CIE 444 – SOIL MECHANICS

Lebanese American University – Fall 2010
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HOMEWORK#4

Out Friday Oct. 29, 2010
Due Friday Nov 5, 2010, IN CLASS

Solve problems **5.14, 5.16, 5.19, 5.22, 6.28, and 6.32** in the textbook:
"Geotechnical Engineering: Principles and Practices", **2nd Edition**, by Coduto et al.

SOLUTION

Problem 5.14

Soil L would make the best highway subgrade because it has the lowest "A" classification and the lowest group index.

Problem 5.16

Soil	Percent			Type	w_L	I_P	USCS Classification
	Gravel	Sand	Fines				
A	0	12	88	Fine	40	19	OL: Organic clay

Problem 5.19

The CL soil would be the best choice because it has the lowest hydraulic conductivity. Water flows through this soil very slowly.

Problem 5.22

No plasticity makes it safe to assume little or no fines. Since the period at the end to sentence can be seen with the unaided eye, we can assume sand size particles. A very uniform size distribution suggests that it's most likely a SP – Poorly graded sand.

Problem 6.28

a.

$$\bar{\gamma}_{d,c} = \frac{17.3+17.7+16.8+17.1+16.0}{5} = 17.0\,\text{kN/m}^3$$

Assume average C_R=92%

$$\bar{\gamma}_{d,f} = (0.92)(19.2\,\text{kN/m}^3) = 17.7\,\text{kN/m}^3$$

$$\frac{\Delta V}{V_f} = \left[\frac{\gamma_{d,f}}{\gamma_{d,c}} - 1\right] \times 100\%$$

$$= \left[\frac{17.7\,\text{kN/m}^3}{17.0\,\text{kN/m}^3} - 1\right] \times 100\%$$

$$= 4.1\%$$

$$\Delta V = (4.1\%)(206{,}670) = 8470$$

$$\text{Required volume of cut} = 206{,}670 + 8470 = 215{,}140\,\text{m}^3$$

$$\text{Volume of export} = 223{,}120 - 215{,}140 = 7980\,\text{m}^3$$

b.

$$\bar{w}_{cut} = \frac{9.1+9.5+8.9+7.2+12.0}{5} = 9.3\%$$

$$\gamma_d = \frac{W_s}{V}$$

$$17.0 = \frac{W_s}{7980} \rightarrow W_s = 135{,}700\,\text{kN}$$

$$W = W_s(1+w) = (135{,}700)(1+0.093) = 148{,}000\,\text{kN}$$

$$M = \frac{148{,}000\,\text{kN}}{9.8\,\text{m/s}^2} = 15{,}100{,}000\,\text{kg} = 15{,}100\,\text{metric tons}$$

Problem 6.32

The contractor is using inappropriate methods, which need to be changed as follows:

1. Use thinner lifts, probably on the order of 200 mm.
2. Mix the water and the soil before compacting, in order to achieve a more uniform moisture content, then adjust the amount of water added to achieve a moisture content near optimum.