ABORATORY TEST ON BORING

PUMP STATION - BEN ME COC 2

BORING No : UB(2) - 03

IG				Natural water content w (%)	Unit weight		Specific gravity Gs	Porosity n (%)	Void ratio e_o	Degree saturation S (%)	Atterberg limit			Liquidity index B	Unconfined compression q_u (Kg/cm^2)	Consolidation					REMARK
					Natural γ (g/cm^3)	Dry γ_d (g/cm^3)					Liquid limit LL (%)	Plastic limit PL (%)	Plastic index PI (%)			Compression index Cc	Coefficient of consolidation Cv (cm^2/s)	Preconsolidation pressure Pc (Kg/cm^2)	Coefficient of volume compressibility m_v (cm^2/g)	Coefficient of permeability k_{20} (cm/s)	
#50	#100	#200																			
0.3	0.15	0.075	0.005																		
16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(29)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)
	100	96.4	30.1	71.29	1.514	0.884	2.569	0.66	1.906	96.1											
	100	95.4	29.2	68.29	1.563	0.929	2.567	0.64	1.764	99.4	65.6	36.2	29.4	1.09	0.208	1.1569	1.94E-04	1.057	1.19E-04	2.21E-08	
	100	94.9	50.2	80.21	1.469	0.815	2.601	0.69	2.191	95.2											
	100	96.5	62.6	91.01	1.436	0.752	2.585	0.71	2.438	96.5	89.0	45.3	43.7	1.05	0.078	1.0109	2.11E-04	0.427	1.66E-04	4.32E-08	
	100	97.2	63.4	89.24	1.453	0.768	2.603	0.71	2.390	97.2											
	100	99.0	68.2	87.38	1.420	0.758	2.595	0.71	2.424	93.5	68.3	36.2	32.1	1.59							
100	90.2	83.2	50.6	80.23	1.429	0.793	2.698	0.71	2.403	90.1											
03.2	84.2	75.2	46.3	69.91	1.454	0.856	2.601	0.67	2.039	89.2	64.7	34.3	30.4	1.17	0.153	1.2712	1.83E-04	1.048	1.18E-04	2.03E-08	
04.2	90.2	80.1	55.2	70.56	1.501	0.880	2.621	0.66	1.978	93.5											
97.87	94.1	93.1	63.9	84.23	1.488	0.808	2.605	0.69	2.225	98.6	70.6	37.6	33.0	1.41	0.222	1.2782	3.37E-04	1.137	1.02E-04	3.74E-08	
95.3	93.2	92.1	61.4	80.21	1.498	0.831	2.623	0.68	2.155	97.6											
2.6	9.7	8	2.7	15.33	1.779	1.543	2.637	0.42	0.710	57.0											
3.4	10.3	9.1	4.2	17.21	1.979	1.688	2.643	0.36	0.565	80.5											
17.9	30.9	23.6	14.5	14.87	1.995	1.737	2.645	0.34	0.523	75.2	33.5	20.4	13.1	-0.42							
96.7	31.2	25.3	16.8	15.91	2.018	1.741	2.651	0.34	0.523	80.7											

4.2 BEARING CAPACITY OF FOUNDATION

For example , a concrete pile with the dimensions 0.4 x 0.4 x 26m is taken, the calculation is as follows :

P = 1.6 m
As = 0.16 m^2

Applying formula

Qult = C Ncs As + C_A 2 π R L

and Qult = q As + ((K_H /2) γsub L^2 tg δ) * P

where q = γsub R Nγ + K_B * γsub * L * Nq - γsub * L

At the borehole UB(2)-03, with following parameters :

- Layer 1 + layer 2 :

L = 24.0 m.
C = 0.074 kg/cm^2 = 0.740 T/m^2
C_A = 0.740 T/m^2
γsub = 0.490 T/m^3

- Layer 4b :

L = 2.0 m .
ϕ = 30°
ϕ' = 35°
γsub = 1.000 T/m^3
K_H = 0.5
tan δ = 0.25
K_B = 0.4
Nγ = 40
Nq = 40
tan δ = 0.25

Because the pile gets through 3 layers so the total bearing capacity is the sum of skin friction through all layers (layer 1 + layer 2, layer 4b) and bearing capacity of tip in layer 4b :

Calculation :

Layer 1 + 2 : Q = C_A 2 π R L

Q_{1+2} = 0.465 T/m^2 x 1.6m x 24.0 m = 17.856 T.

Layer 4b :

Qult = q As + ((K_H /2) γsub L^2 tg δ) * P

q = γsub R Nγ + K_B * γsub * L * Nq - γsub * L

Q_{4b-1} = Po x K_H x tan δ x L x P

Po = 0.490 x 24.0 + 1.000 x 2.0/2 = 12.760 T/m^2

Q_{4b-1} = 12.760 x 0.5 x 0.25 x 4.0 x 1.6 = 5.104 T

Q_{4b-2} = q As

q = γsub R Nγ + K_B * γsub * L * Nq - γsub * L

q = 1.000 x 0.2 x 40 + 0.4 x 1.000 x 2.0 x 40 - 1.000 x 2.0 = 38.000 T

Q_{4-2} = q x As = 38.000 x 0.16 = 6.080 T

Q_{total} = Q_{1+2} + Q_{4b-1} + Q_{34b-2} =

Q_{total} = 17.856T + 5.104 T + 6.080 T = 29.040 T

Choosing safety factor Fs = 3 , Qult = 9.68 T .

Conclusion

With the above mentions, some following remarks can be made :

- Up to 30.0 m deep, the foundation is constructed by Holocene deposit layers, with thickness more 30m (very soft - soft, Organic Clay), have low bearing capacity.

- According to load of construction, foundation can be put on the layer 2 after improving, may be to use cajeput pile foundation, sand pile foundation or draining plastic stripes (for small load construction) or use concrete pile foundation to transmit the construction load to Pleistocene deposit soil layers and in this case have to drill some more deeper boreholes into the Pleistocene deposit at the borehole UB(2)-2.

Calculation for a concrete pile at borehole UB(2)-3 with section (0.4x0.4m) and length of 26.0m has following results :

Qult = 9.680 T .

4.3 . OBSTACLES DURING DRILLING.

During drilling at the boreholes caught some rotten woods have not yet completely disintegrated when drill through layer 2 (Very soft, high plasticity blackish grey).

REFERENCES

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4./ W .M .Cobel - Soil mechanics (Design manual 7-1) - May 1982 .