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The Effect of Gypsum Addition on The Mechanical Properties Of "Clay Sand" Soils

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Abstract: This in the article in the composition plaster was muddy sand of the ground physical-mechanical features experience, "GIDROPROEKT" AJ test in the laboratory studied analysis is made. Granularity of the composition to strength connection and plaster added of the ground features in detail. Also, the ACIC 3.3 device using of the ground to move resistance power calculating. Engineering solutions as soil strength increase roads discussion. Research works Syrdarya in the province Sardoba in the territory take soil samples received through take went.

Keywords: Muddy sand, gypsum, strength, granularity content, internal friction angle, connection power, displacement resistance, hydraulics.

Introduction:

Sardoba territory Syrdarya in the province located to be, to be ground features analysis to do important scientific - practical importance has. Dam in the territory take visited of research main purpose of the ground strength features evaluation, its water under the influence changes analysis to do and possible was deformations from determining consists of. Syrdarya province sandy - clayey soils, limestone and large particulate sediment sexes with. This is characterized by in the area alluvial (river harvest did) and deluvial processes as a result harvest was soils wide spread. Grounds composition water warehouses and dams for important importance has they are water under the influence to decay inclined to be possible. In the area hydraulics facilities in design sandy and clay of layers physicist - mechanic properties deep analysis to be done demand is muddy. Sand of the ground strength and stability construction, hydraulic engineering facilities and engineering geology for important. This is in the article of the ground to the strength effect provider main factors, granularity of the composition role and plaster added of the ground physicist - mechanic features in detail analysis will be done.

METHOD

Sardoba from the territory of soil samples taken test results. Syrdarya province Sardoba from the territory 3 soil samples provided on physical-mechanical properties studied. Research during each in the sample internal friction angle (ϕ) and connection the force (c) was measured.

Grunt's strength in the ACIC 3.3 device ((Одноплоскостного среза)) on the plain shift method according to evaluated and conforms to the GOST 12248-2010 standard appropriate define.

Figure 1. Experiment in the process.

Grounds physical-mechanical features results (Table 1).

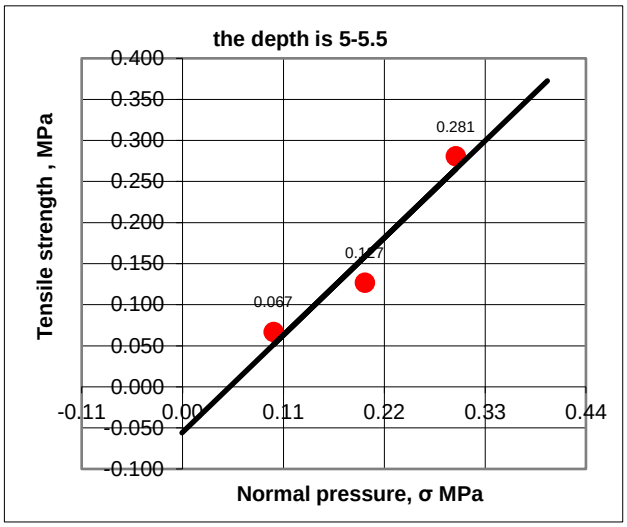
№	Soil properties	Check results		
1	Well depth, m	5-5,5	9-9,5	14-14,5
2	Natural humidity, W (%)	17,20	17,30	22,96
3	Wet condition density, ρ (g/cm³)	1,98	2,01	1,97
4	Dry in the state density, ρ_d (g / cm³)	1,69	1,71	1,60
5	Density (particles), ρ_s (g/cm³)	2,70	2,69	2,70
6	Porosity coefficient, e	0,82	0,57	0,68
7	Relative porosity, n (%)	0,45	0,36	0,41
8	To the water saturation level, S_r	0,57	0,82	0,90
9	Fluidity limit, W_L	30,12	29,14	30,52
10	Plasticity limit, W_p	24,31	22,81	23,49
11	Soil type, I_p (%) “clayey sand”	5,69	6,33	7,03
12	Internal friction angle, φ (°)	35,91	40, 12	38,64
13	Connection strength, C (MPa)	0,029	0,031	0,027
14	Gypsum amount, (%)	12,6	11,3	14,7

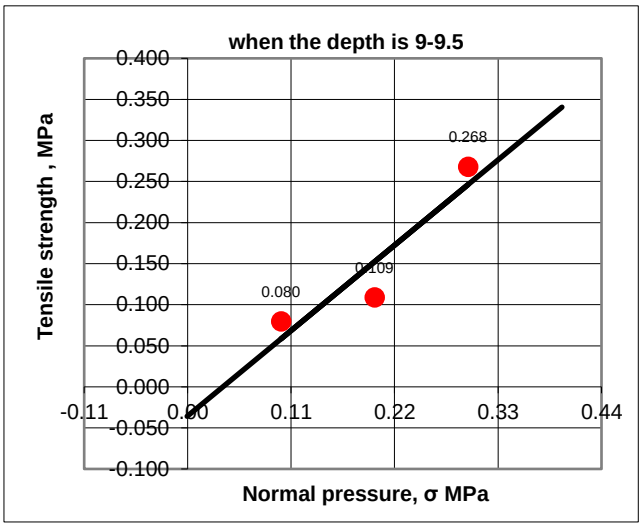
The following in the table Syrdarya province Sardoba from the territory taken of the ground in the process of being pushed test results (Table 2).

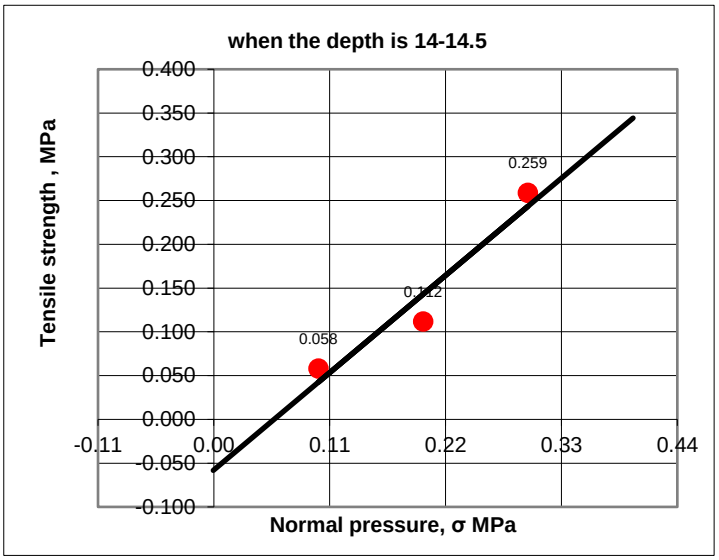
Table 2.

	Well Depth 5-5.5 m.		Well Depth 9-9.5 m.		Well Depth 14-14.5 m.	
№	Normal	To be pushed	Normal	To be pushed	Normal	To be pushed

	pressure , σ (MPa)	resistance strength, τ (MPa)	pressure, σ (MPa)	resistance strength, τ (MPa)	pressure, σ (MPa)	resistance strength, τ (MPa)
1	0.10	0.067	0.10	0.080	0.10	0.058
2	0.20	0.127	0.20	0.109	0.20	0.112
3	0.30	0.281	0.30	0.268	0.30	0.259







This in graphs in the composition plaster was of the ground various kind in the depths to move resistance cases reflection delivered.

Grounds granularity composition and strength features according to cited information normative in documents and training in the manuals there is. “Grunts mechanics, ground and called foundations” study in the manual and “ShNQ 2.06.02-23 Hydraulic Engineering tunnels” normative in the document of the ground strength and deformative characteristics, their calculation methods and relevant parameters (Table 3).

Table 3.

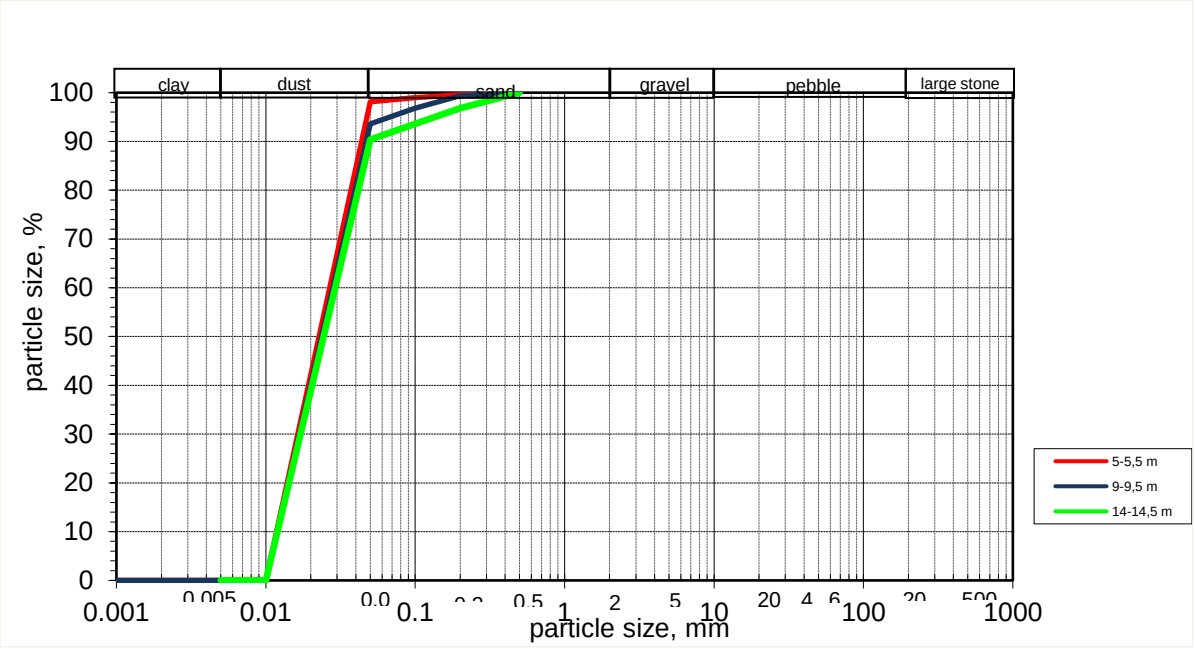
№	Ground type	Particle size (mm)	Internal friction angle (ϕ)	Connection power (c)	Stability level
1	Gravel	> 2mm	35° - 45°	0 - 5 kPa	Very solid

2	Sand (coarse)	0.6 - 2mm	30° - 40°	0 - 3 kPa	Strong
3	Sand (medium)	0.2 - 0.6 mm	28° - 35°	0 - 2 kPa	Average solid
4	Sand (fine)	0.06 - 0.2 mm	25° - 30°	0 - 1 kPa	Less solid

The following in the table Syrdarya province Sardoba from the territory taken of the ground granularity composition (Table 4).

Table 4.

	Particles size, mm						
Sample taken depth, m	*0.001*	*0.005*	*0.01*	*0.05*	*0.1*	*0.2*	*0.5*
5- 5.5 m	0	0	0	98.1	99	99.6	100
9 -9.5 m	0	0	0	93.6	96.8	99.4	100
14 -14.5 m	0	0	0	90.4	93.6	96.8	100



This in the graph, in the structure plaster amount up to 10÷15% soil samples that are particles to size looking at how many percentage organization to be able and soil type is “clay sand” shown.

CONCLUSION

Muddy sand in the ground plaster the amount is between 10-15 %, when they are internal friction angle ϕ and to connect power c noticeable at the level it changes, this and engineering construction in their work into account to be taken necessary. This with together ground granularity composition to strength directly effect does. Large particulate grunts stronger if it is small particulate muddy sand groundhogs to deform inclined. Research results this showed that granularity composition and ground type when detected “muddy sand” known was, in the lineup plaster existence on account of her strength criterion to documents suitable absence and such grunts buildings in design deep to study necessity known it has been.

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