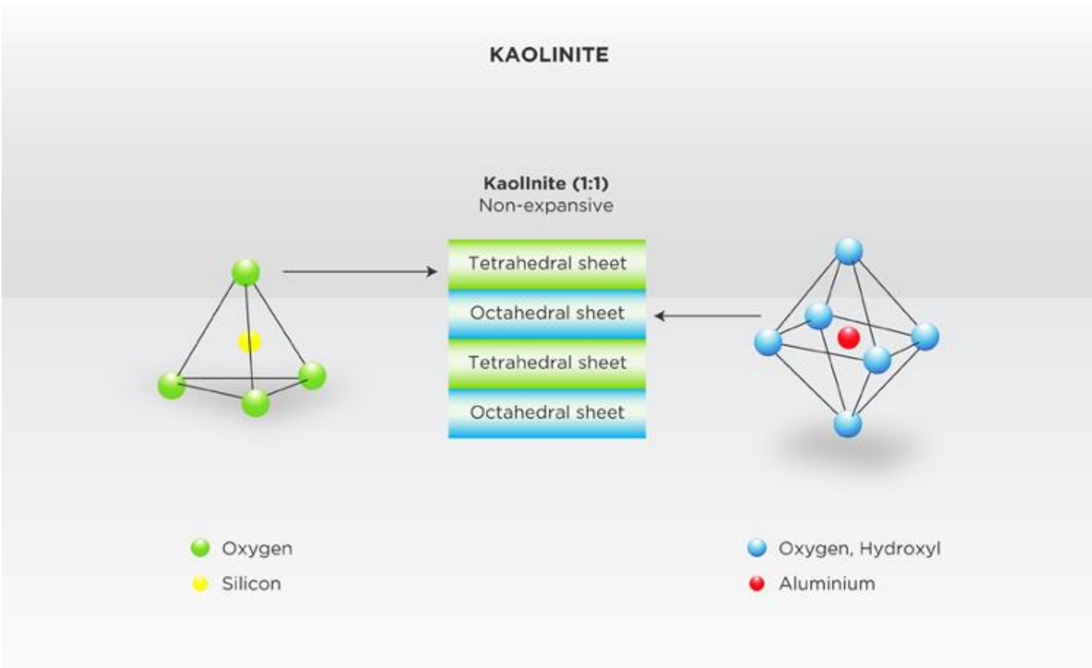
Table 3: Mass Density tests of soil

Sl No.	Test Name
1	"Water displacement method"
2	"Submerged density method"
3	"Core cutter method"
4	"Sand replacement method"
5	"Water balloon method"
6	"Radiation method"

(Source: Self-created)

RESULTS & DISCUSSION

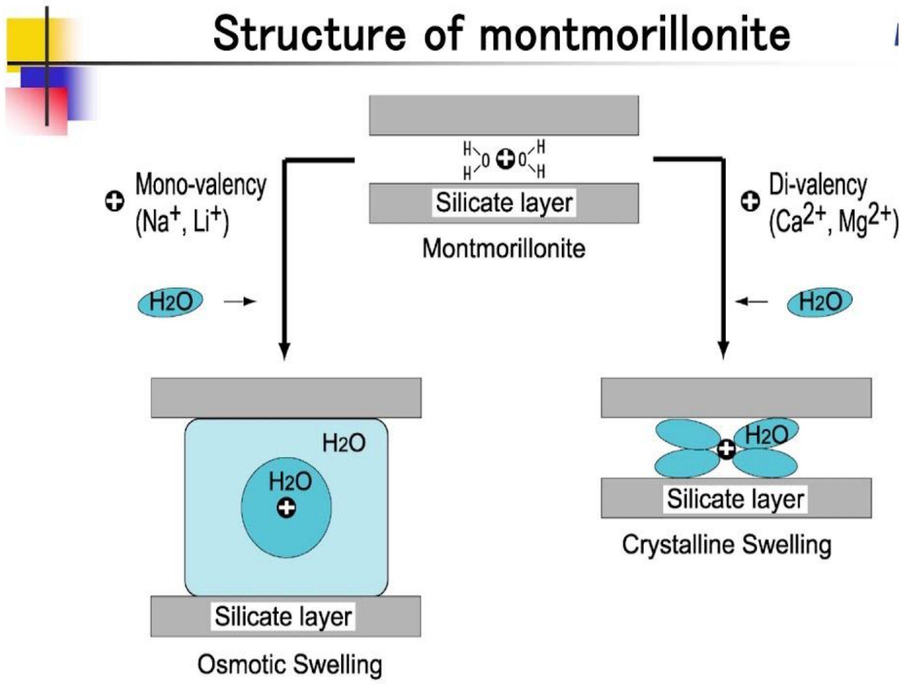
Soil structure [*Refer to Appendix 1*]



(Source: https://static.sciencelearn.org.nz)

Figure 13: Kaolinite soil structure

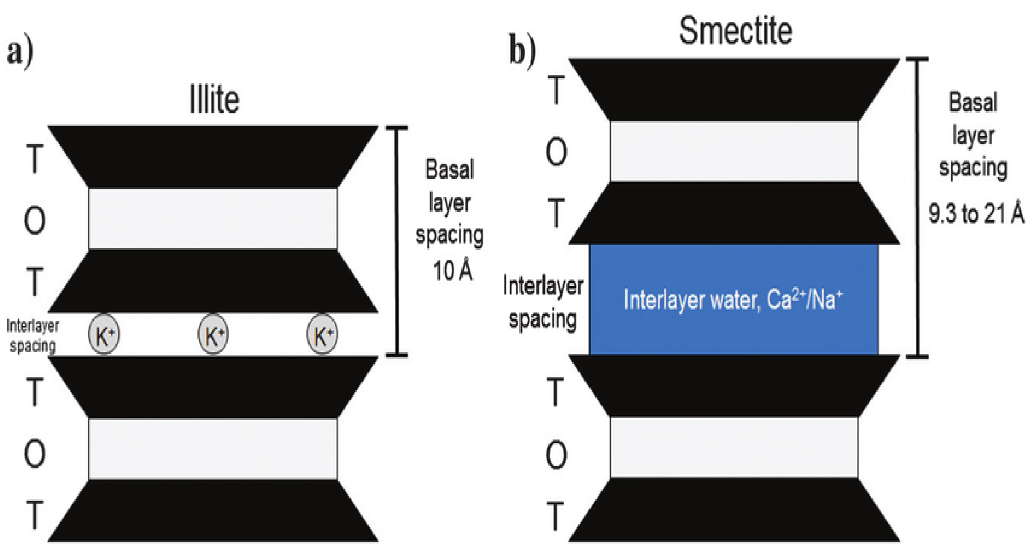
Kaolinite soil structure is shown in the picture above.



(Source: https://i.ytimg.com)

Figure 14: Montmorillonite soil structure

Montmorillonite soil structure is shown in the picture above.

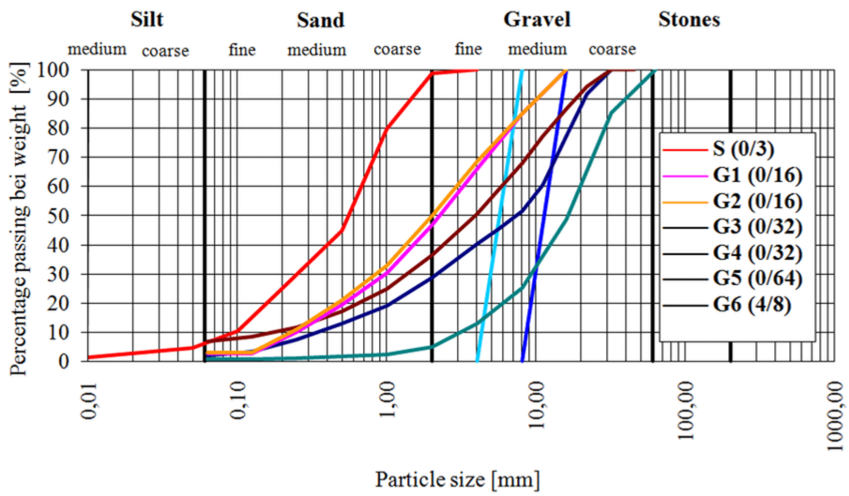


(Source: https://www.researchgate.net)

Figure 15: Illite soil structure

Illite soil structure is shown in the picture above.

Particle size distribution

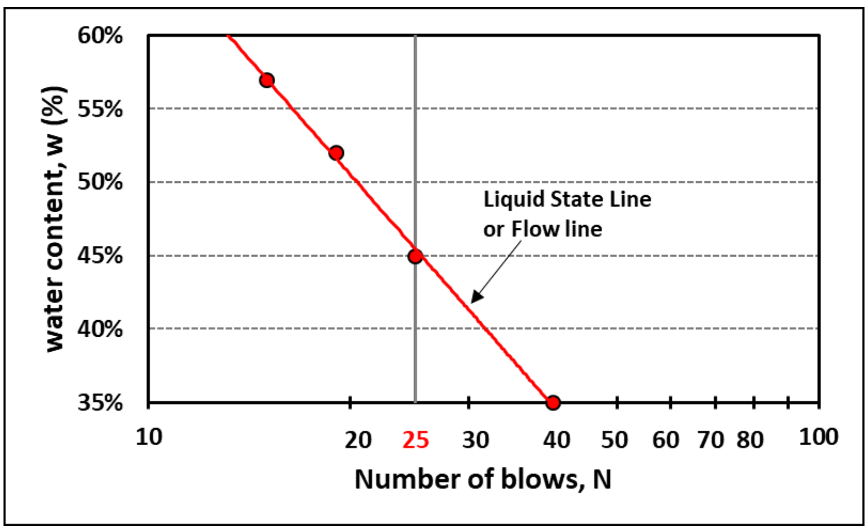


(Source: https://www.researchgate.net)

Figure 16: Grain size distribution of soil

Grain size distribution of soil is shown in the picture above.

Liquid & Liquid Limit



(Source: https://www.geoengineer.org)

Figure 17: Liquid limit test

Liquid limit test is shown in the picture above.

$$w_s = \frac{(M_1 - M_d) - (V_1 - V_2)\rho_w}{M_d} \times 100$$

(Source: https://www.researchgate.net)

Figure 18: Shrinkage limit test

Shrinkage limit test is shown in the picture above.

Activity of clays

Activity	Soil Classification
< 0.75	Inactive
0.75 - 1.25	Normal Active
> 1.25	Active

(Source: https://www.elementaryengineeringlibrary.com)

Figure 19: Activity of clays

Activity of clays is shown in the picture above.

Sensitivity of clays

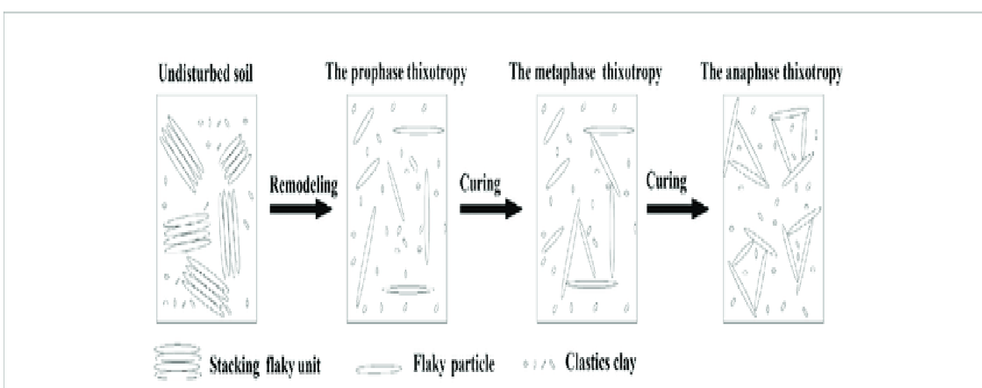
Sensitivity	Soil Type
0 - 1	Insensitive
1 - 2	Little Sensitive
2 - 4	Normal Sensitive
4 - 8	Sensitive
8 - 16	Extra Sensitive
> 16	Quick Clays

(Source: https://www.elementaryengineeringlibrary.com)

Figure 20: Sensitivity of clays

Sensitivity of clays is shown in the picture above.

Thixotrophy of clay



(Source: https://www.researchgate.net)

Figure 21: Thixotropy pattern of clays

Thixotropy pattern of clays is shown in the picture above.

Chemical soil parameters

Soil Test	Range	Classification
pH	<4.5	Extremely acidic
	4.51-5.50	Very strongly acidic
	5.51-6.00	Moderately acidic
	6.01-6.50	Slightly acidic
	6.51-7.30	Neutral
	7.31-8.50	Moderately alkaline
	8.51-9.00	Strong alkaline
	>9.01	Very strong alkaline
Salinity, Electrical conductivity (mmhos)	Upto 1	Average
	1.01-2.00	Harmful to germination
	2.01-3.00	Harmful to sensitive crop
Organic Carbon%	Upto 0.20	Very less
	0.21-0.40	Less
	0.41-0.50	Medium
	0.51-0.80	On an average sufficient
	0.81-1.00	Sufficient
	>1.00	More than sufficient
Nitrogen (kg/ha)	Upto 50	Very less
	51-100	Less
	101-150	Good
	151-300	Better
	>300	Sufficient
Phosphorus (kg/ha)	Upto 15	Very less
	16-30	Less
	31-50	Medium
	51-65	On an average sufficient
	66-80	Sufficient
	>80	More than sufficient
Potassium (kg/ha)	0-120	Very less
	120-180	Less
	181-240	Medium
	241-300	Average
	301-360	Better
	>360	More than sufficient

(Source: https://juniperpublishers.com)

Figure 22: Soil chemical parameters results showing ranges

Soil chemical parameters results showing ranges is shown in the picture above.

Chemical soil test results

Sr. N.	Ph	EC	Soil Texture	Bulk Density	Village	Moi sture Content	Chloride	Fluo ride	% Carbon	% Organic Matter	N	P	K
1	7.5± 0.01	1.882± 0.003	Deep brown loamy	1.41±0. 21	Sawai Madh opur	21.29	6.39± 0.926	1.5± 0.41	0.311± 0.029	0.517± 0.092	91.2± 12.08	100.4± 20.81	364.2± 9.35
2	7.1± 0.24	0.487± 0.164	Deep dark brown sandy	0.98± 0.08	Phalodi	13.47	10.65± 0.392	3.1± 1.01	0.842± 0.112	1.448± 0.261	123.0± 54.62	98.43± 34.66	402.8± 17.99
3	8.3± 0.14	0.536± 0.12	Medium brown loamy	1.02± 0.54	Cha roda	12.08	14.91± 2.98	2.5± 0.97	0.948± 0.154	1.634± 0.385	151.2± 38.29	162.3± 25.04	423.1± 12.58
4	7.6± 0.23	0.24± 0.006	Rock red	0.64± 0.29	Geen apur	7.9	22.01± 3.045	3.0± 1.21	0.435± 0.023	0.749± 0.095	138.7± 47.24	120.4± 15.54	382.6± 29.02
5	7.9± 0.06	0.847± 0.431	Shallow brown loamy	1.09± 0.72	Makh oli	10.47	17.75± 2.091	2.09± 0.45	0.701± 0.104	1.209± 0.189	102.4± 29.05	125.4± 21.43	310.5± 25.43
6	7.9± 0.25	0.026± 0.059	Deep black clayey	1.21± 0.38	Dondri	24.01	22.01± 2.038	6.19± 2.10	0.744± 0.029	1.282± 0.231	98.3± 42.84	97.8± 31.05	242.5± 62.01
7	7.3± 0.93	0.869± 0.073	Deep brown loamy	0.86± 0.47	Kans eer	18.52	7.1± 0.837	2.30± 1.52	0.645± 0.374	1.112± 0.137	190.5± 25.96	154.7± 10.42	528.4± 36.18
8	8.1± 0.53	0.424± 0.026	Deep dark brown sandy	0.74± 0.91	Sellu	12.15	4.26± 1.021	3.01± 1.04	0.095± 0.002	0.164± 0.056	117.2± 38.27	102.9± 21.04	374.6± 19.26
9	7.4± 0.36	0.481± 0.174	Shallow yellowish brown gravelly	0.92± 0.39	Chitara	19.21	12.07± 2.112	4.0± 2.01	1.124± 0.537	1.938± 0.118	87.5± 12.57	74.25± 32.33	251.2± 59.08
10	7.9± 0.42	1.86± 0.046	Red gravelly loam hilly	1.23± 0.24	Dobda	7.02	5.68± 0.984	8.23± 2.11	0.178± 0.097	0.307± 0.106	184.7± 9.02	196.2± 25.09	362.4± 31.55
11	7.4± 0.29	1.58± 0.095	Deep brown clayey	0.69± 0.40	Bhagw atgarh	23.12	21.3± 3.102	6.72± 1.89	0.273± 0.100	0.470± 0.142	70.2± 22.65	142.3± 24.07	217.6± 44.02
12	7.2± 0.84	1.96± 0.11	Medium brown loamy	1.05± 0.33	Behru pura	17.15	19.17± 1.292	3.12± 0.95	0.246± 0.039	0.424± 0.098	170.2± 18.09	101.4± 55.97	402.9± 17.42
13	7.8± 0.34	0.750± 0.027	Deep dark brown sandy	0.83± 0.49	Ranth ambore	9.05	7.81± 0.573	1.10± 0.45	0.560± 0.104	0.966± 0.055	99.4± 24.67	110.2± 21.48	273.5± 22.98
14	7.5± 0.93	0.920± 0.103	Shallow brown loamy	1.40± 0.12	Udha mpuri	19.17	4.97± 0.953	1.15± 0.23	0.701± 0.074	1.209± 0.564	134.5± 10.41	145.2± 32.61	504.2± 14.38
15	8.2± 0.06	0.326± 0.007	Deep black clayey	1.20± 0.98	Korwada	22.85	14.21± 2.054	2.40± 1.04	1.397± 0.153	2.41± 0.135	162.75± 13.004	114.1± 28.04	495.1± 53.22
16	8.0± 0.15	0.956± 0.012	Rock red gravelly	0.91± 0.71	Dum oda	10.55	10.59± 1.503	1.13± 0.95	0.580± 0.045	1.00± 0.04	51.8± 29.72	94.77± 37.55	145.2± 28.36
17	8.4± 0.35	0.198± 0.055	Medium brown clayey	1.24± 0.10	Vijay pur	20.09	10.24± 1.027	4.21± 1.42	1.821± 0.904	3.14± 0.034	218.6± 6.002	254.9± 51.23	641.0± 16.74
18	7.4± 0.02	0.320± 0.01	Shallow brown sandy	0.87± 0.25	Nand pura	8.75	24.14± 4.105	3.52± 1.27	0.572± 0.028	0.982± 0.421	115.2± 15.06	120.9± 23.31	357.2± 24.52
19	8.1± 0.57	0.178± 0.005	Medium brown loamy	1.01± 0.53	Panc halos	18.12	14.18± 2.406	3.72± 0.94	0.765± 0.056	1.32± 0.95	74.3± 26.04	93.73± 41.62	259.7± 53.50
20	7.6± 0.33	0.344± 0.11	Deep brown clayey	1.04± 0.73	Bhadoti	19.3	7.09± 0.307	5.1± 1.89	0.402± 0.012	0.69± 0.12	38.6± 24.09	73.48± 12.97	240.7± 26.71

21	7.9± 0.82	1.93± 0.036	Red gravelly loamy hilly	0.84± 0.21	Bansla	12.42	7.06± 1.002	4.97± 1.22	0.179± 0.054	0.31± 0.05	13.8± 7.92	122.4± 32.84	138.5± 18.63
22	8.1± 0.07	1.33± 0.092	Yellowish silt	0.94± 0.08	Retra	14.17	3.52± 0.428	4.12± 2.05	0.504± 0.096	0.87± 0.02	41.6± 14.72	125.4± 34.75	161.5± 26.44
23	7.4± 0.92	0.530± 0.152	Deep brown clayey	1.05± 0.53	Todra	23.08	8.52± 0.156	2.95± 0.44	0.222± 0.101	0.066± 0.005	34.2± 20.87	54.72± 18.22	172.9± 35.42
24	7.8± 0.21	0.390± 0.217	Deep black clayey	1.21± 0.89	Habib pur	25.43	4.97± 0.087	1.7± 0.59	0.109± 0.065	0.188± 0.042	62.8± 25.31	90.51± 27.45	209.7± 45.29
25	7.9± 0.19	0.264± 0.102	Deep dark brown sandy	0.98± 0.26	Nara yanpur	8.85	9.02± 0.229	3.5± 1.87	1.090± 0.301	1.88± 0.981	103.48± 16.21	165.6± 30.19	347.9± 346.21
26	8.2± 0.47	0.353± 0.5	Brownish sandy	1.22± 0.91	Ahm edpur	7.88	16.58± 0.065	1.5± 0.64	1.293± 0.128	2.24± 0.975	153.64± 10.24	219.8± 31.05	471.2± 53.29
27	7.8± 0.52	0.221± 0.027	Red gravelly loam hilly	1.10± 0.55	Hing otla	10.12	7.01± 0.188	2.4± 1.01	0.556± 0.057	0.96± 0.021	59.1± 21.19	150.3± 16.74	250.3± 34.97
28	8.1± 0.14	0.649± 0.105	Rock red gravell	0.79± 0.36	Seva	16.72	17.75± 0.904	3.0± 1.27	0.435± 0.021	0.749± 0.042	98.5± 14.07	120.6± 25.02	237.6± 28.88
29	7.5± 0.92	0.521± 0.089	Yellowish loamy clay	0.86± 0.11	Nomdya	18.81	19.17± 0.216	1.2± 0.05	0.745± 0.055	1.285± 0.487	129.4± 10.01	132.7± 42.66	389.4± 41.32
30	7.5± 0.57	0.492± 0.002	Deep brown clay	1.05± 0.74	Dibssya	22.47	4.97± 0.108	3.1± 0.53	0.880± 0.102	1.517± 0.206	134.2± 5.04	160.5± 27.25	407.2± 28.36
31	7.4± 0.83	0.580± 0.354	Shallow brown loamy	1.12± 0.67	Ladpura	21.35	12.07± 0.129	1.0± 0.02	0.597± 0.099	1.029± 0.571	87.4± 31.64	152.6± 38.03	196.4± 37.54
32	7.1± 0.75	0.501± 0.162	Deep dark brown sandy	0.97± 0.43	Berkh andi	17.55	8.52± 0.018	3.7± 0.42	0.659± 0.125	1.136± 0.583	139.2± 7.24	123.4± 29.12	386.2± 62.17
33	7.5± 0.12	0.495± 0.036	Medium brown loamy	1.03± 0.39	Goth	20.42	4.97± 0.113	1.95± 0.94	0.941± 0.048	1.622± 0.124	152.7± 4.26	210.5± 54.23	457.5± 45.08
34	7.4± 0.41	0.492± 0.372	Brownish clay	1.52± 0.12	Ajnoti	25.71	9.94± 0.375	1.5± 0.74	0.772± 0.062	1.331± 0.095	109.3± 9.65	87.42± 49.21	372.5± 32.97
35	7.2± 0.39	0.981± 0.129	Deep brown clay	1.24± 0.09	Soorwal	24.08	11.09± 0.217	1.8± 0.26	0.433± 0.108	0.747± 0.045	127.2± 13.87	298.4± 62.71	390.7± 57.09

(Source: https://juniperpublishers.com)

Figure 23: Physio-chemical soil test

Physio-chemical soil test is shown in the picture above.

Correlation of soil test results

	pH	EC	Bulk Density	Moisture Content	Chloride	% Carbon	% Organic Matter	Nitrogen	Phosp horus	Potas sium	Fluoride
pH	1	-	-	-	-	-	-	-	-	-	-
EC	-0.234	1	-	-	-	-	-	-	-	-	-
Bulk Density	0.076	0.023	1	-	-	-	-	-	-	-	-
Moisture Content	-0.324	-0.075	0.276	1	-	-	-	-	-	-	-
Chloride	-0.01	-0.061	-0.006	-0.105	1	-	-	-	-	-	-
%Carbon	0.094	-0.266	0.103	-0.075	0.162	1	-	-	-	-	-
%Organic Matter	0.1	-0.258	0.099	-0.087	0.167	0.998	1	-	-	-	-
Nitrogen	-0.097	-0.026	0.119	0.041	0.104	0.363	0.374	1	-	-	-
Phosphorus	-0.185	0.223	-0.147	-0.186	0.285	0.296	0.3	0.216	1	-	-
Potassium	-0.034	-0.105	0.226	0.12	-0.139	0.278	0.283	0.732	-0.089	1	-
Fluoride	0.207	0.166	-0.12	-0.165	0.093	-0.082	-0.079	0.025	0.174	0.017	1

(Source: https://juniperpublishers.com)

Figure 24: Correlation of different soil tests

Correlation of the soil test is shown in the picture above.

Conclusion & future scope

In this report, the different factors or parameters that influence the working or response of soil were discussed. It can be noticed that there are many factors that are responsible for the different behavior of soil. These can be mainly divided into "physical" & "chemical" characteristics. In the present day, it can be observed that there are constructions taking place on sites that are not so suitable for construction. This creates a huge opportunity of doing research on this matter.

Recommendations

Depending on this report, there are some recommendations that can be given for the betterment of the project. It is to be noted that better technologies can be used for obtaining better results. Also, the results of tests of different soils should be compared to check how these parameters are changing the working of the soils.

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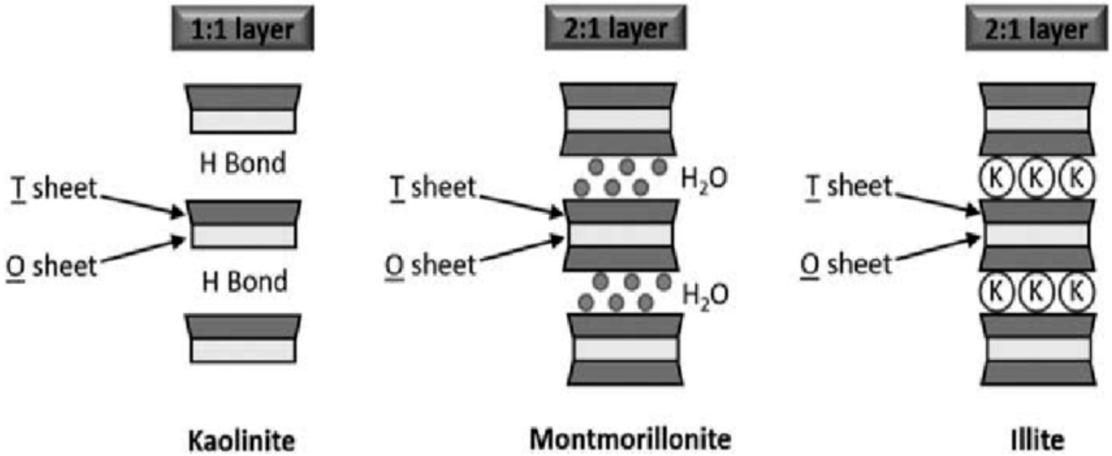
APPENDICES

Appendix 1- Soil structure



(Source: https://www.researchgate.net)