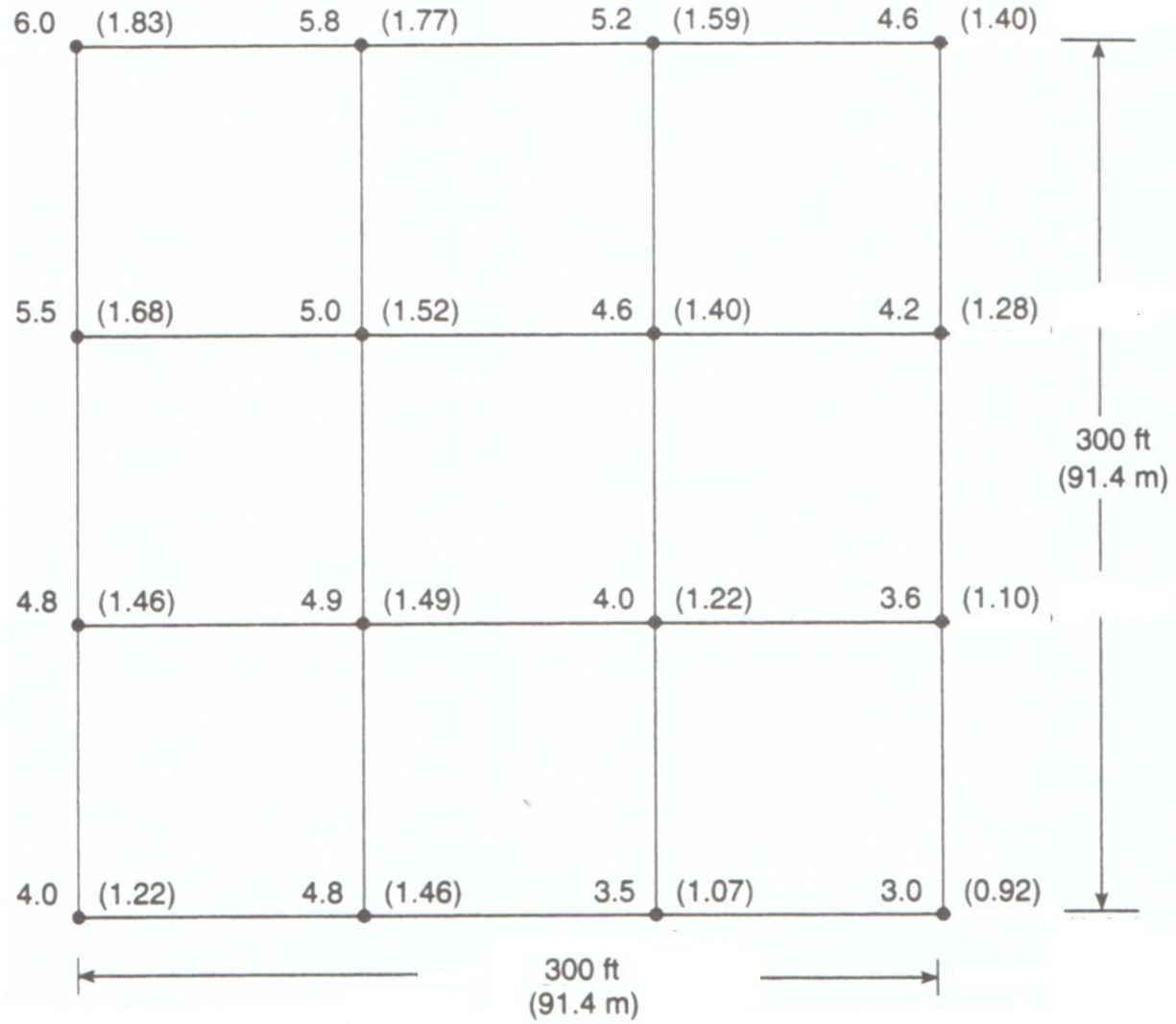
Civil Engineering

CVG 4173 **Construction Management**

Due on: 15/11/2012 SOLUTION Assignment # 2

1. Calculate the volume of excavation in bank measure for the figure shown below.



Solution:

Corner points = 6 + 4.6 + 3 + 4 = 17.6 ft

= 1.83 + 1.4 + 0.92 + 1.22 = 5.37 m

Border points = 5.8 + 5.2 + 4.2 + 3.6 + 3.5 + 4.8 + 4.8 + 5.5 = 37.4 ft

= 1.77 + 1.59 + 1.28 + 1.1 + 1.07 + 1.46 + 1.46 + 1.68 = 11.41 m

Interior points = 5 + 4.6 + 4 + 4.9 = 18.5 ft

= 1.52 + 1.4 + 1.22 + 1.49 = 5.63 m

Average depth = $\left(\frac{17.6 + 2(37.4) + 4(18.5)}{36}\right) = 4.62 \text{ ft}$

$\left(\frac{5.37 + 2(11.41) + 4(5.63)}{36}\right) = 1.41 \text{ m}$

Area = 300 x 300 = 90,000 ft^2

= 91.4 x 91.4 = 8,353.96 m^2

Volume = $\left(\frac{90{,}000 \text{ x } 4.62}{27}\right) = 15{,}400 \text{ BCY}$

= 8,353.96 x 1.41 = 11,779.08 BCM

2. A sample of gravel from a stockpile weighs 15 lb (6.80 kg). After oven drying, the sample weighs 14.2 lb (6.44 kg). Calculate the moisture content of the sample.

Solution:

Moisture content = $\left(\frac{15 + 14.2}{14.2}\right) \text{x } 100 = 5.6\%$

= $\left(\frac{6.8 - 6.44}{6.44}\right) \text{x } 100 = 5.6\%$

3. Find the size of a conical spoil bank created by the excavation of 500 BCY (382 BCM) of clay. The soil's swell is 30% and its angle of repose is 35^o.

Solution:

Loose volume = bank volume x $\left(1+\frac{\text{swell}}{100}\right)$

= 500 x $\left(1+\frac{30}{100}\right)=650\,\text{LCY}$ = 650 x 27 = 17,550ft^3

= 382 x $\left(1+\frac{30}{100}\right)=496.6\,\text{LCM}$

Base diameter = $\left(\frac{7.64\,\text{x volume}}{\tan \text{R}}\right)^{\frac{1}{3}}$ = $\left(\frac{7.64\,\text{x}\,17{,}550}{\tan 35^o}\right)^{\frac{1}{3}}$ = 57.6 ft

= $\left(\frac{7.64\,\text{x}\,496.6}{\tan 35^o}\right)^{\frac{1}{3}}$ = 17.6 m

Height = $\left(\frac{D}{2}\right)$ x tan R = $\left(\frac{57.6}{2}\right)$ x tan 35^o = 20.2 ft

= $\left(\frac{17.6}{2}\right)$ x tan 35^o = 60.2 m

4. A soil weighs 2400 lb/yd^3 (1089 kg/m^3) loose, 3050 lb/yd^3 (1383 kg/m^3) in-place, and 3600 lb/yd^3 (1633 kg/m^3) compacted. Find the swell and shrinkage of this soil.

Solution:

Swell = $\left(\frac{\text{wt / bank volume}}{\text{wt / loose volume}}\text{-}1\right)\text{x}\,100$ = $\left(\frac{3050}{2400}\text{-}1\right)\text{x}\,100$ = 27 %

= $\left(\frac{1383}{1089}\text{-}1\right)\text{x}\,100$ = 27 %

5. A ditch having a cross-sectional area of 50 ft^2 (4.6 m^2) is being excavated in common earth. The soil's angle of repose is 35^o and its swell is 25%. Find the height and base width of the triangular soil bank that will result from the excavation.

Solution:

Loose volume per foot (m) of ditch = area x 1 x $\left(\frac{1+\text{swell}}{100}\right)$

Volume = V = 50 x 1 x 1.25 = 62.5 ft^3 / ft

= 4.6 x 1 x 1.25 = 5.75 m^3 / m

Base width = $\left(\frac{4\,V}{L\,x\tan R}\right)^{\frac{1}{2}} = \left(\frac{4\ x\,62.5}{L\,x\tan 35^o}\right)^{\frac{1}{2}}$ = 18.9 ft

$= \left(\frac{4\ x\,5.75}{L\,x\tan 35^o}\right)^{\frac{1}{2}}$ = 5.7 m

Height = $\left(\frac{B\,x\tan R}{2}\right) = \left(\frac{18.9\,x\tan 35^o}{2}\right)$ = 6.6 ft

$= \left(\frac{5.73\,x\tan 35^o}{2}\right)$ = 2.0 m